Plastic Surgery the Meeting 2022 Abstracts

How the Deep Plane Facelift Rejuvenates the Lower Eyelid

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Goals/Purpose: The goal is to show that lower eyelid rejuvenation does not always require lower eyelid surgery. The extended deep plane facelift is an ideal procedure to rejuvenate the lower eyelid in selective patients.

Methods/Technique: 20 patients had a deep plane facelift +/- necklift. No lower eyelid surgery was performed. 5 patients had just 1cc of fat transferred to each tear trough area. 6 patients had CO2 laser of the periorbital skin. During the deep plane facelift, the lower lateral half of the orbicularis muscle was lifted in a superior-lateral vector. This was then suspended in place with 4-0 PDS suture(s). This approach protects the temporal branch of the facial nerve, as well preserve orbicularis oculi muscle function. The blunt dissection of the malar fat pad and contents frees this tissue and was repositioned superiorly and sutured with 3-0 nylon sutures. This restores the volume of the upper cheek and shortens the lower eyelid and blends the lid-cheek junction. The higher temporal skin incision allows for this lifting effect of all midface and lower eyelid structures as well as tightens the lateral orbital/crows feet skin. 1cc of fat was grafted in the tear trough region in some patients as an adjunctive procedure. The skin in the crows feet area is freed in a superficial plane and excess skin removed to tighten.

Results/Complications: No complications, including no facial nerve injuries. The lower eyelid distance from the lid margin to the lid-cheek junction is successfully shortened. The lid-cheek junction is more blended, and the lateral orbital skin is improved. Additional benefit is not having a traditional lower eyelid surgery that can cause additional bruising, swelling and potential lower eyelid complications such as lid malposition.

Conclusion: The deep plane facelift when extended to reposition and tighten the lower eyelid structures results in a more youthful lower eyelid, while avoiding or not needing lower eyelid surgery.

Temporal Branch Ablation for the Treatment of Facial Rhytids: A New Surgical Technique

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Purpose: Frontal wrinkles are a cause of distress for many people as they give rise to an aged appearance. Traditionally, this has been treated with botulinum toxin injections. However, this procedure is not free from complications and has a temporary result. This report describes a procedure involving temporal branch of facial nerve ablation, a novel and simple technique.

Objectives: The objective of this study was to introduce, in detail, this new technique of ablation for the treatment of frontal wrinkles after analyzing three options of approach based on the number of ablation lines.

Methods: Fifty-one patients with a mean age of 49 years underwent nerve ablation. The temporal nerve branches were located through electrostimulation. Through a skin puncture in the temporal region, an Abbocath ®, with part of the plastic coating removed at its base, was introduced. The nerve branches were cauterized in oblique lines with a monopolar electric scalpel. Patients were divided into three groups, depending on the number of ablation lines: Group 1: one line; Group 4: four lines, and Group 6: six lines.

Results: The median follow-up period was 20 months. Only three (5.7%) patients developed unilateral relapse of muscle activity in the frontal region. Group 6 was statistically superior to Group 1. There was no statistically significant difference between Group 4 and the other two groups.

Conclusion: Facial nerve branch ablation is a simple, easy-to-perform, rapid surgical technique for the treatment of forehead rhytids that produces less postoperative pain, rapid recovery, and, above all, it offers long-lasting results.

Saline Aspiration Negative Intravascular Test (SANIT) - Mitigating Risk with Facial Fillers

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Introduction: Rheological and mechanical characteristics of fillers, facial anatomy and injection danger zones are well documented. Injectors should always proceed with caution and consider that there are "no safe zones". A recent article has reflected on how a negative aspiration, using a hyaluronic acid primed syringe, may be useless. However, it is reasonable that pressure inside a vessel may be insufficient to reflux blood into the syringe due to physical characteristics of different filler products. Since viscoelastic properties of saline are significantly lower than those of fillers [G'], aspiration with saline prior to filler injection may decrease the risk of a false negative aspiration and subsequent catastrophic effects. The rationale behind our SANIT

technique is akin to a "reverse Seldinger" - wherein the absence of a flash of blood with saline aspiration demonstrates that the injector is not inside a blood vessel. This may be especially useful for bolus injections, and especially so for fat or Calcium hydroxylapatite (CaHA), since the G' is much higher than HA and thus reflux of blood into the syringe is exceedingly unlikely to occur.

Methods: A review of the author's experience was performed. Briefly, a 3mL Luer lock syringe is filled with 2mL of 0.9% normal saline and either a 27G needle or a 27G 4cm single hole disposable cannula, turned one-half rotation. After skin puncture, the 3mL syringe is advanced with the plunger pulled back to induce a negative pressure chamber. Progress is made to the desired injection depth, simultaneously aspirating and waiting for 5 seconds. Once the desired location of filler injection is reached, the syringe is exchanged for the syringe containing filler, taking care not to dislodge the needle tip. Prior to this, we remove the 0.1mL of filler to allow for space inside the syringe for aspiration. We again aspirate and inject retrograde as a stack or bolus.

Results: Sixty-two patients undergoing HA, CaHA or fat injection to the nose, temporal, glabellar or malar regions (total of 134 syringes) were treated. There was one case of a positive SANIT test in the temporal region, despite pre-procedure marking of visible veins and superficial temporal artery course; injection was performed 2 days later. This technique is suited for bolus, retrograde, or stacked injection in danger zones, while it is not practical for the tear trough or other regions where tiny volumes of filler are to be used, or when a fanning or microbolus technique is needed.

Conclusion: The increase in demand for soft tissue fillers, including HA, CaHA and fat worldwide has led different providers, with variable degrees of training, to offer these procedures. Plastic surgeons should be the stewards for safe filler techniques; since we are often the specialists seeing and treating patients with filler complications, it is necessary to decrease such complications. Adding an additional safety step through the SANIT technique adds irrelevant cost or complexity to the procedure and may help decrease complications.

Combining Submental Liposuction with Facelift: How Safe?

Abstract Presenting Author:
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Despite being commonly practiced, there is paucity of papers that addresses the risks of combining submental liposuction with facelift. Does it increase the wound and nerve-related complications rate?

Methods: We did a retrospective review of 400 patients who underwent facelifts. Patients were divided into two groups; one group underwent facelift only, another group underwent additional aggressive submental liposuction (, removing an average 90 ml of aspirate, leaving only 2-3 mm of subdermal fat). Patient demographics, body parameters, and complications were reviewed.

The two groups were compared.

Results: Most patients (n=224) underwent submental liposuction in addition to facelift in the same setting. One hundred and seventy-six patients (n= 176) underwent facelift with no submental liposuction. The average follow-up was 6 months. There was no significant difference in the rate of our reported complications (skin slough, skin necrosis, hematomas, and temporary nerve palsy). There was no permanent nerve palsy. It's worth reporting that the occurrence of temporary nerve palsy was higher within the liposuction group. No patients required any corrective procedure for neck deformity.

Conclusion: Combining aggressive submental liposuction with facelift doesn't seem to increase the wound and nerve related complications rate in our study. Care must be taken during aggressive submental liposuction to avoid bad cosmetic sequelae.

The Deep Fascia of The Infraorbital Region and The Suprafibromuscular Facelift: New Anatomical Concepts Applied in Midface Surgery

Abstract Presenting Author:
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Contrary to what previous surgeons have described, the existance of a fibro-fatty fascial layer has been shown between the SMAS and Deep Fascia of the midface and lower face that protects the facial nerve and lines the expressive muscles of the face, including the zygomaticus, orbicularis oris, and lip elevators.

The authors defined this plane in the mid-face and lower face, and described it as above the previously unrecognized "deep fascia", dubbing it "Chiara's fascia."
The authors have correlated anatomical work to explain the new concepts linked to the description of this fascia with over 100 fresh cadaver heads performed in Paris – Laboratoire d'Anatomie, Ecole de chirurgie du Fer à Moulin and over 900 fresh facelift dissections over 10 years in Santa Barbara – Keller Surgicenter.

These massive anatomical and surgical dissections led to the observation of these new anatomical concepts regarding this fascial layer and its relationship with the surrounding structures of the midface:

1. This deep fascia is contiguous with the superficial layer of the deep temporal fascia and the parotid fascia
2. It inserts on the periosteal layer of the inferior orbital rim
3. It is a fibrofatty layer whose histological structure corresponds exactly to the superficial layer of the deep temporal fascia's one
4. It covers the mimetic muscles of the infraorbital area
5. It separates the SubOrbicularisOculi Fat from the pre-periosteal fat

6. It protects the zygomatic branch of the facial nerve and the zygomaticofacial nerve
7. It contributes to or forms the retaining ligaments of the face, including sentinel ligaments such as McGregor's ligament and the parotido-cutaneous ligament.
New anatomical concepts have to be integrated in the anatomy of the midface and applied in the surgical procedures performed on this area to be able to obtain good results lowering the risk of facial nerve damage.

85 cases Gummy smile correction by Dr.Vitusinee 's technique

Abstract Presenting Author:
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Excessive gingival display or gummy smile is condition which an overexposure of maxillary gingiva (>3mm) is present during smiling. There are many different methods for correct gummy smile. This is alternative technique that reduce muscular function of the elevator of the upper lip muscle and repositioning of the upper lip

This report is to present my personal experiences in Lip repositioning with myotomy of the levator Labii Superioris muscle for correct gummy smile. Surgery was performed on 85 patients from 1 January 2020 to 31 October 2021 by Dr.Vitusinee Udee at Punisa lip surgery clinic.

85 patients (female 72 cases, male 13 cases) underwent lip repositioning with myotomy of the Levator Labii Superioris muscle.

The procedure can limit lip elevation on smiling, thus reducing the gingival display when smiling. This technique takes short time operation, less recovery period, less aggressive and have fewer post operative complication compare with orthognathic surgery. Long term stability of the results remains to be seen.

Venous Thromboembolism Prophylaxis in Plastic Surgery Patients Undergoing Facelift

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Purpose: In 2005 the ASPS approved the VTE Task Force Report, which recommended use of the Caprini scoring system for plastic surgery patient, which has been adopted for venous

thromboembolism (VTE) prophylaxis by most surgical societies in America [1,2]. The aim of this study is to investigate the incidence of deep vein thrombosis (DVT) and pulmonary embolism (PE) in patients undergoing facelifts at our institution, who were not chemoprophylaxed based on the Caprini scoring system.

Methods: A retrospective chart review was conducted of patients that underwent facelift at a single institution. Patients were included if they were operated on between 2016-2021 by the lead surgeon and excluded if they received VTE prophylaxis. Comorbidities, rate of VTE, and other relevant data was collected. Descriptive statistics were then conducted to analyze the collected date.

Results: 136 patients were isolated after chart review and no patients were found to have had DVT or VTE. The average caprine score was 5.625 and ranged from 3 to 10. There was 3 patients with evidence of post-operative hematoma (caprine score=5, 5, 7). Overall hematoma percentage was 2.205%.

Conclusion: Based on the average Caprini score for our patients, all should have received chemoprophylaxis for VTE. We found no VTE related events in our patients without chemoprophylaxis. This is consistent with a previous study of 1453 patients receiving a variety of cosmetic procedures without chemoprophylaxis and had no VTE related events [3]. Our study suggests that Caprini Scoring system might not be optimal in predicting VTE in aesthetic patients.

Works Cited:

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Enhanced Recovery After Surgery (ERAS) Protocol in Facelift Surgery

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Purpose: Development of ERAS protocols can improve patient recovery following cosmetic surgery. We aim to present our ERAS protocol for rhytidectomy of the face and neck.

Methods: A review of outcome analyses in the literature was conducted and summarized to formulate our recommendations. Emphasis was placed on high quality trials, prospective studies, and meta-analyses of high evidence-level. Our ERAS protocol contains the following standard elements: medical optimization, anesthetic practices, antimicrobial prophylaxis, complication prevention, and postoperative management. For some elements, recommendations were extrapolated from evidence-based ERAS protocols in other surgical fields.

Results: Preoperative - Medical optimization includes emphasis on strict blood pressure control, smoking cessation, and anticoagulant discontinuation. Systolic blood pressure (SBP) is maintained below 140 mmHg perioperatively, as SBP above 150 mmHg has been identified as a significant preoperative risk factor hematoma, as well as male gender, aspirin or NSAID intake, and smoking.

It has been shown that active smokers are at higher risk for postoperative skin and wound complications decrease when the time between smoking cessation and surgery is ≥4 weeks. However, it has yet to be determined when their complication rates would become equal to non-smokers. Smoking has been consistently linked with increased risk of local flap necrosis and systemic complications. If smoking cessation is questionable, a urine cotinine assay may be used.

Perioperative - Perioperative measures include 0.1 mg clonidine patch the night prior, or oral the morning of surgery to address blood pressure and anxiety. The reported incidence of postoperative infection is low and surgery length dictates the use of antimicrobial prophylaxis. First-generation cephalosporin is given 30 minutes before incision, followed by one additional dose. Known MRSA carriers are given vancomycin, 7 days of topical mupirocin ointment, and 5 days of chlorohexidine soap body wash. No evidence supports postoperative antibiotics.

Intraoperative - The ASPS and AAPS recommended use of 2005 Caprini scores to stratify VTE risk and implement individualized risk reduction plans. Since facelift is usually >2 hours and many patients are ≥70, operation length and high Caprini scores mandate intermittent compression stockings.

To minimize bleeding, tranexamic acid is given mixed with local anesthesia, topically, or intravenously. Normotension is maintained intraoperatively. Second look technique is used at closure to minimize epinephrine rebound bleeding. Flap closure is performed only after both sides of the facelift and anterior neck work are completed. Blood pressure is raised to preoperative baseline prior to closure.

Postoperative - Systolic blood pressure control below 140 is mandatory. Labetalol and hydralazine are initiated if necessary. Multimodal therapy for prevention of pain, postoperative nausea and vomiting, and blood pressure control also includes perioperative intravenous acetaminophen (1g), ondansetron (4g), and dexamethasone administered 30 minutes prior to extubation. Celecoxib has also been effective for pain and opioid use reduction. For blood

pressure and anxiety, 150 µg clonidine may be administered with benzodiazepines if necessary. Patients are seen and discharged the following day with emergency physician contact.

Conclusions: These recommendations have delivered favorable outcomes in the literature and in our practice. Further refinement will require additional high-quality studies in aesthetic plastic surgery.

A Systematic Review and Meta-Analysis of Clinical, Aesthetic, and Patient-Reported Outcomes of Absorbable versus Non-Absorbable Sutures for Skin Closure of Facial Wounds

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Introduction: For optimal results when repairing facial wounds, good understanding of appropriate suture material and technique, and their evidence-base is paramount. There is a paucity of high-quality and robust systematic reviews, which renders decision-making challenging.

Objectives: We reviewed the available literature and evaluated the quality of current evidence on the clinical, aesthetic and patient-reported outcomes of absorbable versus non-absorbable sutures for facial skin closure.

Materials and Methods: The study was registered on PROSPERO a priori (CRD42021267037). MEDLINE (OVID SP), EMBASE (OVID SP), PubMed, Cochrane Controlled Register of Trials (CENTRAL), Google scholar and Science Citation Index were searched by 2 independent authors and only randomized controlled trials (RCTs) were included in the final selection. Study quality was assessed using GRADE. Risk of bias was assessed using Cochrane's Risk of Bias Tool for randomized studies.

Data Extraction and Analysis: Thirteen RCTs, involving 1978 participants and 2069 facial injuries were included. Of these, 50.2% (1038 injuries) were sutured with absorbable sutures and 49.8% (1031 injuries) with non-absorbable sutures. No statistically significant difference was found between absorbable and non-absorbable stitches in terms of cosmesis scales (e.g., visual analogue cosmesis scale and visual analogue satisfaction scale) and rate of occurrence of different complications such as infections, wound dehiscence, and scarring. Several authors showed preference towards absorbable sutures due to lesser discomfort that is associated with suture removal in non-absorbable cases. The quality of the studies was rated as low, with high

risk of bias.

Conclusion: Absorbable sutures are a viable alternative to non-absorbable suture, with current evidence supporting equivalent aesthetic and clinical outcomes. Future, high-quality level I evidence with cost-effectiveness analysis is required to optimize clinician-patient shared decision making.

Facial Nerve Anatomy in the Midface

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Background: Release of the medial orbicularis oculi (OO) and the orbicularis retaining ligament (ORL) is a well described technique to blend the lid cheek junction in lower blepharoplasty and obtain a midface lift. Only few studies have investigated the detailed anatomy of the facial nerve branches inferior to the ORL and medial to the zygomaticus major muscle (ZM).

Subjects and Methods: Thirteen fresh cadaver hemifaces were dissected under 3x loupe magnification. The skin and SMAS were excised. The facial nerve branches were identified at the margin of the parotid gland and traced peripherally. The midface was defined as the triangle bounded by the ORL superiorly, the ZM laterally, and the levator labii superioris (LLS) medially. The facial nerve branches in this triangle were carefully dissected and their relation to the mimetic muscles, infraorbital nerve (ION), inferior orbital rim (IOR), and ORL were noted. Pictures and videos of the dissected specimens were captured.

Results: The zygomatic and buccal rami of the facial nerve entered the midface deep to the ZM (3-6 branches, mean: 3.75). Medial to this muscle they formed a plexus of interconnected branches. This plexus was situated caudal and deep to the OO. From this plexus, multiple minute branches pierced the caudal margin of the OO from its deep surface. The branches (facial) connected medially with the ION (trigeminal) as it lied sandwiched between the LLS and the levator anguli oris. Multiple minute branches then pierced the LLS and perforated the deep surface of the OO. This nerve plexus was located 2 cm caudal to the IOR and only few millimeters inferior to the ORL. The facial vein was constantly related to the medial branches of this plexus. Pictures and videos of the dissected specimens are presented.

Conclusion: This study identified a neural plexus in the midface formed by the zygomatic and buccal branches of the facial nerve. This was situated 2 cm caudal to the IOR deep and inferior to the lower margin of the OO. It connected with the infraorbital nerve medially. Any dissection in the midface should be mindful of this anatomy.

An Analysis of Industry-related Payments Towards Physicians – Cryolipolysis

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Purpose: Non-surgical fat removal has been gaining popularity over the past decade. Cryolipolysis is a method that has been widely accepted by many institutions based on peer-reviewed literature. We endeavour to determine the impact of industry payments to physician authors of published articles on a popular cryolipolysis device and to elucidate the extent to which authors disclose financial conflicts of interest in their published literature.

Methods: We collated all articles that cite the pivotal trial in the FDA approval of the device. Articles were stratified based on their opinion of the device. A separate researcher recorded industry payments using the CMS Open Payments database.

Results: We identified 19 articles, from an initial screen of 91. This included 37 unique authors in the multiple specialties. 100% of published articles had a listed author who was in receipt of payment from the device manufacturer. This equated to a total of $1,476,564.16. The nature of payments included consulting fees 65.9% (Total $972328.27), compensation for other services 23.4% (Total $345020.00), travel and lodging 6.5% (Total $95444.96) food and beverage 3.5% (Total $51371.54) gifts 0.23% (Total $3429.00), education 0.07% (Total $963.80) and other 0.5% (Total 8006.59). 12 (63 %) articles were positive and 7 (37 %) neutral. 22 (59%) authors reported a conflict of interest while 31 (84%) authors received a form of payment.

Conclusions: As physicians are the primary drivers of health care spending, it is critical to examine how their interaction with industry affects their opinions and actions. This study highlights industry payments in excess of one million dollars to authors. While these articles may be based on an objective assessment, receipt of industry payment has the potential to bias such reporting.

The Management of Elective Plastic Surgery Complications at a Tertiary Medical Center

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Background: The aesthetic plastic surgery industry has seen tremendous growth with Americans spending an estimated $20 billion on approximately 15.6 million procedures in 2020.1 However, the effect of complications from these procedures on the healthcare system are not as well known. This study aims to create awareness regarding aesthetic procedure complications through the scope of plastic surgeons at a tertiary medical facility.

Methods: A retrospective chart review was performed on patients who received care at a single academic tertiary referral center over a 5-year period for complications from a cash-paid aesthetic procedure at an outside facility. Financial charges and key performance indicators were analyzed using physician and hospital billing data for relevant encounters.

Results: Forty patients were reviewed, presenting most frequently with complications secondary to abdominoplasty (37.5%, n=15), breast augmentation (30%, n=12), and injectable fillers (20%, n=7). The most common complications were infection (32.5%), wound dehiscence (22.5%) and inflammatory reactions (12.5%). Serious complications occurred in 3 cases, including one mortality. Of those evaluated, 52.5% (n=21) required inpatient admission with an average length of stay of 8.67 days (range 2-35 days). Additionally, 42.5% (n=17) required surgical intervention. Of all reviewed patients, 57.5% (n=23) were covered by Medicaid, 27.5% (n=11) by commercial insurance, and 10% (n=4) by Medicare, while 7.5% (n=3) were self-pay. For physician billing (PB), total charges were $359,118 with $76,196 of payment received. PB gross collected ratio (GCR) was 21.22% and net collected ratio (NCR) was 96.0%. In terms of hospital billing (HB), total charges were $3.86 million with $910,397 of payment received. HB GCR and NCR were 24.71% and 91.14%, respectively. Notably, 10% of these patients accounted for 56.5% of total HB charges with a GCR of 31.55%.

Conclusion: Larger referral hospitals are well-suited to support the aesthetic community with complication management. These findings provide some insight to the impact of complications outside the index facility. The data advocates for thorough closed-loop patient-surgeon communication regarding risk-benefit analysis and detailed courses of action should any complication arise. Likewise, stronger cooperation and communication between ambulatory surgical centers and tertiary referral centers may also help minimize complications and subsequent healthcare needs.

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The Covid-19 Pandemic and its Impact on Cosmetic Tourism Complications: A Single Institution's Experience

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Background: The COVID-19 global pandemic has required us to reallocate resources to the critically ill and even for a period halt elective surgery. Surprisingly, cosmetic tourism remains prevalent and with that, the post-operative complications that ensue. Given the location of our hospital in NYC, plastic surgery complications following medical tourism commonly present to our Emergency Room. Even during the pandemic, we have had a particularly high volume of cosmetic tourism patients presenting to our center, whether be from lifting of travel restriction or patients seeking cosmetic surgery in other locations while elective surgery was restricted. In a time of especially strained healthcare resources as a result of COVID-19, new insights into complications of cosmetic tourism may be especially valuable.

Methods: This is a retrospective review of patients presenting to the Emergency Department of one institution and requiring a plastic surgery consultation for complications resulting from cosmetic tourism from March 2020 to October 2021. Patient demographics, presenting problems, surgical/medical management strategies, and outcomes were examined, including admission, follow up, length of stay, and complications.

Results: 66 patients were included in the study. All were female with an average age of 37. No patients traveled for cosmetic procedures from March to June 2020 and in July 2020, cosmetic tourism patients began to re-emerge, even during times of peak COVID cases. There was a significant peak in the number of cosmetic tourism patients from March 2021 to June 2021, seen 1 year after the initial COVID travel ban. The median time of presentation was 31 days post-operatively. 36 patients (55%) traveled to the Dominican Republic for their procedure, 24 to Florida (36%), and 4 to Columbia (6%). The most common procedures performed were Brazilian butt lift (30%), liposuction (42%), abdominoplasty (40%), and breast augmentation (20%). The most common complications were surgical site infections (33%), seroma (21%), and wound dehiscence (23%). 24% of patients were admitted, with an average stay of 6 days. Seven patients developed acute kidney injury, 4 developed sepsis, 1 developed a pulmonary embolism, and 1 required an ICU stay. Half of all patients required antibiotics, 3 patients required surgical intervention, and 3 patients required an interventional radiology procedure. 29% of patients had an ultrasound, 23% had an XR, 45% had a CT scan. 13 patients re-presented to the emergency

department following discharge, with 5 of these patients requiring subsequent admissions, and 2 requiring surgical intervention.

Conclusions: Despite the global pandemic, cosmetic tourism is still ongoing, with a halt of only 4 months based on the sample at our institution. Cosmetic tourism puts patients at risk of many different complications and causes a significant burden to the healthcare system. Based on our data, this phenomenon has only intensified following COVID-19. Medical tourism during the COVID-19 pandemic continues to promote nonessential travel and utilize already scarce hospital resources. Continued outreach is needed to inform potential patients of the individual and healthcare system risks associated with cosmetic tourism.

Facial Scars, Sex, Attractiveness, and Confidence: A Prospective Study Using Crowdsourcing Technology

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Introduction: Our faces influence others' perceptions of our character traits, and previous research has elucidated the "anomalous-is-bad" bias against those with craniofacial anomalies, such as scars. Previous work demonstrated well-healed facial scars do not negatively impact first impressions of attractiveness, confidence, or friendliness.1 However, the influence sex has on perceptions of people with scars is poorly understood, with a previous study suggesting scars enhance men's desirability for short term relationships.2 This study aimed to assess the interaction between facial scars and sex on perceptions of attractiveness and confidence using crowdsourcing technology.

Methods: Fifty photographs of non-anomalous faces (models) with neutral expressions from Chicago Face Database were digitally manipulated to include hypopigmented scars at one of fourteen locations on the face including the forehead, lower eyelid, cheek, or upper lip, at the middle or border of anatomic subunits, and both parallel and perpendicular to resting facial tension lines. Scar width was approximately 1–2mm, and scar length was adjusted to each model's intercanthal distance. Participants (onlookers) on Mechanical Turk rated images of 50 different faces with one of 14 randomly selected scarred versions or the unscarred version for 2.5 seconds. Onlookers immediately provided ratings on a seven-point Likert scale for attractiveness

and confidence. Statistical analyses were performed with linear mixed effect models (LMEMs) in R Studio.

Results: 88,850 ratings were generated from 1,777 onlookers (54.8% males). In the overall cohort, LMEMs revealed presence of a well-healed facial scar did not influence ratings of attractiveness ($p = 0.276$) or confidence ($p = 0.077$). Additionally, presence of a scar did not interact with model sex or onlooker sex to influence ratings of attractiveness (all $p > 0.05$).

LMEMs revealed male models were rated as more confident than female models ($\beta = 0.48$, $SE = 0.15$, $z = 3.29$, $p = 0.001$), but that presence of a facial scar interacted with male model sex to predict lower ratings of confidence ($\beta = -0.23$, $SE = 0.09$, $z = -2.52$, $p = 0.012$). Presence of a facial scar and onlooker sex did not interact to predict ratings of confidence ($\beta = -0.07$, $SE = 0.04$, $z = -1.72$, $p = 0.085$); however, in a triple interaction analysis, the presence of a facial scar, onlooker sex, and model sex interacted to predict ratings of confidence ($\beta = 0.16$, $SE = 0.06$, $z = 2.53$, $p = 0.011$).

Conclusions: The presence of a facial scar influenced perceptions of confidence when both model and onlooker sex were accounted for. Additionally, males were rated as significantly less confident with the presence of a facial scar. These findings substantiate previous work that scars may impact perceptions of character traits in a sex-dependent manner.

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National Trends in Facial Cosmetic Procedures by Race/Ethnicity from the "Tracking Operations and Outcomes for Plastic Surgeons" Database

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Introduction: Cosmetic facial procedures remain popular in the general population with the three most common being rhinoplasty, blepharoplasty and rhytidectomy.1 Nevertheless, the

preference and distribution by race and ethnicity for these procedures is still unknown.

Purpose: Evaluate national trends by race or ethnicity of rhytidectomy, blepharoplasty and rhinoplasty to better understand current population needs.

Materials and Methods: This is a retrospective review from the TOPS database from 2003-2018. The groups are divided into 4-year intervals for analysis. Univariate analysis was performed to compare frequencies. Graphs were created to visualize trends.

Results: A total of 38,569 patients were evaluated. The distribution of procedure by race/ethnicity showed rhytidectomy as the most common in White race (13,370 cases [50.0%]), primary rhinoplasty for Black (153 cases [38.6%]), blepharoplasty for Asian (1690 cases [67.7%]), and primary rhinoplasty for Hispanic ethnicity (624 cases [39%]). Visualizing trends by four-year intervals showed in rhytidectomy an increase in White (2003-2006: 45.9% vs 2015-2018 58%) and Asian race (2003-2006: 7.2% vs 2015-2018 13.4%) with no significant difference in Black or Hispanics. Blepharoplasty showed significant decreasing rates for White (2003-2006: 56.2% vs 2015-2018 38.4%), Asian (2003-2006: 78.1% vs 2015-2018 65.9%) and Hispanics (2003-2006: 40.9% vs 2015-2018 23.3%). Primary rhinoplasty showed slight statistically significant decrease in White race (2003-2006: 85.3% vs 2015-2018 81.6%) with increase in Asian (2003-2006: 14.5% vs 2015-2018 16.7%) and Hispanic population (2003-2006: 29.2% vs 2015-2018 44.6%). Secondary rhinoplasty showed increasing rates in Black (2003-2006: 4.7% vs 2015-2018 7.1%) and Asian (2003-2006: 2.0% vs 2015-2018 5.7%) with a decrease in White race (2003-2006: 3.4% vs 2015-2018 2.5%).

Conclusion: The results from this study show the most popular facial cosmetic procedure for each race/ethnicity. In addition, it provides the trends these have shown throughout recent years. Understanding and knowing trends for different cosmetic procedures can help tailor efforts to improve satisfaction and outcomes.

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Comparative Outcomes of Malar Implants Vs Fat Transfer to Cheeks among Transgender Women Undergoing Malar Augmentation

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Background: Malar augmentation is a key procedure sought out by transfeminine individuals seeking to feminize their facial appearance. Different surgical techniques have been described in the literature including fat transfer to the cheeks and malar implant placement. Due to the paucity of information in the literature, there is no consensus on best practices for this procedure and the decision on which technical approach to perform remains largely surgeon- and patient-dependent. The objective of our study is to determine the effectiveness and safety of malar implants as compared to fat transfer to the cheeks in transfeminine individuals.

Methods: We examined all patients with the diagnosis of gender dysphoria that were referred to the senior author seeking consultation for feminizing facial procedures between June 2017 and October 2021. Patients who underwent fat transfer to the cheeks or malar implant placement were included in our study. Patients who underwent both procedures at the same time were excluded from our study. We reviewed the electronic medical record of each patient and we retrieved and analyzed data regarding demographics, past medical and surgical history, operative dictations, clinic notes and postoperative follow up. Univariate analysis was used to assess for differences in postoperative complications between these two groups.

Results: We identified 161 patients who underwent feminizing facial procedures. Of which 105 patients met our inclusion criteria. Seventy-nine patients underwent malar implant placement and 26 underwent fat transfer to the cheeks. Mean age was 34.1 years ± 9.9 and 39.7 ± 12.4 respectively (P=0.045). Mean BMI was 26.3 ± 6.0 and 26.2 ± 4.8 respectively (P=0.98). Patient satisfaction was reported higher in the malar implant group. The complication rate between the 2 groups was 3 (3.8%) vs 0 (0%), P-value=0.573 respectively. In the malar implant group, 2 patients had implant infection necessitating washout and removal and 1 patient had asymmetrical implants necessitating revision. In the fat transfer group 5 patients came back for cheek implant placement due to dissatisfaction with the fat transfer result.

Conclusion: Our findings support the contention that malar implants are a safe alternative for malar augmentation among transgender women. While autologous fat transfer to the cheek is an indispensable option in patients requiring minor malar enhancement, malar implants offer a more permanent option with a better aesthetic outcome in patients requiring major malar enhancement. In order to minimize post-operative complications, surgeons should emphasize patient compliance with postoperative directions.

Experience in Complex Outpatient Plastic Surgery Procedures using Sufentanil Sublingual Tablets

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Goals/Purpose: The number of outpatient plastic surgeries continues to rise, and patients are requesting more complex procedures to be performed with minimal sedation. Optimizing pain control, safety and recovery time while meeting the patient's expectations are ongoing challenges. Sufentanil sublingual tablet 30 mcg (SST) is equianalgesic to 5 mg IV morphine. The pharmacokinetic profile achieves analgesic plasma concentrations within 15 minutes, a peak plasma concentration by 60 minutes, a duration of action of 3 hours following a single dose and a mean elimination half-life of 13 hours. In a recently published series, 31 patients underwent awake plastic surgery with SST and local anesthesia. The most common procedures were liposuction (71%), facelift (10%), and blepharoplasty (6%). The mean procedural duration was 81 minutes, and the mean recovery time was 15 minutes. The study shown SST to be associated with reduced overall opioid use and postsurgical recovery time.

The intent of this investigation was to examine the impact of SST in an outpatient plastic surgery population, in patients undergoing complex surgical procedures of longer duration.

Methods: This awake surgery analysis was a prospective single-group cohort study conducted at our plastic surgery practice. Typically, the patient arrives to the Center and is administered 2 or 3 milligrams of lorazepam orally and 40 mg of aprepitant prophylactically. The patient disrobes and is marked for their procedure. A saline lock IV is started but typically is only used for prophylactic antibiotics and antiemetics. The first dose of SST is given 15 to 30 minutes prior to administration of local and/or tumescent anesthesia. The procedure is begun 20 or 30 minutes after that, as SST is near its peak plasma concentration at 60 minutes. Additional dosages are given as needed, with a minimum of 60 minutes between dosing. Average dose per procedure was 60 mcg in two 30 mcg aliquots. Breakthrough discomfort or anxiety were managed by inhaled 50% nitrous oxide. Intravenous ondansetron or additional oral lorazepam was rarely required.

Results/Complications: This new approach has allowed us to preform 324 cases in ten months, to date. We plan to present results for a full year, all of which would normally have required general anesthesia. So far, the cases undertaken are liposuction with or without fat transfer, breast augmentation with or without mastopexy, breast reduction, brachioplasty, facelift, rhinoplasty, and blepharoplasty, and most significantly, abdominoplasty. Many combination procedures were also undertaken. The mean (± standard error) procedural duration will be reported. Patient characteristics including age and sex will be described. The amount of opioid administered will be calculated, using the Morphine Milligram Equivalents (MME), as published in the online Practical Pain Management Opioid Calculator. To date, no unstable vital signs have been encountered, mild oxygen desaturation is easily handled by rousing the patient and providing supplemental oxygen, opioid reversal has not been necessary. Recovery time and complication rates will be reported.

Conclusions: In this analysis, we will report the impact of SST in an outpatient plastic surgery population, undergoing long duration complex surgeries with minimal sedation. Awake surgery was performed using local anesthesia and sufentanil administered sublingually in 30 mcg aliquots. The absence of cognitive impairment after extended awake surgery allowed an easier

discharge. Implementing the use of SST in our outpatient surgical center, resulted in our ability to perform complex, longer duration procedures without general anesthesia.

Zero-Depth vs. Penile Inversion Vaginoplasty: A Comparison of Surgical Techniques and Postoperative Outcomes

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Purpose: Zero-depth vaginoplasty (ZDV) and penile inversion vaginoplasty (PIV) are two surgical options for patients undergoing feminizing gender affirming surgery. The primary purpose of this study is to compare surgical technique, complication rate, and need for revisionary surgery in PIV vs. ZDV.

Methods: A retrospective chart review was performed on patients undergoing vaginoplasty during 2018-2021 by the senior author (KG) at the University of Wisconsin Hospitals and Clinics. Variables of interest included patient demographics, intraoperative data, and postoperative outcomes. Variables were compared between ZDV and PIV cohorts using independent samples t-test for continuous variables and chi-square or fisher's exact test for categorical variables.

Results: Of the 114 patients who underwent vaginoplasty, 84 patients (73.6%) underwent PIV and 30 patients (26.3%) underwent ZDV. ZDV is a vulvoplasty only with no vagina, while PIV includes dissection of a vaginal canal which is lined with a full thickness skin graft. Patients who underwent PIV were significantly younger (M=38.8) compared to ZDV patients (M=52.3, $p<0.001$). PIV operations were significantly longer than ZDVs (4:06 vs. 2:30, $p<0.001$), resulted in higher estimated blood loss (303.7 vs. 211.3mL, $p<0.001$), and required more intraoperative fluids (2359 vs. 1381mL, $p<0.001$). PIV patients had significantly longer hospital stays than ZDV patients (5.7 vs. 2.6 days, $p<0.001$), however duration of follow-up was similar among the cohorts (139.8 vs. 183.5 days, $p=0.28$). Following vaginoplasty, PIV patients required catheterization for significantly longer than ZDV patients (5.7 vs. 2.8 days, $p<0.001$), while the vaginal pack was in place, with extended activity restrictions. PIV patients developed significantly more wound healing complications ($p<0.001$) and pelvic floor spasm with vaginal dilation ($p=0.02$), requiring higher rates of postoperative pelvic floor therapy ($p=0.04$). Rates of hematoma, prolonged pain, surgical site infection, and granulation tissue were the same in both groups. A minority of patients required revisionary surgery (19% PIV, 10% ZDV, $p=0.4$).

Conclusion: Penile inversion vaginoplasty, with reconstruction of a vaginal canal in addition to vulvoplasty, is a more extensive operation with longer hospital stay and higher rates of postoperative delayed wound healing and pelvic floor spasm. Preoperative counseling regarding need for lifelong vaginal dilation and patient interest in postoperative penetrative vaginal intercourse must be taken into consideration when determining surgical approach.

Calf Augmentation and Volumetric Restoration: A Systematic Review and Meta-Analysis

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Purpose: According to the American Society of Plastic Surgery (ASPS) National Clearinghouse of Procedural Statistics, 655 documented calf augmentation cases were reported during 2018 in the United States, representing a 27.43% increase from 2015. Due to the recent attention that has been brought to the aesthetics of the leg, outcomes in the literature are underreported and require further investigation. We summarized the available evidence on the surgical techniques to augment the volume and dimension of the calf based on clinical outcomes and satisfaction rates

Methods: An electronic search was conducted across PubMed MEDLINE, Web of Science, Scopus, and Ovid MEDLINER(R) in accordance with the PRISMA statement. Data collection included the patients' characteristics, surgical techniques, and postoperative outcomes. Satisfaction among patients was determined when satisfaction was stated above a numeric threshold in a score or when a patient was explicitly reported to be "satisfied". Pooled estimates were calculated with a random-effect meta-analysis using the DerSimonian-Laird model.

Results: Forty-eight studies were included in the systematic review. We included 2455 patients. 508 were males (20.7%) while 1176 were females (47.9%). The average age and follow-up were 33.15 years and 33.58 months, respectively. Unilateral calf augmentation was reported in 446 patients (18.16%), while 1565 patients (63.74%) received a bilateral calf augmentation. The indications for calf augmentation were aesthetic concerns in 1196 patients (48.7%) and reconstructive in 558 patients (22.7%). The most common technique for calf augmentation was subfascial implant placement (70.2%) followed by fat transfer (17.6%), submuscular implant placement (10.1%), fasciotomy only (1.71%), reconstruction with free flaps (0.12%), dermal-fat graft (0.04%), subcutaneous implant placement (0.08%) and non-specific implant (0.04%).

Overall, the pooled satisfaction rate following calf augmentation was 95.4% (95%CI 93.7%-97%). The pooled satisfaction rate for implant placement and fat transfer was 96.7% (95%CI 94.4%-97.9%) and 87.2% (95%CI 78.5%-96%), respectively. The most common complications following subfascial implant placement were seroma formation (3.83%), hyperpigmentation or hypertrophic scar formation (2.9%), and pain or discomfort (2.14%). The most common complications after lipotransfer were asymmetry or contour irregularities (4.16%) and pain or discomfort (2.54%). The pooled incidence of implant removal was 1.3% (95%CI 0.7%-2%). The pooled estimate for additional fat grafting procedures following initial fat transfer was 54.1% (95%CI 38.3%-70%). From the patients who underwent reconstruction with a free flap, one patient required the revision of the anastomosis (33.33%) and one had significant blood loss (33.33%).

Conclusions: Overall, calf augmentation is a safe procedure. Subfascial placement of the implant was the most common technique as it is less invasive and reproducible. However, the rate of minor and major complications may be higher in comparison to other procedures. Fat grafting can be used to improve the outcomes following implant placement. When fat grafting is implemented as a single surgical modality the volumetric expansion is modest versus implant placement, and further fat grafting is required in almost half of cases to achieve satisfactory outcomes.

Public Perspectives on International Cosmetic Surgery Tourism

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Purpose: The purpose of this study is to better understand the motivations of patients willing to travel internationally for cosmetic surgery and gain insight into public perceptions of cosmetic surgery tourism by surveying a large, representative sample of the general public.

Methods: A cross-sectional survey was performed through Amazon Mechanical Turk regarding cosmetic surgery tourism in adults 18 years and older and currently residing in the United States (US).

Results: A total of 484 responses were analyzed. Of those, 45.2% of participants would consider having plastic surgery. Among these participants, 67.1% would consider traveling outside of the

US to receive cosmetic surgery. Participants who reported Hispanic or Latino ethnicity had increased odds of considering surgery abroad (OR 3.1, 95% CI 1.1-8.7, p=.030), as did participants who felt more knowledgeable about the option to travel abroad for plastic surgery (OR 1.6, 95% CI 1.2-2.2, p=.004). The perceived safety of receiving plastic surgery abroad was not related to willingness to consider having surgery abroad (p=.268). Additionally, participants reported that the top perceived advantages of traveling outside of the US for surgery were the price of surgery internationally, a shorter waiting list for surgery, and privacy during recovery. The top perceived disadvantages were the risk of complications, lack of follow-up or continuity care after surgery, and distance from home.

Conclusions: These findings support the need for continued awareness of patients considering international travel for cosmetic surgery and increased education of the general public regarding the safety of cosmetic surgery tourism and the importance of selecting board-certified plastic surgeons and accredited facilities.

Evaluation of the Effects of Incisional Negative Pressure Wound Therapy on Complications After Abdominal Body Contouring Procedures

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Purpose: There is a wealth of basic science and clinical data supporting incisional negative pressure wound therapy's (iNPWT) healing capabilities. Literature supports the use of iNPWT on closed surgical incisions in orthopedic, cardiothoracic, neurosurgical, and plastic surgery procedures. Plastic surgery journals have shown a decrease in wound healing complications with the use of iNPWT in reduction mammaplasty and breast reconstruction; however, literature on the effects of iNPWT in body contouring is lacking.

We sought to determine the effects of iNPWT on surgical complications in patients undergoing abdominal body contouring procedures. We hypothesized that complication rates in patients who had an iNPWT device placed post-operatively would be decreased in comparison to a matched patient population without iNPWT device placement.

Methods: We performed a retrospective, cohort study of patients whom had an abdominal body contouring procedure at a large, academic healthcare system from December 2015 to December 2020. All panniculectomies and abdominoplasties were performed by one of three board-certified plastic surgeons. Complications consisted of wound dehiscence, seroma, hematoma, infection, and superficial skin breakdown. Wound dehiscence was defined as measurable soft

tissue breakdown with exposure of the deeper subcutaneous tissue. Infection was defined as clinical signs concerning for infection with initiation of antibiotics within 90 days of surgery. Superficial skin breakdown consisted of skin epidermolysis requiring minimal, local wound care.

Results: A total of 341 patients had an abdominal body contouring procedure performed over the five-year period. More than half of these patients (54.6%) were status post bariatric surgery. Forty percent of patients had an iNPWT device placed post-operatively. Mean Body Mass Index (BMI) was 32.7 (range 20.7-67.3). Patients with lower BMI (31.5 vs. 33.6, $p = 0.0154$) and a history of mild liver disease (26.3% vs. 14.7%, $p = 0.008$) were more likely to have had an iNPWT device placed.

There was a lower rate of wound dehiscence (2.9% vs. 9.8%, $p = 0.0148$) among the iNPWT patients. Patients with an iNPWT device were significantly less likely to have had signs of infection warranting antibiotics within 90 days of surgery (7.3% vs. 23%, $p = 0.0001$). Hematoma and seroma rates in the iNPWT group were 3.6% and 8.0% versus 4.4% and 11.8%, respectively, in the group without iNPWT. Fifty-three percent of iNPWT patients, and 50% of patients without iNPWT, had superficial skin breakdown requiring local wound care. None of the hematoma, seroma or superficial skin breakdown differences reached statistical significance.

Conclusions: Our results show that the risk of wound dehiscence was significantly decreased with the use of an iNPWT device. In addition, iNPWT was associated with less wound infections as that cohort subsequently required fewer antibiotic prescriptions within 90 days of surgery. The rates of seroma and hematoma in the iNPWT group were decreased, however, did not reach statistical significance. Our analysis shows that iNPWT devices placed on body contouring incisions post-operatively decreases wound dehiscence and surgical site infections, especially in the high-risk, obese patient population.

The Potential Role of Exosomes in Aesthetic Plastic Surgery: A Review of Current Literature

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Background: Interest and discussion on the implementation and utilization of exosomes in the field of Plastic Surgery are increasing given its broad regenerative potential and cell-free characteristics. Exosomes are heterogeneous vesicles that can be derived from various cell types and exert their effects via intercellular communication through the regulation of several cell signaling pathways (1). The purpose of this study is to 1) review exosomes' characteristics and mechanisms of action, 2) explore potential clinical applications of exosomes in the field of

Aesthetic Surgery, 3) report available products on the current market and techniques for procurement and preparation, and 4) encourage further investigation on this emerging topic within the aesthetic community.

Methods: Comprehensive literature review was performed, identifying articles between years 2010 to 2021, using keywords exosomes, aesthetic surgery, plastic surgery, skin rejuvenation, scar reduction, hair growth, body contouring, and breast augmentation. Articles were analyzed and categorized into described sub-topics, with findings represented in table format. A separate search on Google was conducted to identify exosomes manufacturers, five of which were identified as the largest distributors and advertisers online. These organizations were contacted by email and phone, with the characteristics of their exosome derivatives listed in a table.

Results: In current literature, exosomes have shown to be beneficial in various animal- and cell-based models. Early clinical trials showed promising results for skin rejuvenation, promotion of wound healing, scar reduction, hair growth stimulation, and enhancement of fat graft survival (2, 3, 4). Currently available exosome products are derived from source cells including adipose tissue, bone marrow, placental mesenchymal cells, chorionic tissue, umbilical cord, and Wharton's Jelly. Exosome products are available either in aqueous solution or lyophilized form, with indicated use for facial rejuvenation and hair restoration. However, no products are FDA-approved, and only one is approved by the Personal Care Products Council.

Conclusions: Exosomes show promise in several areas of non-surgical rejuvenation. However, further studies are warranted to determine if exogenous exosomes treatment is more cost-effective, superior, and/or safer than other non-surgical treatment modalities such as autologous platelet-rich plasma and fat grafting.

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The Impact of Elective Plastic Surgery Complications on the Military Health Care System

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Background: The prevalence of elective cash-paid aesthetic plastic surgery procedures has increased globally, particularly as costs are lower abroad. Little is known about their medical and financial effects to the military health care system. This study examined the impact of complications from elective fee-for-service aesthetic procedures at outside facilities on healthcare resource utilization at Naval Medical Center San Diego (NMCSD).

Methods: A retrospective chart review was performed on adults presenting to NMCSD between October 2015 and November 2020 for complications from an elective cash-paid procedure performed at civilian facilities. Data collected included index surgery, complications, medical and surgical interventions performed, inpatient stay, and outpatient management. Hospital resource utilization was extrapolated by calculating work relative value units (wRVU) from procedure CPT codes.

Results: Thirty-five patients presented to NMCSD during this period; all were female and seven (20%) were active-duty service members. Of these, 45.7% (n=16) had procedures outside the U.S., and 22.9% (n=8) had procedures within San Diego County. The most common index procedures were breast augmentation with or without mastopexy (57.1%, n=20) and abdominoplasty with or without liposuction (22.8%, n=8). Fifty-seven percent presented as outpatients (n=20) with the most common chief complaints being symptomatic macromastia, breast ptosis, and capsular contracture. These complaints were largely addressed with outpatient surgery. Of the 15 who presented emergently, 11 (73.3%) were diagnosed with surgical site infections requiring emergent operative debridement. Across all patients, an average of 30.5 wRVUs was spent for surgical interventions. The emergent cohort required, on average, 4.4 inpatient days, 5.7 outpatient encounters, and 12.9 wRVUs (0-81.71). The outpatient cohort required an average of 5.5 clinic (preoperative and postoperative) encounters and 43.7 wRVUs (14.88-97.9).

Conclusions: Fee-for-service plastic surgery procedures are increasingly popular but are found to have higher than expected complication rates, which may impact the military health care system with significant resource utilization for management. Furthermore, these additional hours in the operating room, wards, and clinics significantly affect this already resource-constrained system. Improved patient education and an efficient protocol for referring to trusted surgical centers can help limit these complications and minimize subsequent healthcare needs.

Complications of Cosmetic Surgical Tourism

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Introduction: The number of patients seeking cosmetic surgical procedures abroad, "cosmetic tourism" is increasing,1 driven by perceived affordability,2 shorter wait time, and familiarity with the host country.3 When US patients seek care abroad, short stays and lack of follow-up4 often lead them to seek treatment for complications back at home. Incomplete medical records, uncommon bacterial infections and unfamiliar surgical practices pose significant challenges for US physicians managing these complications, but there is limited data on the scope and prevalence. We present a review of the literature of cosmetic tourism complications treated by US physicians.

Methods: Articles from Web of Science, Cochrane, Embase, Scopus and PubMed were searched using keywords to capture the topics of "cosmetic surgery" and "medical tourism." Two independent reviewers conducted title, abstract and full-text screening and a 3rd reviewer resolved conflicts. Articles were included if they were in English, full-text, and reported complications of patients receiving postoperative care in the United States after undergoing cosmetic surgical procedures abroad. Articles reporting complications of domestic or non-cosmetic medical tourism were excluded.

Results: 1,119 articles were imported and 454 duplicates were removed for a total of 665 articles screened for inclusion/exclusion criteria. Ultimately 21 articles were included, reporting complications of 209 unique patients. Articles were published from 2008-2021 and nine studies were single patient case-reports. Of the patients with reported demographics, 97.1% were female, 1% were male and 1.5% were transgender females, with an age range of 19-64. 82.8% of the surgeries took place in the Dominican Republic, 4.3% Mexico, 3.3% Colombia and 9.6% other or unknown. The most common surgical procedure was abdominoplasty (39.3%), followed by liposuction (21.7%), breast augmentation (15.1%) and buttock augmentation (6.6%).

Overall reported complications included 117 infections (56.0%), 9 seromas (4.3%), 7 embolic complications (3.3%), 16 granulomatous reactions to silicone (7.7%) and 2 retained foreign objects (1.0%). The majority of reported patients underwent a surgical management for their complications (55.9%). Thirteen papers reported exclusively infectious complications, including surgical site infection and abscess. Ten studies reported non-tuberculous mycobacterial (NTM)

infections, with treatments including extensive operative debridement and long-term antibiotics. Antibiotic regimens involved linezolid, amikacin, imipenem and tigecycline, among others. Complications of these antibiotic treatments included severe GI distress and hearing impairment, as well as indirect costs of long-term intravenous infusions. When reported, costs of complication management ranged from $38,178-$154,700. Insurance information was available for 94 patients, 60% had Medicaid, 21.3% had commercial, 9.6% had Medicare and 5.3% had no insurance. One patient reported loss of home due to financial strain.

Conclusions: US physicians treat a range of complications from surgical procedures performed abroad, with potentially devastating outcomes. Life-threatening infections, emboli and significant scarring as well as antibiotic reactions and financial devastation are all consequences of these procedures. Much of the published literature on this topic focuses on NTM infections, requiring a long treatment period and high rate of surgical management.

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Safety of Concomitant Umbilical Hernia Repair during Abdominoplasty: A Propensity Score Matched Analysis

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Background: Over 97,000 abdominoplasties were performed in 2020 in the United States alone. Patients seeking a cosmetic abdominoplasty often have concurrent umbilical hernias stemming from shared risk factors for fascial and skin laxity. Optimum management and the safety of performing umbilical hernia repair during the same operation as an abdominoplasty is not well described. In this context, we compared the complication rates of performing an abdominoplasty

with an umbilical hernia with abdominoplasty alone. Further we share our technique for umbilical hernia repair.

Methods: We performed a retrospective propensity score-matched cohort study of patients (n=271) who underwent an abdominoplasty at Massachusetts General Hospital between January 2014 and December 2020 by the senior author. Patients with panniculectomy were excluded to give a more homogenous population. Patients who underwent repair of an umbilical hernia at the time of the abdominoplasty were identified. One-to-one nearest-neighbor propensity score matching was conducted to adjust for differences in patient baseline covariates. The primary outcome was any post-operative complication. Secondary outcomes included umbilical necrosis, skin flap necrosis, hematoma, venous thromboembolism, seroma, infection, and hernia recurrence.

Results: One-to-one propensity-score matching yielded 63 patients in each exposure group (126 patients total) with the distribution of observed baseline covariates closely aligned. If an umbilical hernia was present, a fascial slit was made inferior or superior to the umbilicus, the hernia contents were reduced if needed, and the fascial edges were approximated with one to three 0-Ethibond sutures from underneath. Within the matched cohort, there was no significant difference in total complication rates (abdominoplasty alone 8% (n=5) vs. abdominoplasty with hernia repair 6% (n=4) p=1.00). Similarly, there were no significant differences in any of the secondary outcomes ($p>0.05$). Specifically, there were no cases of abdominal skin necrosis or umbilical necrosis in either group.

Conclusions: Performing umbilical hernia repair during the same operation as an abdominoplasty is safe without significantly increasing risk to the patient. Avoiding the dissection of or through the umbilical stalk may help provide adequate blood supply for survival. Future prospective studies are needed to evaluate patient-reported and long-term outcomes.

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Comparing the Efficacy and Safety of Monotherapy Triamcinolone Acetonide or 5-Fluorouracil versus Combination Triamcinolone Acetonide and 5-Fluorouracil in the Treatment of Hypertrophic Scars and Keloids: A Systematic Review and Meta-analysis

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Purpose: Keloids and hypertrophic scars predispose to physical and psychosocial problems. Combination triamcinolone acetonide (TAC) with 5-fluorouracil (5-FU) is presumed to enhance the treatment of pathological scars, although there is a dearth of evidence. We aimed to evaluate the efficacy and complication rates of combination intralesional TAC and 5-FU in comparison to monotherapy intralesional TAC or 5-FU for the treatment of hypertrophic scars and keloids. Methods: The protocol was published a priori on PROSPERO (CRD42021271406). EMBASE, MEDLINE and CENTRAL were searched by two independent reviewers. Primary outcomes were treatment efficacy (defined as 51- 100% improvement) and reduction in scar height. Study quality and risk of bias were assessed using GRADE and Cochrane's risk of bias tool, respectively.

Results: Of 641 articles screened, 12 studies involving 847 patients were included. There were 11 randomized controlled trials (RCT) and 1 non-randomized study of interventions. There were 6 and 8 studies comparing combination intralesional TAC and 5-FU versus monotherapy intralesional 5-FU and intralesional TAC, respectively. The combination group demonstrated superior objective treatment efficacy when compared to the monotherapy intralesional TAC group (RR 1.45, 95% CI [1.27, 1.64], P<0.001) and monotherapy intralesional 5-FU group (RR 1.46, 95% CI [1.24, 1.71], P<0.001). The combination group exhibited a greater reduction in scar height when compared to the monotherapy intralesional TAC group (SMD -0.48, 95% CI [-0.73, -0.23], P=0.006). The most consistently reported complication was telangiectasia, occurring at rates of 5.63% and 23.5% for combination and monotherapy intralesional TAC, respectively (RR 0.25, 95% CI [0.12, 0.52], P<0.001). There were no consistently applied validated patient reported outcome measures (PROMs).

Conclusions: Combination intralesional TAC and 5-FU demonstrated superiority to the respective monotherapy of these agents in objective measures of treatment efficacy, scar height reduction and adverse complications. The paucity of PROMs should be urgently addressed in subsequent clinical trials.

GBL Principles: Skin Detachment, Repositioning and Shrinkage

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Purpose: To present the principle of the Gliding Brow Lift (GBL) technique, which provides minimal incisions, an effective and stable eyebrow lift, and offers the advantage of precise reshaping of the eyebrow.

Material and methods: Here we discuss the principles of GBL, which consist of wide subcutaneous detachment, 50% of skin displacement under traction and subsequent skin shrinkage of the remaining 50%.

The procedure was used in the frontal area to brow elevation but can be applied in any other part of the facial skin. It begins with tumescent anesthetic infiltration into the subcutaneous plane, followed by the complete subcutaneous detachment performed by Viterbo's dissectors through two 3mm scalp stab incisions at the frontal–temporal area. Once the detachment is completed, the lower forehead skin is pulled upward with one simple hook elevating the skin and the brow, consequently. Many stitches are applied crossing the skin and taking deep subcutaneous and muscles. This will produce a skin redundancy in the upper part. More stitches in the middle and more in the middle of the middle of this skin will produces a skin shrinkage accommodating the skin.

This kind of external sutures in face liftings were created for hematoma prevention by Auersvald and called hemostatic net.
We used the hemostatic net in the GBL to elevate the brow but it can be employed to change the position of any other part of the facial skin with almost no scar.
The hemostatic net is removed with 48-72 hours.

Results: Postoperative recovery is uneventful, with moderate edema and mild pain. The brow elevation is evident in all cases in the immediate postoperative period, with long-lasting results.

Conclusions: The GBL principle allows facial skin mobilization with minimal scars.

Intestinal Perforation after Liposuction: A Systematic Review

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Purpose: As one of the most commonly performed cosmetic procedures, liposuction is a relatively safe procedure. Bowel injury after liposuction is a rare but devastating complication,

which necessitates hospital admission and surgical intervention. In this study a systematic review of the current literature pertaining to bowel injury after liposuction and the patient outcomes was performed.

Methods: An electronic database search of Ovid MEDLINE was completed according to PRIMSA guidelines for articles pertaining to bowel injury secondary to liposuction. Study characteristics, patient demographics and comorbid conditions were collected. Patient presentation, hospital course, and patient outcome information were collected.

Results: A total of 15 manuscripts representing a total of 34 patients were included for analysis. Average patient age was 51.4 (SD 10.6), and the majority of patients were women (n=26, 76.5%). On average, patients reported symptoms or presented to the hospital at a median of 1.0 days (IQR 0.0-2.0) from the index operation but were admitted or diagnosed with perforation a median of 3.0 days (IQR 1.5-5.5) after liposuction. All patients (n=34, 100.0%) required operative intervention. 3 patients (8.8%) required abdominal reconstruction following initial surgical management. A total of 6 mortalities (17.6%) were reported. When described, length of stay was a median of 19.5 days (IQR 13.3-37.8).

Conclusions: While safe, elective cosmetic procedures are not without risk of serious and even fatal complications. Providers must be familiar with the presentation of bowel injury following abdominal liposuction in order to prevent delays in appropriate surgical and medical care.

The Retaining Ligaments of the Neck: Anatomy and Clinical Implications in Neck Rejuvenation

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Background: The anatomy, nomenclature, and clinical implications of the neck retaining ligaments described by Feldman and others remain variable. Confusion exists in the literature because multiple names have been given to the same or similar structures and the named structures differ in location and consistency from patient to patient. In modern neck rejuvenation, there continues to be a debate between anterior and posterior-lateral approaches to the neck. However, both approaches adhere to a basic tenant of facial rejuvenation which is ligamentous release. The purpose of this study was to identify retaining ligaments in the neck and describe their variations to better understand their anatomy, function, and influence of their manipulation on the quality of neck rejuvenation.

Methods: 20 cadaveric Hemi-necks were dissected. The platysma mandibular ligament (PML), cervical retaining ligament (CRL), platysma auricular ligament (PAL), submental ligament (SML), and medial platysma filaments (MPCF) were dissected in the supra & sub-platysmal plane. Length, width, and depth (laxity) were measured. For standardization, the distance between the gonial angle and symphysis was recorded. Additional Feldman neck retaining structures were identified.

Results: All neck retaining structures were dissected and mapped in various cadaveric specimens. A plot diagram was constructed documenting location variability. The PML, PAL, CRL, SML and MPCF were identified and measured in all 10 specimens. The laxity of the PML ranged from 2-6 mm with an average depth of 3.4 mm. Based on our findings the platysma mandibular ligament is the same structure that has been referred to as the mandibular septum. The MPCF exhibited the largest laxity variation whereas the SML exhibited the least laxity variation. The average length of the SML was 20 mm and the average laxity of the MPCF was 4.98 mm. The mean width of the CRL at the inferior mandible was 14.1 mm and decreased as the ligament traversed caudally. On average, the CRL was located 14.2 mm anterior to the gonial angle. The neck ligaments that have been described in the literature vary significantly in size, mass, and consistency. The distribution, density, and size of the retaining ligaments were variable between hemi-faces. Although some hemi-faces had few, flimsy ligaments/filaments, other had dense and thick ones in multiple rows

Conclusions: This study provides a refreshed roadmap that depicts the variation in location and mass of the neck retaining ligaments & filaments. Our findings suggest that the platysma mandibular ligament and mandibular septum may very well represent the same structure.

Fat Grafting Safe Practices in Dynamic Definition Liposculpture

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Background: The aesthetics standards for the male and female body fluctuate among different populations, hence Aesthetic Body Sculpting has to adjust accordingly to suit the patient preferences and expectations. One of the pillars in which Dynamic Definition Liposculpture (HD2) stands on is Fat Grafting, which nowadays include the concepts of power muscles and definition muscles. The latter are subject to demarcation and careful carving during surgery, while the former benefit as well from Fat Grafting in order to improve their volume and projection, and as a consequence, the anatomic, athletic, and youthful contour. We carried out a retrospective cohort including patients who underwent fat grafting of different muscles during HD2 including: The trapezius, the latissimus dorsi, the erector spinae, the pectorals, the breasts, the rectus abdominis muscle, the gluteus medius, above the gluteus major (SQ), the deltoids, the

biceps, the triceps, the vastus medialis/lateralis, the biceps femoris, and/or the calves.

Methods: We performed cadaveric dissections for each anatomical region in order find the main pedicle for each muscle and as a result design a safe and reproducible fat grafting technique. Furthermore, we looked into our records for patients who underwent fat grafting in addition to HD2 from January 2017 to February 2022. Criteria for inclusion were any patient undergoing fat grafting of any/multiple muscles as part of HD2 procedures.

Results: A total of 1192 patients consecutive patients met the inclusion criteria. About 1020 (85%) were women and 172 (15%) were men. Anatomic regions subject to fat grafting included the posterior torso (5%), the upper limbs (14%), the anterior torso (37%), the gluteal region (94%) and the lower limbs (10%). Adipose graft volumes ranged from 40 to 650 cc (Avg = 250 cc). Only three cases of cellulitis were reported (0.3%), they were treated with oral antibiotics and physical means. Hematoma was reported in 5 cases (0.4%), which solved with conservative measures. No other complications were reported related to fat grafting. Almost all patients were satisfied with the procedure (95%). Follow up period ranged from 2 to 48 months.

Conclusions: Liposuction might not be enough to achieve either the ideal muscularization of the male's body or the voluptuous/slim figure of the female anatomy. In such cases, fat grafting has become the cornerstone to achieve the desired body contour. The proper recognition of the main neurovascular pedicle from each muscle subject to fat grafting, the accurate preoperative markings and a meticulous surgical technique ensure both the safety and the reproducibility of our techniques. The high satisfaction index and the low rate of complications support our findings and encourage future studies to broaden the targeted population with a multicenter approach.

Level of Evidence: IV. Type of Study: Therapeutic – Retrospective Cohort.

Keywords: Anatomic dissection; liposculpture; high definition; body contouring surgery; fat grafting; intramuscular lipoinjection; subcutaneous lipoinjection; multilayer lipoinjection.

New Aesthetic Concepts in Dynamic Definition Liposculpture: Facets, Power & Definition muscles

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Background: Throughout history, painters and sculptors have created their masterpieces by employing the blueprints of the body as an alternative approach to analyze anatomical shapes and transforming them into geometric forms. The edges of adjacent planes become transitions between each other and can be crafted to look soft and subtle, pronounced or somehow sharp.

Planes have numerous patterns that interplay over the surface anatomy of both an athletic man and a slim woman. For Dynamic Definition (HD2) liposculpture we described surgical planes among the superficial and deep tissue layers and, which the plastic surgeon uses to replicate the effect of depth and softening over the patient's anatomy, resulting in a congruent, athletic, and natural appearance of the body. Another important concept is the difference between power muscles and definition muscles. The latter are usually carved with sharp edges and strong contours while the former need volume enhancement and strong shadows to give them an even greater volume perception. While men have clear differences between power and definition muscles, these concepts may be somewhat "abstract" for women, so the surgeon has to find a balance between muscle definition and volume according to each case.

Methods: We reviewed our medical records for patients who underwent Dynamic Definition Liposculpture (HD2) and fat grafting between January 2017 and January 2022 at a single center in Bogotá, Colombia. Exclusion criteria: Patients with a history of thromboembolic events; Those classified as ASA III or above; active heavy smokers; Patients with BMI ≥ 32 kg/m2; patients with prior excisional procedures and/or secondary/tertiary liposculpture.

Results: We found 1369 consecutive patients who underwent HD2 with or without fat grafting. Men accounted for 17% (n=231) and women for 83% of the patients (1138). Age ranged from 19 to 58 years old (Avg = 32.5). Lipoinjection was performed in 1192 patients (87%). A non-standardized survey was conducted to evaluate outcomes with a Satisfaction Index of 95%. No major complications were reported. Minor complications included prolonged bruising (1%), seroma (2%), burns (0.3%), hematoma (0.5%).

Conclusions: The adequate differentiation of power muscles (trapezius, latissimus dorsi, triceps, pectorals, gluteus medius and serratus muscles) and definition muscles (rectus abdominis, quadriceps, obliques, gluteus) for the male, and the concept of planes/facets at the abdominal region, the posterior torso, and the limbs for the female, have all been a huge advancement in HD2. Facets have a special meaning for women, since the concept actually helps to enhance the most attractive features of the dynamics between the musculature and underlying bone structure.

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Back Pain According to Roland-Morris Low Back Pain Scale Following Abdominoplasty With Plication: a Prospective Case Series

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Purpose: Chronic back pain is a physically debilitating condition that affects more than 80% of adults in the United States. Even though various pharmacological and surgical treatment options are available, chronic low back pain is multifactorial and difficult to manage. A recent case series highlighted how abdominoplasty with wide abdominal rectus plication can offer an alternative surgical approach for treating chronic back pain (1). Their results have since been corroborated by a large Australian prospective case series using the Oswestry Disability Index (2). However, this study excluded male and nulliparous subjects, who may also benefit from this surgery. Our group aims to investigate the effect of abdominoplasty on back pain in a more diverse patient population using a different, non-interchangeable Roland-Morris Low Back Pain and Disability Questionnaire (RMQ).

Methods: Subjects over 18 years of age who are undergoing radical abdominoplasty with plication are recruited. Subjects undergoing abdominoplasty without plication or additional surgeries are excluded prior to surgery, subjects are given an initial survey inquiring the history of back pain and back surgery, in addition to current level of back pain. Past medical history such as body mass index (BMI), diabetes, smoking history, parity and prior cesarean section are also documented through chart review. RMQ, a highly sensitive questionnaire for grading mild to moderate disability caused by chronic low back pain, is administered. Surgical information including weight resected and liposuction volume are recorded during surgery. A follow up survey and RMQ is then given six months after surgery. Paired Wilcoxon Rank Sum test is used to compare RMQ scores before and after surgery.

Results: Twenty-eight subjects have been enrolled. Twenty-one completed both the initial and follow-up surveys, and seven were lost to follow up. Of the 21 subjects included, the average age is 47.8 (SD = 9.3). Nineteen subjects are female and 18 are postpartum. Ten subjects had a history of cesarean section, and five had given birth to at least one set of twins. Fifteen subjects reported initial back pain on the RMQ scale. Of these, 13/15 reported a decrease in RMQ score after surgery, including male and nulliparous subjects (n = 2). Paired Wilcoxon Rank Sum test showed a significantly decreased median RMQ score six months after surgery, with a decrease of 3.00 out of 25 points ($p = 0.0079$). No significant change was observed in the subjects' BMI before and after surgery, but 12/21 demonstrated a sustained decrease in BMI six months after surgery. No significant relationship was observed between weight resected, percent weight resected or liposuction volume in relationship to RMQ score change. Further sub-group analysis of female subjects demonstrated significantly decreased RMQ score in subjects with a history of cesarean section delivery and multiparous birth.

Conclusion: Abdominoplasty with plication significantly decreases self-reported back pain six months after surgery. Fifty-eight percent of the subjects also demonstrated sustained weight loss after this period. These results support that abdominoplasty is not purely a cosmetic procedure but can also be applied therapeutically to improve functional symptoms of back pain.

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What We Have Learned After Two Decades of High Definition and Dynamic Definition Lipoplasty

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Background: High definition liposculpture (HDL) emerged as an innovative surgical technique that allowed plastic surgeons around the world to achieve higher aesthetic results by carving the underlying muscles and its contours in a new and different fashion compared to prior methods for lipoplasty. The innovative natural, anatomic, and athletic appearance of the body after surgery was achieved through minimal stealth incisions which ended up in imperceptible scarring. The technique has evolved throughout the years by incorporating different artistic concepts, new technologies, multiple approaches to protect the patient, and as a consequence improve the overall outcomes. Currently, the ultimate goals of Dynamic Definition Liposculpture are: High Aesthetic Standards and Patient Safety.

Methods: We retrospectively reviewed our records from 4 private medical centers (Evolution Medical Center, Santa Barbara Medical Center, and Dhara Clinic in Bogota; and FOSCAL in Bucaramanga – Colombia), looking for patients who underwent High Definition Liposculptures performed by the senior author over a 20-year period (2002 to 2022). Patients were classified into three groups: Suction-assisted lipoplasty (Period I), VASER-assisted HD lipo (Period II), and Dynamic Definition liposculpture (Period III).

Results: We established a cohort of 5,237 patients (4,374 women and 863 men). 923 in period I, 1272 in period II and 3042 in period III. Pooled analysis and pondered comparison between pre and postoperative Hb, HCT and amount of Extraction among the 3 periods showed that although higher volumes of extraction were performed in the last period, outcomes and safety were actually improved when compared to the other 2 prior periods. Most common complications included seroma, bruising, hematoma, acute anemia, hyperchromia, wrinkled skin, wound

dehiscence, and local infections. No major complications were reported.

Conclusions: High Definition and Dynamic Definition liposculpture procedures are safe and reproducible techniques to attain not only an athletic and but also a natural body contour. The evolution of the technique has increased the satisfaction rate, the safety of the procedure and the aesthetic results by means of different measures such as: Incorporation of artistic concepts, using emerging technologies for skin retraction, implementation of protocols for blood management and DVT prevention, ensuring normothermia, and a long learning curve. Complication rates decreased through time while we also performed even greater volumes of extraction and further muscular definition. HDL and HD2 have always been framed towards patient safety so as to provide them with higher aesthetic outcomes using extensive medical, anatomical, artistic, and technological knowledge.

Level of Evidence: IV. Type of Study: Therapeutic – Retrospective Cohort.

Keywords: Liposuction; high definition; body contouring surgery; fat grafting; safe lipo; dynamic definition.

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THE CRITICAL BLOOD-SPARING EFFECT OF TRANEXAMIC ACID (TXA) IN LIPOSUCTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Purpose: Tranexamic acid (TXA) has been used to improve bleeding outcomes in many surgical procedures. However, its blood-sparing effect in liposuction is not well established.

Methods: A systematic literature search was performed using: PubMed, EMBASE, CINAHL, Cochrane Central, ClinicalTrials.gov, and WorldWideScience.org databases from their inception to October 8, 2021 according to PRISMA guidelines. The authors focused on 3 main topics: 1) TXA; 2) liposuction; 3) complications. We included articles evaluating potential blood-sparing effects of TXA in liposuction. Studies were excluded according to the following criteria: systematic review article or protocol paper, animal studies, conference abstract, survey study, and non-English publication.

Results: A total of 685 articles were identified with one retrospective and 4 prospective (3 randomized) studies meeting our inclusion criteria (References 1-5). TXA was utilized in various forms: IV either on induction or after the procedure, mixed into the tumescent solution, or infiltrated into the liposuction sites after lipoaspiration. A significantly smaller reduction in hematocrit was noted in the TXA group compared to the Non-TXA group ($p<0.001$) despite a significantly greater amount of lipoaspirate removed in the TXA group ($p<0.001$). Patients in non-TXA cohorts experienced adverse effects (such as seroma and need for transfusion) that were not seen in TXA cohorts.

Conclusion: TXA use in liposuction patients seems to be associated with a beneficial blood-sparing effect, which may enhance safety in this population. Future studies should aim to determine the optimal route of administration for TXA use in liposuction.

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Painless, Drainless Lipoabdominoplasty: A Retrospective Study of Pain Following Lipoabdominoplasty Utilizing Liposomal Bupivacaine and a Modified ERAS Protocol

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Background: There are many functional and aesthetic benefits to lipoabdominoplasty, including increase in core strength, reduction in urinary incontinence, and improvement in lower back pain. However, patients are still hesitant to undergo surgery due to the perceived fears of post-surgical drains, and post-operative pain. Recently literature has demonstrated that pre- and intraoperative analgesia can prevent the development of long term and chronic pain.

Methods: A total of 80 patients operated on between 7/23/2020 - 12/15/2021 were evaluated in this study. Patients all underwent lipoabdominoplasty and were administered a standardized pre-, intra-, and post-operative pain regimen. Pain scores were measured across all patients in the immediate post-operative period, and post-operative days 1, 7, 28, 90.

Results: Mean pain scores in the PACU were 0.46/10 (+/- 0.18). Subsequent reassessment in the post-op recovery suite yielded mean pain scores of 0.34 (+/- 0.15). Mean pain scores on POD1 were 1.23 (+/- 0.15), and consistent through to POD7 at 1.24 (+/- 0.11) with patients taking an average of 6.65 total percocet 5mg during the week. After POD7, 95% (76/80) of patients were only taking NSAID medications. A total of 75/80 patients (93.75%) reported zero pain at 4-6 weeks after surgery (mean pain score 0.10 +/- 0.08).

Conclusions: The multimodal analgesia protocol consisting of preoperative or immediate induction IV Tylenol, precut local analgesia with Marcaine and lidocaine, and intraoperative use of liposomal bupivacaine, can improve perioperative pain control in patients undergoing lipoabdominoplasty.

Decreasing Seroma Incidence following Abdominoplasty: A Systematic Review and Meta-Analysis of High-Quality Evidence

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Background: Seroma formation is the most common complication of abdominoplasties, with incidence rates of up to 25% having been reported.[1] Many interventions-including the frequent use of closed-suction drains-have been proposed to help prevent seroma formation, but none have been recognized as the definitive method for seroma prevention, partly due to varying levels of evidence (LOE) in the literature. Although a systematic review of prospective randomized controlled trials was recently published by Seretis et al. in 2017,[2] the study's selection criteria excluded papers that still demonstrated a high level of evidence and could therefore contribute additional high-quality data.

Objectives: The objectives of the current review are to qualitatively and quantitatively analyze methods backed by high-level evidence to prevent seroma formation after abdominoplasty.

Methods: The PubMed® database was queried in June 2021. The primary articles of interest were those with high-quality study designs such as randomized controlled trials, prospective comparative studies, and meta-analyses of these study designs. The LOE for each article was determined according to the ASPS Rating Scale. The "seroma occurrence ratio," defined as the percentage of seroma events in the interventional group divided by that in the respective control group, was calculated to compare seroma occurrence rates between techniques.

Results: Data on seroma prevention technique was pooled from 20 articles, yielding 1,205 patients and 9 categories of seroma prevention techniques. Study designs included randomized controlled trials (n = 10), prospective cohort studies (n = 2), prospective comparative studies (n = 7), and retrospective randomized studies (n = 1). The use of PTS and QS had the greatest amount of data supporting a statistically significant reduction in seroma, with a seroma occurrence ratio of 0.306 ($p < .001$). Tissue adhesives and preservation of Scarpa's fascia were also well reinforced, with a seroma occurrence ratio of 0.375 ($p < .01$). Increasing the number of drains did not significantly reduce seroma occurrence ($p = .7576$). Other potentially beneficial techniques such as triamcinolone injections, adjunctive liposuction, continuous negative pressure drains, and the use of plasma coagulators (vs. conventional electrocautery) warrant further discussion and research prior to a more definitive consensus. A meta-analysis of the data (n = 203) illustrated that adjunctive techniques to the standard placement of two drains were likely more beneficial for reducing seroma occurrence than placing drains alone (pooled risk ratio 0.30, 95% CI = [0.13, 0.71]). Subgroup analysis further supported that PTS and QS were also more beneficial, with a risk ratio of 0.24 (95% CI [0.07, 0.82]).

Conclusions: This systematic review highlights multiple techniques used to reduce seroma occurrence in abdominoplasty that were investigated in recent high-quality literature. Overall, we suggest future randomized comparative studies of the aforementioned seroma prevention methods under investigation to fully ascertain their efficacy following abdominoplasty.

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Tranexamic Acid (TXA): A Powerful Tool in Rhinoplasty

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Purpose: Tranexamic acid (TXA) has emerged as a lifesaving antifibrinolytic agent for treating traumatic hemorrhage. Despite its great popularity in other surgical specialties, published reports on TXA use in plastic surgery, especially in aesthetic surgery, are limited and an optimal dosing regimen has not been yet described. The aim of this study was to evaluate the efficacy and safety profile of TXA in rhinoplasty.

Methods: All patients underwent primary rhinoplasty by a single surgeon using an intravenous bolus dose of 1 g TXA before skin incision. TXA was also added to local anesthesia (0.5 mg TXA in 5-ml saline 0.9% and 0.5 mg epinephrine in 10-ml lidocaine and 10-ml Marcaine) and injected locally before skin incision in the TXA group. Saline 0.9% IV bolus and standard local anesthesia (0.5 mg epinephrine in 5 ml saline 0.9%, 10 ml lidocaine, and 10 ml Marcaine) were used for the control group. Hospital records were reviewed for patient demographics, pre-and postoperative hemoglobin (Hgb) and hematocrit (Hct), operative time, and visual analog scale (VAS) for pain at discharge. Postoperative periorbital ecchymoses, edema, day of return to social activity, and secondary revision rates were also recorded. Means were compared with Student's t-test.

Results: 150 elective primary rhinoplasties were included in the study. Operative times were significantly shorter in the TXA group ($p<0.05$). Patients undergoing rhinoplasty under TXA had significantly reduced postoperative periorbital ecchymoses ($p<0.05$) and edema ($p<0.05$) and faster return to social activity ($p<0.05$). Secondary revision rates were lower in the TXA group compared to the control; however, this change was not statistically significant ($p>0.05$). Neither thrombotic events nor other TXA related complications were recorded (0%).

Conclusion: TXA's anti-inflammatory properties are cardinal in its role in aesthetic surgery, in addition to its antifibrinolytic effects. Intravenous and local administration of TXA have a significant effect in decreasing pain, periorbital edema, and ecchymosis and achieving a faster return to social activity in rhinoplasty patients. These findings may be enormously beneficial in rhinoplasty where postoperative edema may mask results and influence patient and surgeon perception of surgical outcome for several months after surgery.

Mini Rhinoplasty

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Introduction: Traditional and modern rhinoplasty techniques have been applied for years and have strengths and weaknesses. In these techniques, in addition to being long operative times in general, they are also associated with longer downtime and increased morbidity. Regarding an aesthetic look, if sufficient projection and rotation can be provided, reduction is not needed in many cases. In this way, good results can be achieved by focusing on some key points.1-5

There are four structures that show great resistance to rotation and projection of the nose: the caudal septum, the cephalic part of alar cartilage, the caudal of upper lateral cartilage, and the depressor septi nasi muscle. With the technique referred as mini rhinoplasty, we aimed to reach the desired ideal result by intervening in these regions with a 15–20-minute procedure under local anesthesia.

Methods: Patients who have nasal tip drooping and minimal hump were included in our study conducted between January 2017 and February 2022. Care was taken to avoid having significant axis deviation in the selected patients.

Intraoperative Technique: A T-shaped full transfixion incision and a short intercartilaginous incisions are made. In the upper half, the membranous septum and the caudal excess of the septum are removed. No cartilage or mucosa should be removed from the lower half. If we need fullness in supratip, radix or nasolabial angle, the tissue removed from the membranous septum can be deepithelialized and used as a soft tissue graft, as it also reduces the hump appearance. The depressor septum nasi muscle is cut and folds over itself on the nasal spine. Then the cephalic part of the alar cartilages and the caudal end of the upper lateral cartilages are trimmed. If soft tissue is to be placed on the radix, blunt dissection is performed with Stevens scissors, the radix is reached with a small tunnel and the graft is placed. Finally, the open incision is sutured up with a 5/0 or 4/0 vicryl with transfixion suture.

Clinical improvement was evaluated six months after using the Global Aesthetic Improvement Scale (GAIS) from 1 to 5 (1: exceptional improvement; 5: worsened patient) by two independent plastic surgeons. Patient satisfaction was evaluated in a scale from 0 to 10 (0: not satisfied; 10: very satisfied).

Results: A total of 36 patients (7 male, 29 female) (mean age: 28 years) were enrolled in the study. All patients were discharged on the same day. Mean score of patient satisfaction was 7.5/10 after six months. Clinical evaluation scores after the procedure were 2.1/5 and 2/5 in GAIS. Mean follow-up period was 2 years. No complication was observed during the follow-up period.

Conclusion: Our mini rhinoplasty technique can be performed for those who do not have significant axis deviation and a major hump, do not want major surgery and general anesthesia and want to return to daily life quickly; we believe that it is a good method that can be applied with local anesthesia in 15-20 minutes, especially in male patients who do not want a feminine nose and are not suitable for reduction.

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Facelift in the" Filler Filled Face": A Difficult Challenge

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The so called "Liquid facelift" has become an increasing popular choice of facial rejuvenation because the relative non-invasive nature of the procedure. This phenomenon has left an entire population of "Fillers crippled' patients who eventually realize that they are in need of a facelift. A routine straight forward facelift is often deemed to fail in getting satisfactory results since a sizable amount of these patients have an extensive list of pre-existing problems including tissue distortion, scarring, presence of permanent and-or semi-permanent fillers, granulomas etc. and therefore a different approach is often necessary.

A review of the author experience (51 patients) in dealing with patients with permanent, semi-permanent and absorbable fillers is described.

MRI and UTZ were performed in 7 patients with a history of previous symptomatic infections in the past. Those patients were treated pre- and post-operative with a different antibiotic regimen. All patients underwent a vertical facelift with ancillary procedures and various degrees of removal of fillers. One patient had fat grafting to replace the volume loss. Complications include 1 post-operative infection 6 weeks after surgery on a patient who failed to disclose that she had repeated bouts of infections in the past and one patient complained of presence of residual fillers. Most patients had prolonged swelling which eventually resolved after 4 weeks.

An algorithm for managing this patient is presented.

The filler filled face lift is a higher risk procedure due to the complexity of the factors which play a role. It requires a more extensive work up, often a different antibiotic regimen and a more complex surgical procedure along with a lengthier discussion with patients to set realistic expectations.

Despite these factors, it is the author's opinion, that excellent result can be obtained as long as a strict protocol is observed.

Indications for Excision of the Medial Crural Footplate in Rhinoplasty

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Purpose: The medial crural footplates are known to affect tip projection, columellar symmetry, and structural support during rhinoplasty. Additionally, the footplates are a functional component of the external nasal valve. Direct excision of the footplate has not been well described in the literature. We depict an in depth analysis of this technique particularly focusing on alleviating medial crural flaring and balancing nasal tip aesthethics. As a single step in a multi-faceted approach to controlling nasal tip harmony, nostril shape/function, and columellar symmetry, this study aims to clarify the role of medial crural footplate excision.

Methods: This was a retrospective, single surgeon study that identified patients undergoing rhinoplasty which involved bilateral medial crural footplate excision. The study period spanned 5 years from 2015-2020. Patient demographics, operative indications, surgical technique, structural outcomes, and complications were recorded. Institutional review board approval was obtained. Patient satisfaction and post-operative follow up 3D vectra photos were reviewed. Anatomic landmarks were identified.

Results: A total of 441 septorhinoplasties were performed during the 5 year study period, of which 95 underwent medial crural footplate excision and were included. Indications for excision included cosmetic concerns, such as improving nostril diameter/shape, tip projection, and columellar asymmetry. Functional indications included external nasal valve obstruction. Nasal

tip balance, projection and functional outcomes were improved with extremely high patient satisfaction.

Case Example: A 24-year-old female presented with complaints of nasal obstruction, mouth breathing, snoring, and frequent sinus congestion. She had c-shaped septal deviation, internal and external valve collapse, and slit-like nares. On profile, patients' nose was underprojected with a low-hanging columella. Specific operative techniques for her septorhinoplasty included autospreader flaps, high-low-high osteotomies, articular alar rim grafts, septal extension graft, turbinate outfracture, and medial crural footplate excision. She recovered without incident and reported improved nasal breathing as well as being very pleased with nostril shape and columellar positioning on lateral view. There were no complications at one year follow-up.

Conclusion: Medial crural footplate excision during rhinoplasty can be a useful adjuvant in creating nasal tip harmony, improving nostril shape, alleviating columellar asymmetry and improving functionality of the external nasal valve.

Full Thickness Fractional Skin Ablation: A New Approach to Nonsurgical Blepharoplasty

Presented During:

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Background and Objective: Suction mediated needle coring technology (Ellacor, Cytrellis, Boston, MA) was recently approved for the treatment of moderate-to-severe wrinkles in the mid-to-lower face. However due to the depth of penetration and forces inherent in the needle design, the device is unsuited for use on the eyelids. We sought to evaluate a novel laser that performs full thickness fractional skin ablation for nonsurgical eyelid rejuvenation.

Study Design/Materials and Methods: A Sciton Erbium:YAG laser (Sciton Inc, Palo Alto, CA) with variable spot sizes and shapes was used. Explanted facial and eyelid skin was first used to assess histology with various settings. Since December 2019, a total of 50 patients underwent either upper or lower eyelid full thickness fractional skin ablation under local anesthesia. 25 patients had previous blepharoplasty or laser resurfacing. All patients were injected with 1% lidocaine with epinephrine (1:100,000) prior to treatment. Corneal shields were placed, and standard laser precautions were taken. A Clarius L20 ultrasound device (Clarius, Vancouver, BC) was used to measure eyelid skin thickness for each patient, and the depth of ablation was set to 0.1 – 0.2mm deeper than this skin thickness measurement, to reach the hypodermis in each case. Lower densities (1.5 – 10%) and small spot sizes (250 µm, 430 µm) were utilized in our

initial patients (n = 28) but settings and technology were optimized to a novel diamond shaped skin ablation pattern with up to 50% fractional coverage per treatment (n = 22). Post operative wound care was instituted, and all patients received perioperative prophylactic antimicrobial medications.

Results: All patients tolerated their treatment to completion. There were no wound healing complications (infections, necrosis, hypopigmentation, or hyperpigmentation) noted. Higher density treatments showed clinically significant improvement in laxity and skin excess, as determined by independent observers.

Conclusion: Full thickness fractional ablative laser skin excision appears to be a safe and effective alternative to blepharoplasty in properly selected patients. This may widen the availability of treatments for eyelid laxity beyond traditional plastic surgery. Prospective trials and advanced imaging may prove useful in further defining the role of this technology.

Practice Patterns, Part 2: An American Society Of Plastic Surgeons (ASPS) Member Survey, 2000 And 2020. How Much Has Browlifting Changed?

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Purpose: In 2001, Elkwood and Matarasso conducted an American Society of Plastic Surgeons (ASPS) member survey detailing browlift practice patterns. Despite significant changes in approach in the past twenty years, no survey has been performed since.

Methods: A 34-question descriptive survey was electronically distributed to a random group of 2,360 ASPS members. Results were then compared to the 2001 survey.

Results: A total of 257 responses were collected (11% response rate; ±6% margin of error at 95% CI). The most frequent technique for the correction of brow ptosis in both surveys was the endoscopic approach. The use of hardware fixation has increased in endoscopic browlifting while the use of cortical tunnels has decreased. While coronal browlifting has decreased in frequency, hairline and isolated temporal lift have increased. Neuromodulators have replaced resurfacing techniques as the most common non-surgical adjunct. Frequent use of neuromodulators has risen from 11.2% to 88.5%. Nearly 30% of current surgeons feel that neuromodulators have replaced formal brow lifting procedures to a significant degree.

Conclusion: In comparing the 2001 and current ASPS member survey there has been a clear transition to less invasive procedures over time. While the endoscopic approach was the most popular means of forehead correction in both surveys, coronal brow lifting has decreased in frequency while the hairline and temporal approaches have increased. Neurotoxins have replaced laser resurfacing and chemical peeling methods as an adjunct, and in some cases replaced the invasive procedure entirely. Possible explanations for the above will be discussed.

Piezoelectric osteotomy versus conventional osteotomy in rhinoplasty: a systematic review and meta-analysis of clinical and patient-reported outcomes

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Introduction: Osteotomy is a technique used to shape the nasal bones during rhinoplasty. Procedural morbidity may arise from soft tissue damage, with resultant post-operative oedema, ecchymosis, and pain. Two osteotomy techniques in current use are conventional osteotomy, which uses a traditional osteotome, and piezoelectric osteotomy, which uses ultrasonic vibration for bone reshaping. Prior systematic reviews have been inconsistent and are critically low quality, according to the AMSTAR-2 criteria (1-3). We conducted a high-quality systematic review and meta-analysis aiming to evaluate short and long-term outcomes of piezoelectric osteotomy compared with conventional osteotomy in adult patients undergoing rhinoplasty.

Methods: MEDLINE, EMBASE, Web of Science and CENTRAL were searched for articles published before November 2021. Additional articles were identified via hand search. Two independent reviewers screened and extracted data, with any discrepancies resolved by a third reviewer. Studies comparing use of piezoelectric osteotomy vs conventional osteotomes for rhinoplasty and reporting at least one outcome of interest (eyelid oedema, periorbital ecchymosis, mucosal injury and post-operative pain, duration of surgery or patient reported outcome measures (PROMs) were included. Data were pooled with random effects models. This study was pre-registered on PROSPERO: CRD42021287877.

Results: Out of 347 studies screened, 10 studies were included (9 randomized control trials and 1 prospective cohort study) with a total of 578 patients. The overall quality of studies using GRADE criteria was low, with moderate to high risk of bias using ROBINS-I tool.

Piezoelectric osteotomy resulted in significantly reduced post-operative pain (SMD 1.48, 95%CI

-2.07, -0.88), oedema (SMD -0.72; 95%CI -1.06, -0.38) and ecchymosis (SMD -0.94; 95%CI -1.12, -0.76) during the first week post-operatively. Subgroup analysis showed this remains consistent throughout the early post-operative course. Piezoelectric osteotomy was also associated with reduced rate of mucosal injury (SMD 0.06; 95%CI 0.01, 0.52). Importantly, a higher risk of tissue necrosis was associated with use of piezoelectric osteotomy (SMD 13.00; 95%CI 2.07, 81.48).

Piezoelectric osteotomy had no impact on procedural duration (SMD 3.15; 95%CI -1.83, 8.12). Only one study reported PROMs, with significant increase in patient satisfaction following piezoelectric osteotomy. One study assessed medium-term effects of the procedure on sinonasal symptoms, nasal flow, and sense of smell, concluding no difference between piezoelectric and conventional osteotomy.

Conclusion: These data suggest piezoelectric osteotomy in rhinoplasty results in superior short-term post-operative outcomes such as eyelid oedema, periorbital ecchymosis, and pain, with no increased procedural length. An important safety signal identifying higher rates of tissue necrosis warrants further study. Medium and long-term outcomes remain limited and future work should investigate these, in addition to including PROMs within their designs.

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Minimally Invasive Browlift using RF Plasma

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Purpose: To describe a minimally invasive technique for cosmetic Browlift to correct Brow Ptosis; This technique requires two small incisions, no fixation required, with lasting results, and a faster operative time of 30 minutes, with minimal scarring or complications; The tissue

contraction from the concomitant use of an RF plasma device negates the need for soft tissue fixation

Methods and Materials: A retrospective review of one surgeon's experience with a novel minimally invasive surgical technique to correct brow ptosis, with the aid of an RF plasma device. Fifteen patients underwent a minimally invasive sub-periosteal browlift technique, within a 1-year period (2021-2022), ages 35-74. There were 14 female and 1 male patient. The procedures were performed with a variety of anesthetic techniques, from local with oral sedation, IV sedation, or general anesthesia.

Operative technique as follows: Tumescent solution was infiltrated into the forehead area for a total of 60 cc in a sub-periosteal plane, to initiate hydrodissection; Next, two 2 cm paramedian incisions were made and carried into the sub-periosteal plane; Sub-periostea dissection was carried with periosteal elevators, and carried inferiority to release the Arcus marginalis insertions of the brows medially and laterally, and laterally to release the deep temporal fascia lateral forehead insertions. Next, the forehead soft tissue was elevated to the desired position, and the scalp laxity translated to the more posterior scalp tissue. Next, instead of soft tissue fixation, soft tissue contraction is performed with the RF Plasma device, and closure performed with skin staples over the scalp incisions. Compression dressings placed. Patients seen at one day post-op, then weekly as needed thereafter. The longest follow up was one-year post-operative.

Results: There was good aesthetic subjective correction of the brow ptosis and all the patients. One complication occurred with one patient, who experienced a soft tissue infection with Pseudomonas Aureginosa at ten weeks post-operative and resolved after treatment with 2 weeks of oral antibiotics.

Conclusion: This novel minimally invasive browlift technique with RF Plasma is a safe and effective technique in correcting brow ptosis. This new technique offers a new option to offer patients a procedure with minimal scarring, minimal recovery, and discomfort, but with more lasting results, in the correction of brow ptosis. More long-term follow-up is needed to see the longevity of the results, and more objective measurement of the brow ptosis correction long term needs to be measured.

Piezosurgery In Rhinoplasty – How Effective It Is?

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Introduction: Rhinoplasty is one of the most common plastic surgery procedures performed around the world. In rhinoplasty surgery, management of the bony vault and lateral walls is most often performed with mechanical instruments like saws, chisels, osteotomes and rasps. Extensive bony work is usually associated with prolonged oedema, ecchymosis, and pain in postoperative period. Also, mechanical instruments lack precision and there is always a risk of radiating

fracture lines. Piezoelectric instrumentation (PEI) has the ability to selectively act on bones without injuring soft tissues and the fracture lines created by PEI are very precise and accurate. In present study, we observed the postoperative outcomes in patient who underwent piezoelectric instrument assisted rhinoplasty.

Material & Methods: This was a prospective observational study in which patients requiring bony correction during rhinoplasty were recruited. Bony osteotomy, ostiectomy and bony reductions were carried out using piezoelectric bone surgery system. Patients were evaluated in early postoperative period (day 1 and 7), for the level of oedema, ecchymosis and pain. The scoring criteria used were Kara Score for oedema, Caglar Score for ecchymosis and Numerical Rating Scale (NRS) for pain. All patients were followed up for 3 months. The data was compared against that of patients undergoing the procedure using traditional surgical instruments.

Results and Conclusions: Piezoelectric system allowed precise bony modulation while preserving surrounding soft tissue structures. Patients in the study group revealed significantly less post operative oedema (Kara score <2) and decreased ecchymosis (Caglar score <3) at post op day 1 and 7. There was also statistically significant reduction in post operative pain (NRC < 4). Thus, piezoelectric bone surgery system is a valuable aid during rhinoplasty. It allows for accurate alteration of osseous nasal vault under direct vision. It also leads to less post-operative oedema and ecchymosis, potentially improving the outcomes.

High-Resolution Ultrasound Mapping of the Dorsal Nasal Artery to Prevent Filler Related Complications

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Background: Catastrophic complications in relation to dorsal nasal filler injection include skin necrosis and blindness due to retrograde embolization. Traditional methods to avoid intra-arterial injection have included lateral nasal compression, although this complication has still been shown to occur in the literature. High-resolution, hand-held ultrasound has become increasingly popular in the field of aesthetic surgery for facial mapping. The purpose of this study was to map the dorsal nasal artery, specifically depth and distance from midline. Precise knowledge of dorsal nasal artery location may allow accurate prediction and avoidance during filler injection.

Methods: Eight subjects underwent high-resolution ultrasound mapping (Clarius, L20 HD, 8-20 MHz) of the dorsal nasal artery. The radix to nasal tip was marked through the midline at one-centimeter intervals. Color flow doppler was utilized to assist in identification of the arteries. The

nose was divided into thirds (upper, midline, lower) and laterality, depth, and distance from midline were recorded. Statistical analysis was performed.

Results: Five (62.5%) subjects were male and three (37.5%) were female. The average age was 29. The dorsal nasal artery was bilateral in five subjects (62.5%) and unilateral in three (37.5%). Of the unilateral arteries, all (100%) were present on the left. One subject had bilateral arteries which centralized to the midline at the inferior one-third of the nose. The dorsal nasal artery average distance from midline in the upper third of the nose was 1.62 ± 1.63 mm, middle third 2.64 ± 2.16 mm, and lower third 2.46 ± 2.43 mm. The artery's average depth in the upper third of the nose was 1.49 ± 0.78 mm, middle third 1.97 ± 1.01 mm, and lower third 1.65 ± 0.94 mm.

Conclusion: High-resolution ultrasound can be utilized to map the location of the dorsal nasal artery prior to nasal filler injection. Distance from midline and depth can be used to predict the location of the dorsal nasal artery rather than relying on traditional safety measures. We continue to gather data to increase our study's sample size with the inclusion of all facial vasculature.

Building Bridges: Predicting Aesthetic Outcomes From Custom-Fabricated Dorsal Nasal Implant Placement Via A Novel 3D-imaging Protocol

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Purpose: Surgical alterations of facial appearance are exceedingly common in contemporary practice, with indications varying from the correction of dramatic congenital, oncologic, or other acquired anatomical insults to elective cosmetic enhancement. However, current options remain limited and are accompanied by a high level of perioperative morbidity and aesthetic unpredictability. Thus, many surgeons prefer synthetic implants, which themselves require crude reshaping and have an extensive complication profile. In response, we have developed a novel, rapid, patient-specific design workflow to fabricate point of care, rapidly producible, biocompatible, custom dorsal nasal implant scaffolds at low cost, thereby providing an efficient and efficacious alternative to the current options for dorsal nasal augmentation.

Methods and Materials: To validate our protocol, we utilized de-identified facial computed tomography (CT) data to provide "ground truth" patient anatomy. Using these data, 3D models of the subject's skull and soft tissue were 3D-printed in-house with polylactic acid (PLA)

filament on a Prusa i3 3D printer and cast in silicone, respectively. This "face phantom" patient mockup was imaged to generate a 3D photograph utilizing commercially available photogrammetry software (Metashape, Agisoft LLC). Desired augmentation of the nasal dorsum was determined via virtual deformation of this model by a plastic surgeon. A corresponding, custom-designed dorsal nasal implant was then 3D-printed in PLA, implanted on the phantom, and reimaged as above. To demonstrate spatial fidelity, the photogrammetrically derived model with and without augmentation was co-registered and compared to CT-derived "ground truth" mesh using 3D Slicer software (www.slicer.org).

Results: Photogrammetric comparison between the 3D photograph of the "face phantom" patient mockup and CT-derived "ground truth" patient data revealed an average Hausdorff distance of 0.198 mm (95% 0.640 mm; Dice coefficient=0.989). Dorsal nasal augmentation revealed an average Hausdorff distance of 0.381 mm (95% 1.56 mm; Dice coefficient=0.978) compared to "ground truth." Comparison between expected and actual augmentation revealed an average Hausdorff distance of 0.276 mm (95% 1.24 mm; Dice coefficient=0.985). Heatmap analysis demonstrated high congruence in all relevant anatomical areas of interest, with variation exclusively noted along the nasal dorsum as expected.

Conclusions: Our imaging protocol and accompanying customized implant fabrication workflow produce a highly accurate means of capturing critical facial anatomy necessary for the design of custom-designed dorsal nasal implants. We anticipate that implant fabrication to each patient's anatomical need will dramatically reduce cost, operative morbidity, and indications for revision, and produce a highly satisfactory aesthetic result. Ultimately, we hope to generalize our protocol to other facial structures such as the chin, cheek, and submalar region, thereby allowing for the point of care production of multiple customizable facial implants.

Anthropometric Differences Among Male and Female Latin American Noses and Implications in Rhinoplasty: a Systematic Review and Meta-Analysis

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Purpose: Within the field of ethnic rhinoplasty, a variety of techniques can be employed which take into consideration a patient's ethnic background and how ethnic anatomic differences may influence rhinoplasty outcomes. Although much of the literature describes qualitative differences in nasal morphology, there are indeed quantitative measurable differences, which could have surgical implications.

Methods: We conducted a systematic review and meta-analysis on Latin American patients undergoing rhinoplasty with the objective of identifying comparable nasal anthropometric measurements to assess for intra-ethnic nasal differences among Latino patients. 6 databases were queried: PubMed, Cochrane, Web of Science, Embase, Scopus, and LILACS. Study inclusion criteria were those with 1) gender specificity, 2) anthropometric data, 3) Latin American populations. Student's t-test followed by Bonferroni correction was used to analyze the summary statistics and standard deviations obtained. Because 6 t-tests were used for each gender analysis, Bonferroni correction was set at alpha equal to (.05/6) or .008. $P<.008$ was recorded only if the population demonstrated significantly different values when compared to each of the other two groups.

Results: 785 articles were uploaded to Covidence (Cochrane, Melbourne, Australia). Articles were screened by two reviewers with disputes resolved by a senior author. After full-text review, 3 studies met inclusion criteria. Study populations included Caucasian Latinos, Chileans, and Caucasian Brazilians. Each study had a sample size of $n \geq 100$ and included average measurements for nasolabial angles and nasofrontal angles for both men and women. All female nasolabial angles and nasofrontal angles demonstrated statistically significant differences when compared to each of the other two groups. Among the male cohorts, only Caucasian Latinos (95.0°) had significantly different nasolabial angels from both Chileans (104.8°) and Caucasian Brazilians (107.8°). Male nasolabial angels for Chileans and Caucasian Brazilian were not statistically different when compared to each other ($p=.146$). Furthermore, only male Chileans demonstrated statistically significant nasofrontal angle measurements (137.6°). Nasofrontal angel measurements for Caucasian Latinos (131.4°) and Caucasian Brazilians (133.7°) were not significant when compared to each other ($p=.268$). Studies with only qualitative data from other Central American, South American, and Caribbean populations were excluded due to a lack of anthropometric data.

Conclusion: Our study demonstrates definable objective differences in Latino nasal dimensions that are influenced by both the ethnicity and gender of the patient. Data on population-based angle measurements are useful as a foundation for ethnic rhinoplasty, allowing one to more precisely maintain or alter certain features, especially as they relate to ethnic norms. These objective differences must be considered when performing rhinoplasty to achieve results congruent with a patient's ethnicity and gender-identity.

Emotional Outcomes and Facial Action Units in Different Eyebrow Rotations - An Artificial Intelligence Analysis Study

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Purpose: Post-operative facial analysis remains largely subjective. We correlated manual brow rotations with emotional outcomes using artificial intelligence to objectively determine how specific brow manipulations affected human expression.

Methods: We included ten brow-lift patients in this study. Pre-operative patients' brows were rotated to -20, -10, +10, and +20 degrees in respect to the central axis of their existing brow using PIXLR, a cloud-based set of images editing tools and utilities. The degree of brow rotation was automated in PIXLR; however, brow placement required a manual component to ensure the rotated brows aligned with patients' existing brow height and width. These images, along with patients' original pre-operative and post-operative photos, were analyzed using FaceReader, a validated software package that uses computer vision technology for facial expression recognition. The primary facial emotion (neutral, happy, surprised, scared, angry, disgusted, or sad) and intensity of facial action units (0=no action unit detected to 4=the most intense action unit detected) generated by the software were recorded.

Results: 60 total images [6 images (pre-operative, -20 degree brow rotation, -10, +10, +20, and post-operative images) per patient] were analyzed using FaceReader. The primary emotion detected in the majority of images was neutral. The percentage of disgust in patients' expressions, as detected by FaceReader, increased with increased positive brow rotation (2% disgust detected at -20 degrees, 2.3% at -10 degrees, 2.9% at neutral, 4% at +10 degrees, and 5.2% at +20 degrees). In contrast, the percentage of sadness in patients' expressions decreased with increased positive brow rotation (27.6% sadness detected at -20 degrees, 19.9% at -10 degrees, 15.3% at neutral, 16.1% at +10 degrees, and 15.9% at +20 degrees).

As expected, the intensity of the inner brow raiser facial action unit decreased with increased positive brow rotation (0.088 at -20 degrees, 0.011 at -10 degrees, 0.038 at neutral, 0.03 at +10 degrees, and 0.008 at +20 degrees). Similarly, the intensity of the outer brow raiser increased with increased positive brow rotation (0.046 at -20 degrees, 0.018 at -10 degrees, 0.032 at neutral, 0.111 at +10 degrees, and 0.139 at +20 degrees).

Facial action unit analysis also corresponded with primary emotion analysis. For example, the emotion of sadness corresponds with three facial action units: inner brow raiser, brow lowerer, and lip corner depressor. As the percentage of sadness detected decreased with positive brow rotation, the intensity of the inner brow facial action unit also decreased, as well as the intensity of the brow lowerer action unit (0.049 at -20 degrees, 0.052 at -10 degrees, 0.031 at neutral, 0.024 at +10 degrees, and 0.017 at +20 degrees).

Conclusion: We demonstrated that increasing the degree of brow rotation correlated positively

with the percentage of disgust and inversely with the percentage of sadness detected by FaceReader. This study demonstrated how different manipulated brow positions affected emotional outcomes using artificial intelligence. Physicians can use these findings to better understand how brow-lifts can affect the perceived emotion of their patients.

Sculpting of Neck and Face with Liposuction

Abstract Presenting Author:
Richard Bensimon MD

Goals/Purpose: Liposuction of the neck is a common procedure, usually making small Mercedes cannulas or spatula shaped cannulas, yielding reasonable results. The entry points are typically one or two stab wounds in the submental area.

My premise was to maximize results by using different instruments, what have the capability to carve soft tissue effectively and give substantive improvement to this common aesthetic problem.

Methods/Technique: The cannulas I designed feature four rows of one mm holes, which remove small, even-sized particles of fat which leave behind an attractive, even layer of fat which is the foundation of a good result.

Each hole has a small barb or tooth, which improves efficiency and allows "craving" of fibrous tissue, partially near the mandible angle. The barb tips stimulate the underside of the skin, leading to maximal skin contraction. They come in 2.1 mm and 2.4 mm in diameter and our manufactured by Tulip Medical (no financial interest). The tip is bullet-shaped which allows entry through a 16-gauge needle puncture, which tends to leave no mark.

The procedure can be done under IV sedation (or general anesthesia) or with oral sedation and local anesthesia. Initial entry is via two punctures in the submental area and using the 2.4 mm cannula to address the central submental area and featuring posteriorly. Separate entries are then made laterally and posteriorly allow the 2.1 mm cannula to crisscross the submandibular area, completing the treatment. A network of fibrosis is created, which supports the neck structures. The cannulas can then be angled posteriorly to address the submandibular area and below the area.

Since the 16-gauge punctures do not leave marks, direct entry into the jowls is possible, either posteriorly or anteriorly to them. This adds an important dimension to facial shaping not commonly done in standard liposuction due to the attendant marks. The liposuction can be done manually, or there is an adapter available to allow the use of power-assisted apparatus. The surgery typically takes less than 1 hour.

Experience: Between November 2015 to February 2022, 132 cases were performed. Longest

follow-up is 5 years.

Results/Complications: This technique results in a thorough re-shaping of the neck/jowl area with definition of the mandible outlining the border between the mandible and the neck with an appropriate shadow. In the right patient, there is ample skin tightening leading to an elegant result.

Complications include bruising and swelling which usually resolves promptly. Induration of the submental area can occur necessitating massage in patients. If the neck skin is lax, irregularities can form which could be objectionable despite other improvements. A temporary marginal mandible palsy can result if extensive work in the angle is needed.

C**onclusion**: This is an excellent procedure which requires minimal capital outlay and can benefit a large number of patients, from younger ones with early changes to older ones with reasonable skin elasticity. A great advantage is the favorable aging of the cervical area following this surgery.

Experience with Injectables Performed at a Resident Departmental Aesthetic Surgery Clinic

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Background: The number of toxin and filler injections have increase exponentially over the past few decades, with annual expenditures totaling over $2 billion. 1 For new residency graduates or plastic surgeons early in their careers, these procedures represent an opportunity to accrue future surgical aesthetic patients when developing an aesthetic practice. Despite the high demand, plastic surgery residency programs have found it challenging to provide an opportunity for their residents to learn these procedures and achieve competency upon graduation. 2 In order to meet ACGME requirements (7 toxin and 7 soft-tissue filler injections), resident cosmetic clinics have been developed and incorporated into plastic surgery residency training. Unfortunately, there is a paucity of data with regards to institutional experience with injectable products and procedures. The objective of this study was to review the volume and variety of injectable procedures performed by senior residents at our institutional resident aesthetic clinic.

Methods: We performed a retrospective chart review of all patients who presented to the resident cosmetic clinic requesting injectables in 2021. Conversion rate (number of consults which subsequently received an injectable) was calculated. Outcomes of interest included

demographic factors, procedural details, and complications. Descriptive statistics were calculated using SPSS Statistics (IBM Corp., Armonk, NY).

Results: A total of 244 consultations (160 patients) met inclusion criteria for analysis. 237 consultations proceeded to an injectable procedure being performed, resulting in a 97.1% conversion rate, which equates to about 60 injectable encounters per chief resident at our institution. The patients were predominantly female (91.4%) with an average age and BMI of 48.3 ± 4.2 years and 23.2 ± 3.9 kg/m2, respectively. Overall, the patients were in relatively good health with only 2.0% suffering from diabetes and 3.3% were active smokers. The most common type of injectable product used was botulinum toxin (75.7%), followed by fillers (11.7%) and steroids (2.1%); 10.5% of visits consisted of patients receiving multiple types of injectable treatments (toxins and soft tissue fillers). Patients returned for touch-up (≤12 weeks) and repeat treatments in 11.5% and 33.8% of cases (>12 weeks), respectively. Local anesthesia was used prior to injection in 9.8% of the cases. There was only one recorded complication which was skin discoloration following toxin and filler injection into the face due to possible vascular occlusion, which was treated with hyaluronidase without any long-term sequelae.

Conclusion: Aesthetic clinics provide residency programs with an invaluable tool to ensure competency of graduating plastic surgery residents. The large volume of consultations for injectable products seen at the NYU Aesthetic Clinic supports its utility in plastic surgery training while maintaining a complication rate comparable to nationally published data.

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Artificial Intelligence for body dysmorphic disorder screening

Abstract Presenting Author:
Williams Bukret MD

Background: Screening for body dysmorphic disorder (BDD) is necessary for all patients requiring cosmetic surgery to identify those that can benefit from surgery and those who require psychological treatment. Besides, the use of Artificial Intelligence (AI) permits efficiently identifying patients with BDD before surgery and referring them to psychiatrists opportunely.1-4 This study analyzes the use of AI for BDD screening and evaluates the risk factors related to the BDD of patients requiring aesthetic surgery.

Methods: A prospective review of all patients assessed in a single private practice between June 2020 to November 2021 for BDD detection using the body dysmorphic disorder questionnaire

(BDDQ). The author conducted a descriptive and inferential analysis of the patients identified positive for BDD compared to the control group. The Pearson correlation test was used to analyze the risk factors and BDD.

Results: One thousand three hundred twenty-three patients submitted the BDDQ that were positive in 350 (26.4 percent), 321 were women (91.7 percent) and 29 men (8.3 percent), age 14 to 70 years old (mean = 34), average follow up 9 months. Notably, only 1 female patient (0.3 percent) underwent liposuction and gluteal augmentation with fat with a diagnosis of BDD under psychological treatment. Although the satisfaction rate was moderate in this patient after 13 months of follow-up, 329 screening positive for BDD were ineligible for surgery (95.3 percent), and 21 were lost for follow-up (6 percent). Additionally, the Pearson correlation coefficients between BDD and stress in the last three months (0.98), and age (-0.95) were statistically significant ($P < 0.01$).

Conclusions: The AI is an efficient tool for screening BDD. Furthermore, the importance of this finding is that it helps to opportunely identify and refer patients for psychological treatment. However, further studies are necessary to characterize BDD demographic in different populations.

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Outcomes and Management of Hypertrophic Scarring: The Mayo Clinic Experience
Presented During:

Abstract Presenting Author:
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Background: Hypertrophic scarring is a consequence of the wound healing process that cause functional and aesthetic disability. Generally, hypertrophic scarring corresponds to a spectrum that contains both keloid and hypertrophic scars. Numerous treatment methods have been described for abnormal scarring. Common treatments include intralesional pharmacotherapy (i.e., triamcinolone), surgical excision, and energy-based laser devices. However, a widespread, optimal treatment strategy has yet to be defined and established. Purpose: In this study, we reviewed our experience and present an algorithmic approach for the treatment of abnormal scars.

Methods: Herein we performed a 10-year retrospective study of patients that developed post-surgical hypertrophic scarring between January 2007 to December 2017 at our institution. Specifically, procedural treatments for hypertrophic scarring were evaluated in dermatology and plastic surgery outpatient clinical practices. Patients included had a minimum follow-up of 6 months. Demographics, clinical and surgical characteristics, and complications were extracted and analyzed. Finally, the information obtained was used to create an algorithmic approach for the management of these type of lesions.

Results: We identified a total of 325 procedures (i.e., intralesional steroid injection, surgical excision, and laser-based treatment) in 218 patients with clinical diagnosis of hypertrophic scarring or keloids. Approximately, 73% were female and 27% were male. A total of 87% were Caucasian. The median age at first procedure was 43 years. Most procedures involved treating scars located on the anterior chest (n=134; 36.2%) and abdomen (n=57; 15.4%). Procedural therapies included intralesional steroid injection (n=163; 50.2%), surgical excision (n=101; 31.1%) and laser (fractional laser vs. pulsed dye laser; n=51; 18.8%). The mean scar length was 8.96 cm, with a range of 0.4cm to 50cm. On average, each patient had 1.49 procedures. For those with more than one procedure, Kenalog injection was the most likely first procedure (n=37, 71% of patients with 2 or more.). Plastic surgery performed more procedures than dermatology (197 vs. 128). Between plastic surgery and dermatology, there was a difference in procedure type. Dermatologic procedures included a higher proportion of PDL laser therapy, while plastic surgery had a higher proportion of excisions and Fraxel. We found an association between anatomic location and procedure type. Abdominal scars were most likely to be treated with Kenalog, as were chest scars. Hand and upper extremity scars were overrepresented in the PDL group, but all others were underrepresented. Of our 12 Fraxel cases, five involved treating the chest and four the abdomen.

Conclusion: Treatment modality varied between dermatology and plastic surgery practices, depending on physician-patient preference. In addition, anatomical region may favor the use of certain treatment modalities. This single-center series of patients with hypertrophic scarring highlights patient-centric approach to management and offers clinical guidelines for provider-patient shared decision making.

Public Perspectives on the Safety of Botulinum Toxin and Facial Filler Injections

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Purpose: Though both botulinum toxin and facial filler injections are safe procedures with high efficacy and patient satisfaction, potentially serious risks and complications do exist. While providers presumably educate individual patients on the risks of botulinum toxin and filler injection, it is unclear how knowledgeable the general public is about the risks of these common cosmetic, nonsurgical procedures. Given the potentially serious consequences of injectables, an intimate knowledge of facial anatomy is required in order to safely deliver these injections. Currently, providers with diverse backgrounds, including nurses and physicians from many specialties, deliver these injections. The goal of this study is to assess public knowledge of the risks of botulinum toxin and facial filler injection as well as perceived comfort with various providers delivering these injections.

Methods: A cross-sectional survey was performed through Amazon Mechanical Turk regarding knowledge of the risks of botulinum toxin and facial filler injection as well as provider and location preferences among adults 18 years and older and currently residing in the United States (US).

Results: A total of 498 complete, unique responses were analyzed. The average age of respondents was 38.8 years and 61% of respondents self-identified as female. Thirty-four percent of respondents previously received botulinum toxin injections and 22% previously received facial filler. Moreover, 69% and 51% would consider receiving botulinum toxin or filler injections, respectively. When asked to identify potential risks of botulinum toxin injections from a list, asymmetry, bruising, and drooping of parts of the face were correctly identified by 38%, 50%, and 49% of respondents, respectively. Asymmetry, bruising, blindness, and blood vessel clotting (vascular occlusion) were identified as risks of filler injection by 40%, 51%, 18%, and 19% of respondents, respectively. Additionally, plastic surgeons were the most preferred provider for botulinum toxin and facial filler injections, preferred by 43% and 48% of participants respectively. Dermatologists were the next most preferred provider, selected by 28% of participants for botulinum toxin injections and 24% for facial fillers. Participants were also asked to rate their knowledge of the risks of botulinum toxin and filler injections. Those with higher self-rated knowledge had lower odds of selecting a plastic surgeon or dermatologist as their preferred provider for botulinum toxin (OR .35, 95% CI .23-.51, $p<0.0001$) or filler injections (OR .34, 95% CI .20-.57, $p<0.0001$).

Conclusion: While most people would consider botulinum toxin or facial filler injections, the potential risks of these procedures, especially the serious risks of facial fillers, are poorly

appreciated by the general public. Though most people would elect to see a plastic surgeon for these procedures, those with a higher self-rated knowledge of their risks may actually prefer non-physician providers. This may be due to high self-rated knowledge reflecting high confidence in the safety of these procedures; further inquiry is needed to understand this relationship or elucidate other potential influences. Plastic surgeons must continue to advocate for the safe and informed delivery of botulinum toxin and facial fillers.

Spot Treatment of Adipose Layer Thickness on Lateral Thighs using a Simultaneous emission of HIFEM and Synchronized RF Energy: Multicenter MRI Study

Abstract Presenting Author:
Brian Kinney MD, FACS

Purpose: Lateral fat most prominently affects the female population and may lead to an imbalance with the rest of the body. This study investigates the effect of high intensity focused electromagnetic field procedure (HIFEM) simultaneously combined with synchronized radiofrequency (RF) for the treatment of lateral thigh adipose tissue.

Methods & Materials: Out of 93 subjects, 85 (21-70 years old, BMI 19-34.5 kg/m2, skin types I-VI) completed four HIFEM+RF procedures once per week, each consisting of the 30-minute bilateral application over the lateral thighs with intensities (0-100%) set according to the patients' tolerance. Therapy comfort and safety were monitored after each treatment. Magnetic resonance images (MRI) of the treated area were obtained at baseline, 1-month, 3-month, and 6-month follow-up to document the changes in fat layer thickness. Furthermore, the circumference of the hip and thighs was measured, and the subject's satisfaction was assessed.

Results: The MRI scans revealed a significant reduction of fat tissue in the saddlebag region. Results peaked at 3 months (-1.9±0.5 cm; N=49) and maintained up to 6 months (-1.8±0.4 cm; N=52). Correspondingly, in subjects who finished a 3-month follow-up visit, the thigh circumference measured at three predefined levels decreased on average by 2.3 cm, with the greatest change at the level of 10 cm below the gluteal fold (-3.5 cm). At 6 months, the maximum decrease in circumference was maintained at -3.3 cm. The therapies were safe, and the vast majority of subjects found it comfortable. The subjects were generally satisfied with the treatment outcomes (82%), reporting the treatment area felt more toned post-treatment (84%).

Conclusion: Our findings document the effectiveness of the novel HIFEM+RF technology for the reduction of adipose tissue on lateral thighs. MRI examination revealed a significant long-term decrease in fat thickness, accompanied by circumference reduction. The results suggest that the treatment effect is gradually improving up to 3 months and maintained for 6 months post-treatment.

The Effect of Tranexamic Acid in Lowering Bleeding, Edema and Ecchymosis in Rhinoplasty: A Systematic Review & Meta-Analysis

Abstract Presenting Author:
Connor McGuire MD

Background: Tranexamic acid (TXA) is an anti-fibrinolytic that has been commonly used to reduce intraoperative blood loss. The objective of this study was to systematically examine the role of TXA in reducing bleeding, edema, and ecchymosis among patients undergoing primary elective rhinoplasty.

Methods: A systematic review was undertaken using a computerized search. Publication descriptors, methodological details, and outcomes were extracted. Articles were assessed using the Cochrane Collaboration risk of bias instrument and the GRADE criteria. Random effects meta-analysis was completed to determine overall effect size.

Results: Five studies were included. All studies were randomized control trials published within the past five years. The age of patients was a mean of 27 (range 16 to 42) while the mean sample size was 66 (range 50 to 96). Meta-analysis of four studies indicated that on average (95 percent confidence interval), patients lost 41.6mL (69.8mL to 13.4mL) less blood intraoperatively when treated with TXA compared to controls (p=0.004). Three studies indicated that edema and ecchymosis were reduced with TXA treatment compared to controls, however there was no significant difference when compared to steroids. Four studies (80 percent) were considered of high methodological quality with a low risk of bias. The overall quality of evidence was high.

Conclusions: TXA has the ability to significantly reduce intraoperative blood loss, edema, and ecchymosis among patients undergoing primary elective rhinoplasty.

A Comparison of Multimodal Analgesic Regimens for Opioid Reduction in Elective Plastic Surgery: A Randomized Prospective Study

Abstract Presenting Author:
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Abstract Co-Author(s):
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Steven Davison MD

Background: Opioid reduction and ERAS development are prominent surgical issues. In a previous study, we found that a multimodal analgesic approach to postoperative pain management resulted in a 35% decrease in opioid use.[1] Critiques of this study focused on the lack of an adequate preload of gabapentin. The purpose of this trial was to study an analgesic

approach with the aforementioned preload and compare its efficacy to a multimodal NSAID approach to postoperative pain management in cosmetic surgery.

Methods: This randomized study prospectively studied 107 patients undergoing elective cosmetic surgery in an outpatient surgery center. Patients were randomly assigned into one of two pain management protocols: a preload of Gabapentin and Tylenol protocol or an NSAID and Percocet protocol. Data on compliance, the number of narcotic pills consumed, the duration of pain medication use, pain levels, patient satisfaction with pain control, time from close to PACU admission, and incidence of bleeding-related complications were collected and analyzed.

Results: Patients from both pain protocol regimens reported equality in all of the above metrics except compliance, patient satisfaction with pain control, time from close to PACU, and incidence of bleeding-related complications. Multimodal NSAID patients exhibited a 8.92% higher rate of compliance ($p=0.02$), a 5.88% higher rate of satisfaction with pain control ($p=0.04$), a 12.8% lower rate of time from close to PACU, and a 7.84% lower rate of bleeding-related complications, all of which were statistically significant ($p=0.05$).

Conclusions: The results indicate that there is no significant difference between both multimodal pain protocols in reducing pain levels. Consequently, both regimens are viable tools in combating the over-prescription of opioids. However, the NSAID protocol has a higher rate of compliance and patient satisfaction and is more cost-effective by reducing the time of emersion. There were no hematomas associated with the use of NSAIDs and there was greater ease of use, supporting its use in ERAS protocols.

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Productivity and Efficiency of a Departmental Resident Aesthetic Plastic Surgery Clinic

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Background: The number of aesthetic surgery procedures performed in the United States has consistently grown over the past several decades, with the most recent annual expenditures totaling over $9 billion. Despite this increasing demand, plastic surgery residency programs have

found it challenging to provide comprehensive training in aesthetic surgery to fulfill ACGME requirements (150 aesthetic procedures). Prior studies evaluating institutional experiences in resident aesthetic clinics have been limited by sample size. Here we present our experience with productivity and efficiency of a resident aesthetic clinic at the NYU Hansjörg Wyss Department of Plastic Surgery and highlight its potential impact on the competency of graduating plastic surgery residents.

Methods: We performed a retrospective chart review of all adult surgical patients who presented to the NYU Aesthetic Surgery Clinic in 2021. Patient demographics, co-morbidities, consultation/procedural data, and postoperative complications were used to generate descriptive statistics using SPSS Statistics. Conversion rate (the number of consults which subsequently underwent a procedure), as well as complication and revision rates were calculated. Cases were indicated, performed and followed postoperatively by residents with dedicated attending surgical supervision and anesthesia care.

Results: A total of 407 consultations (380 patients) met inclusion criteria and were included in the study. Of these, 171 consultations underwent a procedure (42% conversion rate) and 464 distinct surgical procedures were performed. Patients were predominantly female (94.5%) and in relatively good health (3.9% diabetes, 6.6% active smokers). The cohort had an average age and BMI of 49.3 +/- 13.6 years and 27.1 +/- 5.2 kg/m2, respectively. Face and neck procedures (55.8%) accounted for the majority, followed by breast (22.2%) and body contouring (22.0%). The most common procedures performed were blepharoplasty (26.9%), mastopexy (11.2%), face and neck lifts (9.5%), liposuction (8.2%), and abdominoplasty (8.0%). None of the patients required re-operation due to a major complication, while 3.5% required a minor office intervention under local anesthesia and 9.9% were treated conservatively with local wound care and/or antibiotics. Minor wound dehiscence (<2 cm) was the most common complication overall (7.0%). Minor revisional procedures performed under local anesthesia were subsequently required for 4.1% of cases, while 1.8% required a major revision under general anesthesia. The mean operative time across all cases was 3.8 +/- 1.3 hours.

Conclusion: These data represent the largest current reported study of plastic surgery resident aesthetic procedures and outcomes, demonstrating high volume of productivity and efficiency of consult conversion at the NYU Aesthetic Surgery Clinic. Notably, the total procedural volume as well as the high percentage of face/neck procedures is well above training minimums, contrary to national trends. Under the direct supervision of dedicated surgical and anesthesia faculty, these results further support the enormous benefit of resident aesthetic clinics to ensure superior training for senior residents while maintaining low complication and revision rates comparable to national published data.

Establishing the Role of Topically Administered Tranexamic Acid (TXA) in Panniculectomy Surgery

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Background: Abdominal panniculectomy after weight loss is a common procedure that despite associated high patient satisfaction continues to have a high post-operative complication profile. Several modifiable risk factors have been proposed to reduce such risks in addition to surgical approaches; preservation of Scarpa's fascia, tissue adhesives, and progressive tension suture techniques. 1 However, the use of tranexamic acid (TXA) has not been previously described in panniculectomy surgery. With a more comprehensive understanding of the role of TXA in plastic surgery, further contribution to the expanding body of literature is imperative. To improve the safety and predictability of this procedure, the authors aim to investigate the safety and efficacy of topically administered TXA during panniculectomy surgery to determine whether it reduces seroma, hematoma, and shorter drain duration.

Methods: A retrospective review was performed to identify consecutive patients who underwent panniculectomy (January 2010 to January 2022). Pertinent preoperative, intraoperative, and postoperative details were collected. Primary outcome measures included: hematoma requiring surgical evacuation, clinically significant seroma formation mandating percutaneous aspiration and drain duration. Patients taking anticoagulation/antiplatelet medication or those with a history of thromboembolic diseases were excluded. Patients who had received TXA were compared to a historical control group who did not receive TXA within the same cohort.

Results: A total of 288 consecutive patients were included. Topical TXA was administered in 56 (19.4%) cases. The mean (SD) follow-up was 43.9 (37.4) months [3.7 years]. The median (range) resection weight was 2.6 kg (0.15 – 19.96 kg). With regards to seroma and hematoma formation, the univariate logistic regression analysis demonstrated that the use of TXA did not reduce the likelihood of developing seroma or hematoma (odds ratio, OR= 1.7, 95% confidence interval, CI [0.56 – 4.8], p= 0.38 and OR= 2.1, 95% CI [0.4 – 11.8], p= 0.42, respectively). Overall, drains were maintained for a median duration of 16 days and did not differ between the groups (17 days for non-TXA group, 15 for TXA group, p=0.4). No complications associated with the administration of TXA were observed, including thromboembolic events or seizures.

Conclusions: As the use of TXA in plastic surgical procedures continues to expand, the utility of TXA in panniculectomy and abdominoplasty has not been elucidated. Although prior studies support the use of tranexamic acid as an adjunct for reducing hematoma risk and seroma in other plastic surgery procedures, the use of TXA was not associated in reduction of seroma, hematoma, or drain duration following panniculectomy surgery. Future work through a randomized controlled study will help to elucidate the impact of this medication more clearly in patients undergoing panniculectomy or abdominoplasty.

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Volumetric Analysis And Quality Of Life Outcomes Three Months After Hyaluronic Acid Injectable Facial Filler

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Introduction: Over 2.6 million minimally invasive procedures for hyaluronic acid (HA) soft tissue filler were performed nationwide in 2020. Despite their widespread use, there is a lack of literature on long term volumetric analysis or patient reported outcomes (PROs) as it relates to hyaluronic acid facial fillers in women. This prospective study aims to quantify PROs and volumetric changes up to 3 months after HA fillers.

Methods: Women aged 40-65 were consented. Subjects were injected in the nasolabial folds, marionette lines, malars, and/or cutaneous vermillion border in a standardized fashion using Restylane® dermal fillers. Subjects completed 12 independent domains of the FACE-QTM questionnaire and were photographed pre-injection, post-intervention, 2 weeks, 4 weeks, and 12 weeks post-injection using 3D Vectra® M3 Imaging Software. 3D images were layered and calibrated for volumetric analysis.

Results: Sixty-nine women received intervention. On 3D analysis, medians of 71.3% and 69.1% of injected volume were maintained in the lower- and mid-faces at 12 weeks, respectively. Improvements in PROs were seen from baseline to 3-months in appraisal of facial appearance, lips, cheekbones, cheeks, lower face/jawline, psychological function, social function, and psychosocial distress (all $p<0.05$), but not with evaluation of aging, nasolabial folds, and marionette lines. Volumetric augmentation in the lower face was correlated with improvements in FACE-Q domains of aging, psychological function, social function, and satisfaction with outcome. Increased volume of the entire face was correlated to improvements in both FACE-Q of psychological function and satisfaction with outcome (all $p<0.05$).

Conclusion: Adequate volume is maintained three months after HA facial fillers. Further, facial fillers indeed improve patient reported outcomes in multiple facial domains at three months following injection, and volumetric augmentation is correlated to improvements in specific PRO domains. Clinicians should consider long term patient goals when advising patients on HA facial fillers. Additional studies using longer terms and fillers of different rheological characteristics is needed.

Frequency, Indications, and Intra-operative Dynamics of Repositioning of the Lateral Crura of the Lower Lateral Cartilage: 35 Years Experience

Abstract Presenting Author:
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Background: Lower lateral cartilage repositioning (LLCR) is an effective technique that places the lateral crus in a newly created caudal pocket and is utilized for a variety of indications including cephalic malposition, alar asymmetries, and tip rotation/projection alteration. However, there is a relative sparsity in the literature regarding this procedure and the dynamic changes that it produces. In this study, we report our experiences with LLCR.

Methods: Data from our institution was collected from the most recent one-hundred primary rhinoplasties, one-hundred secondary rhinoplasties, and all LLCR performed. For each LLCR, patient demographics and concurrent surgical techniques were compiled. Additionally, information was extrapolated from computer log sheet of all 127 of rhinoplasty patients whose surgery include LLCR. A descriptive analysis was performed for all cohorts, while Fischer's exact test was performed to compare the primary and secondary cohorts.

Results: Eleven (11%) patients in 100 primary rhinoplasty group and twelve (12%) were in the one hundred most secondary primary cohorts established the frequency of this LLCR in our practice. Removal of cephalic lower lateral cartilage was significantly more common in the primary and secondary LLCR cohorts ($p=0.0373$). In the cohort of 127 patients who had undergone LLCR the most performed concurrent procedures were simple splints (67.7%), removal of cephalic LLC (66.1%), and trans-domal suture placement (52%). The most common indication for the LLCR was cephalic malposition followed by over-projection and asymmetry of the lower lateral cartilages. Intraoperative observation of dynamic changes included invariable cephalic rotation of the tip, ability to precisely control of the tip projection, drastic narrowing of the domal arch, often negating the need for the transdomal suture, alar repositioning caudally, correction of alar retraction and more elegant tip definition.

Conclusion: LLCR is a powerful and versatile tool that can be utilized in either primary or secondary rhinoplasty.

Facial Aesthetic Procedures after Radiation to the Head & Neck Region

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Purpose: A frequently cited theory regarding tissue healing in irradiated patients is that radiotherapy for cancer treatment causes gradual microvascular occlusion and ischemia, which cause poor healing after surgical treatment. However, significant evidence suggests that irradiated skin is not ischemic, and that poor healing is attributable to irradiated fibroblasts and fibroblast stem cells. Normal oxygenation in irradiated tissue should thus allow surgical healing, as long as skin tension is avoided. We report four successful cases of facial aesthetic procedures performed within heavily irradiated tissues, with normal healing.

Methods: A retrospective review was performed identifying patients who underwent aesthetic or reconstructive facial procedures after undergoing radiation. Patients operated on by the senior author (S.A.W.) were reviewed. Aesthetic outcomes and postoperative complications were evaluated.

Results: Four patients were identified who underwent aesthetic or elective facial procedures after significant radiation.

Patient 1: A 56-year-old female with squamous cell carcinoma (SCC) of the floor of mouth, underwent radiation therapy, with resultant accelerated facial aging. She underwent a subcutaneous SMAS plication facelift for improvement of the lower neck and mandibular contour. Following this, for skin resurfacing, she underwent phenol-croton oil peel with significant improvement in skin texture and fine rhytids; there was no hyper- or hypopigmentation nor skin loss. After 23 months, due to moderate residual unilateral jowling, she underwent another unilateral facelift with tightening of the jowl area. Recovery was uneventful.

Patient 2: A 63-year-old male had received 6000-cGy cobalt irradiation for treatment of a T3N2M0 SCC of the left floor of the mouth, tonsil, lateral pharyngeal wall, and neck 13 years earlier. A face lift, submental lipectomy, and genioplasty were performed, using the prior right neck scar. Healing was uneventful, with no skin necrosis.

Patient 3: A 14-year-old male with rhabdomyosarcoma of the maxillary sinus underwent radical

excision and radiation therapy at age 3 years, with subsequent significant hypoplasia of his midface. He then underwent multiple reconstructive procedures, including bilateral serratus anterior free muscle flaps, a LeFort III osteotomy with external distraction, iliac bone grafting to the orbit, and a tip rhinoplasty. He experienced no complications, with good skin viability and no wound healing issues. He underwent fat grafting two years after finishing distraction, with good maintenance of grafted volume and a good aesthetic result.

Patient 4: A 78-year-old female with a history of multiple cutaneous skin cancers including basal and SCCs underwent radiation of her chin (52 Gy/13 fxs) at age 76. She presented with a long platysma band and neck wrinkling. She underwent a lengthening genioplasty and a neck lift with hemostatic net. She experienced no complications and healing was successful despite poor skin quality.

Conclusion: In all patients, irradiated skin healed normally with no complications. Radiation itself can cause tissue damage, fibrosis, scarring and radionecrosis. Irradiated tissues are associated with increased rates of surgical complications, which has led some surgeons to avoid offering cosmetic interventions to this patient population. Our results lend support to the conclusion that patients undergoing facial aesthetic procedures following radiation can have acceptable aesthetic results without complications.

Frailty Indices Outperform Historic Risk Proxies as Predictors of Post-Abdominoplasty Complications: An Analysis of a National Database

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Background: Abdominoplasty is one of the most common aesthetic procedures (1). Complication rates may be >50% in select populations (2). The literature has conflicting data regarding risk factors, but supports age, BMI, and diabetes as predictors of surgical risk (3). Recent literature may support patient frailty as a more accurate predictor of surgical risk. Specifically, the modified 5-item frailty index (mFI-5) has been shown to be a strong predictor of 30-day postsurgical complications for panniculectomy, and the modified Charlson Comorbidity Index (mCCI) is similarly predictive for other procedures (4,5). The authors hypothesized that frailty measures are more predictive of 30-day postoperative complications in abdominoplasty,

versus historic risk proxies.

Methods: A retrospective review of the NSQIP database was performed of all patients from 2013-2019 who underwent abdominoplasty without other concurrent procedures. Demographics, comorbidities, and outcomes/complications were gathered. The mFI-5 and mCCI scores were calculated for each patient. Age, BMI, number of major comorbidities, ASA class, mFI-5 score, and mCCI score were compared as predictors of all-cause 30-day complications, 30-day surgical site complications of any kind, length of stay, and aggregate Clavien-Dindo complication severity score, using univariate and multivariate logistic regression. Statistical significance was set at $p<0.05$.

Results: There were 421 patients identified. The strongest predictor for all-cause complications was mCCI≥3 (odds ratio 9.82, $p<0.001$), followed by mFI-5≥2 (odds ratio 7.43, $p<0.001$). Complication severity was also significantly associated with mCCI≥3 and mFI-5≥2 ($p<0.001$). Age, ASA class, major comorbidities, and BMI were less strongly predictive. Overnight stay was weakly predicted by major comorbidities, age, and mFI-5 score. The only predictor of surgical site complications was BMI≥30.0 (odds ratio 4.68, $p=0.01$). Smoking status was not predictive of any outcome measure.

Conclusions: The mFI-5 and mCCI are stronger predictors of postoperative 30-day complications and complication severity than age, BMI, and diabetes. While the mCCI is a stronger predictor than the mFI-5, the mFI-5 is a simpler tool that can be easily and quickly calculated during an initial patient consultation. Surgeons can apply these tools to aid in patient selection or in risk stratification for elective abdominoplasty.

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Pretreatment of Brazilian Butt Lift Patients with QWO

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Purpose: Brazilian Butt Lift surgeries have been one of the most popular treatments over the past several years. The procedure has evolved to enhance patients' safety and improve results. Collagenase clostridium histolyticum-aaes (QWO) is the first FDA approved injectable for cellulite of the buttock. Cellulite is often a limiting factor in the results of the Brazilian Butt lift as it limits the projection and overall appearance of the buttock. The purpose of this study is to evaluate the safety and effectiveness of pretreating patients undergoing fat transfer to the buttock with QWO. .

Methods and Materials: Eleven consecutive patients were treated with QWO prior to their Brazilian Butt Lift. To be included in the study patients need to have at least one treatment of QWO prior to their fat transfer procedure. Then all patients were evaluated by the clinician reported photonumeric cellulite severity scale comparing their photos prior and post treatment. Patients were also surveyed to evaluate their satisfaction with the results of the treatment. Two patients were unavailable to complete the satisfaction survey. Nine patients were included for analysis.

Results: Nine patients were evaluated for clinical improvement and satisfaction after treatment with QWO prior to their Brazilian Butt Lift. All patients were treated with QWO between fourteen and twenty-eight days (mean 22 days) prior to their fat transfer procedure. Seven of the 9 patients showed a 1 grade improvement in cellulite, two patients showed a 2 grade improvement in cellulite. Eighty-nine percent (8/9) of patients were very satisfied or satisfied with the results of their treatment. One patient was neither satisfied or dissatisfied with their treatments.

Conclusions: QWO was found to be safe and effective in patients undergoing a fat transfer procedure to the buttock. The phase III trials of QWO found satisfaction rates of 49%, while our study found a satisfaction rate of 89%. The study also found that all of the patients showed improvement in their cellulite compared to 61% in the phase III study. Further studies need to be done to show that these results are consistent in larger series, however the concept of dissolving the bands that cause cellulite prior to filling the buttock with fat warrants further evaluation. Patients that were treated with QWO prior to their Brazilian Butt Lift were found to have a very high satisfaction rate.

Pulmonary Embolism Risk after Cosmetic Abdominoplasty

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Background: Tighter abdominal wall plication during cosmetic abdominoplasty compared to functional panniculectomy may confer additional risks, such as those associated with decreased venous return. The purpose of this study was to determine whether cosmetic abdominoplasty increases risk for thromboembolic events.

Methods: Retrospective cohort study was conducted utilizing NSQIP for excision of excessive subcutaneous infraumbilical skin and soft tissue at participating hospitals between 2015-2019. Procedures performed for cosmetic abdominoplasty versus functional panniculectomy were compared for occurrences of postoperative PE.

Results: During the study interval, 11137 patients underwent excision of excessive infraumbilical abdominal skin, including 57.4% (n=6397) patients undergoing functional panniculectomy and 42.6% (n=4740) patients undergoing cosmetic abdominoplasty. Most patients were female (89.3%, n=9946). The average age at surgery was 46.4±12.1 years, and those undergoing cosmetic abdominoplasty were significantly younger (p<.001, 44.9±11.5 years vs 47.5±12.3 years). The average preoperative BMI was 31.7±8.0 kg/m2, and patients undergoing functional panniculectomy had significantly higher BMI than those undergoing cosmetic abdominoplasty (p<.001, 33.3±8.9 kg/m2 vs 29.5±6.0 kg/m2).

Comorbid conditions were found to be present in 38.9% (n=4331) patients undergoing either panniculectomy or cosmetic abdominoplasty, but patients undergoing functional panniculectomy were significantly more likely to have comorbidities than those undergoing cosmetic abdominoplasty (p<.001, 44.9% vs 30.8%).

On univariate regression analysis, patients undergoing cosmetic abdominoplasty were 2.4 (95%CI 1.3-4.3) times more likely to experience postoperative PE than patients undergoing functional panniculectomy (p=.003, 0.6% vs 0.3%). PE was associated with congestive heart failure (p=.021; OR 7.5), preoperative recent weight loss (p=.005, OR=10.5), coagulopathies (p=.030, OR=4.3), and higher BMI (p=.024, 32.6 kg/m2 vs 30.0 kg/m2).

On multivariate regression analysis, the risk for postoperative PE was independently associated with cosmetic abdominoplasty (p<.001, AOR=4.2), elevated BMI (p=.001, AOR=1.4 per +5 kg/m2), preoperative recent weight loss (p=.006, AOR=20.7), and concurrent hernia repair (p=.049, AOR=2.4). Most PE events occurred outpatient after discharge (87.2%, n=41 of 47), while only a minority occurred while patients were still hospitalized/inpatient (12.8%, n=6 of 47). The average postoperative time from surgery until PE was 10.5±6.7 days.

Conclusions: This study demonstrates that patients who underwent cosmetic abdominoplasty had a higher risk of PE than functional panniculectomy, despite having significantly fewer comorbidities. The abdominal wall is substantially tightened during cosmetic abdominoplasty, which reduces abdominal wall compliance and reduces intraabdominal volume, and thus increases intraabdominal pressure. Intraabdominal hypertension imparts extrinsic pressure on the inferior vena cava, and thereby decreases peripheral venous return. Decreased venous return through the IVC has been demonstrated to increase risk of DVT. Higher rates of DVT in the context of intraabdominal hypertension may contribute to the significantly higher rate of PE in patients undergoing cosmetic abdominoplasty compared to those undergoing functional panniculectomy.

The Objective Buttocks Assessment Scale (OBAS): a new and complete method to assess the gluteal region.

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Introduction: New treatment methods to improve and enhance buttocks appearance require globally accepted scales for aesthetic research and patient evaluation. The purpose of our study was to develop a set of grading scales for objective assessment of the gluteal region and assess their reliability and validity.

Materials and methods: Twelve photonumeric grading scales were created. Eleven aesthetic experts rated photographs of 650 women in 2 validation sessions. Responses were analyzed to assess inter-rater and intra-rater reliability. The Rasch model was used as part of the validation process.

Results: All the scales exceeded criteria for acceptability, reliability and validity. Overall interrater reliability and intra-rater reliability were both "almost perfect" ($p=0.15$ and $p=0.16$ respectively).

Conclusion: Consistent outcomes between raters and by individual raters at 2 time points confirm the reliability of the Objective Buttocks Assessment Scale in female patients and suggest it will be a valuable tool for use in research and clinical practice.

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Preoperative Knowledge of Mean Gray Value (MGV) Decreases Wound Complications in Abdominoplasty

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Background: Wound complication rates remain high in body contouring surgery.1 MGV quantitates variability of the superficial fascial system (SFS), which can be measured preoperatively. Our research group has previously shown that MGV correlates positively to subcutaneous tissue collagen content and suture pullout strength and is inversely related to wound complications.2,3

Methods: A study was conducted utilizing data from all abdominoplasties performed by a single surgeon between 2016-2021. All patients after 8/2018 (prospective cohort) received ultrasound imaging of the subcutaneous tissues followed by image processing and calculation of MGV. Patients with average to poor MGV (0.127 or less) were identified preoperatively for tension-reducing procedures. Wound complication rates were compared to a similar retrospective cohort. Outcome measures included healing imperfections, wound complications, and major wound complications. Wound healing imperfections were defined as small areas of scabbing, eschar or dehiscence that required observation or topical treatment and did not interfere with the planned recovery. Wound complications were defined as any wound that was managed in an outpatient office setting but still required intervention such as debridement or packing. Major wound complications required return to the operating room for management. All abdominoplasties were performed using the same suture materials and techniques by the senior surgeon. All abdominoplasties were closed with 2-0 Vicryl in the subcutaneous layer followed by 0 Quill in the dermis and 2-0 Quill in the subcuticular layer. Progressive tension sutures with 2-0 Vicryl were routinely used for all abdominoplasties. Abdominoplasty technique included supraumbilical undermining, umbilical transposition, and rectus abdominis plication.

Results: A total of 167 patients were analyzed and separated into two cohorts based on preoperative knowledge of MGV: 82 in the prospective cohort vs 85 in the retrospective cohort. There was no statistical difference in the age, BMI, average weight resected, smoking, diabetes, history of bariatric surgery and history of massive weight loss between the two groups. There was no difference in the rate of wound healing imperfections (8/82 (9.8%) vs 10/85 (11.8%); p=0.86; chi-square) and major wound complications (0/82 vs 1/85) between the two cohorts. There was a statistically significantly higher number of wound complications in the retrospective group vs the prospective group (11/85 (12.9%) vs 2/82 (2.4%); p=0.025; chi-square).

Conclusion: MGV is a patient-specific, structural variable of the integument, and its preoperative use in this study decreased wound complications in patients undergoing abdominoplasty.

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Is the Public Adequately Informed about #BBL? A Content Analysis of Instagram Posts Regarding the Brazilian Butt Lift Procedure

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Background: Brazilian Butt Lift (BBL) is a popular procedure to remove fat from undesirable areas and transfer it into the gluteal region. However, there are risks associated with BBL, including fat embolism and a high mortality rate. The objective of this study was to analyze public social media content about the BBL procedure on Instagram.

Methods: Instagram was queried using seven relevant hashtags (#bbl, #brazilianbuttlift, #bbljourney, #bblrecovery, #bblsafety, #safebbl, #bblsurgery) twice in one month. The first 50 relevant posts for each hashtag in the "Top" search category were analyzed for author qualifications, social media currency ("likes" and comments), and content, including types of photos, references to research, educational information, and discussion of safety risks.

Results: A total of 587 posts, with a total of 458,659 "likes" and 9,230 comments, were included in the analysis. The majority (79%) of authors were physicians or physician groups. One third of all posts were shared by the same five accounts, including three board-certified plastic surgeons

and two physician groups. Of 128 unique physicians, 63% were plastic surgeons verified to be board certified by the American Board of Plastic Surgery, the American Osteopathic Board of Surgery, or an equivalent international organization. The rest were cosmetic surgeons (17%), plastic surgeons who were not board certified (13%), or physicians whose training or certification status could not be verified (8%). There were no posts created by any regional, national, or international plastic surgery organizations, and only one post created by an academic plastic surgery department. Most posts (73%) showed post-operative results, and 39% were advertisements encouraging patients to schedule a clinic appointment or procedure. While 29% of posts included some educational information, only 12% mentioned risks and only 3% referenced research. Board-certified plastic surgeons contributed 57% of the educational posts, but only contributed 33% of the posts mentioning risk. One-quarter of posts about risk only mentioned non-specific "risk" or "danger". The most frequently specified risks were edema (14%), fat embolism (13%), and death (11%).

Conclusion: Most BBL-related content on Instagram does not provide educational information to patients or promote understanding of the risks of the procedure. Social media remains an underutilized mechanism for patient education, suggesting that plastic surgery organizations and board-certified plastic surgeons should consider using social media to disseminate information on the risks and indications of BBL and other popular cosmetic procedures.

Surgical Outcomes in Patients Undergoing Abdominal Contouring Procedures After Recovering from Prior COVID-19 Infection

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Purpose: The outbreak of coronavirus disease 2019 (COVID-19) has been a rapidly evolving pandemic with over 78 million cases in the U.S. alone.1 The progression of the pandemic into its third year has brought increasing recognition to the long-term physiologic sequelae associated with SARS-CoV-2 infection -- which is still not well understood.2, 3 Similar to other viral pulmonary syndromes that impact surgical outcomes, there may be an increased risk of postoperative complications in patients who have recovered from COVID-19.4 However, there is scant literature regarding this concern and none to date have examine plastic and reconstructive procedures. We aim to investigate the association between prior SARS-CoV-2 infection and postoperative complications in patients undergoing abdominal contouring procedures.

Methods: A retrospective review was conducted for all patients who underwent abdominoplasty or panniculectomy at Montefiore Medical Center from March 2020 to November 2021. Patients were separated into exposed and non-exposed cohorts via preoperative history to COVID-19

infections. Patient factors such as demographic data and concurrent comorbidities were included. Postoperative complications, readmission/reoperation, and length of stay (LOS) were collected as well. Parametric, nonparametric, and multivariable regression modeling was utilized for analysis.

Results: Of the 181 patients included in the study, 14 (7.7%) had a prior SARS-CoV-2 infection. The average time from infection to surgery was 250 (range 92-382) days. No patients experienced inpatient hospitalization, intubation, or antibody treatment related to SARS-CoV-2 infection. The mean age and Charlson comorbidity index for non-exposed and exposed patients were 45.4 and 45.9 years, and 1.24 and 1.36 points respectively. Patients with prior histories of SARS-CoV-2 infection were more likely to have a history of CKD (OR: 6.79, p=0.017) and undergo abdominoplasties compared to panniculectomies (OR: 4.43, p=0.039). There were no other significant differences in patient or operative characteristics between the cohorts. Compared to those with no history of infection, patients with prior histories of SARS-CoV-2 infection had increased odds of postoperative complications such as delayed wound healing (OR: 27.67, p<0.001). Subanalysis by procedure demonstrated that this increased odd of delayed wound healing was significant in patients undergoing abdominoplasty (OR: 19, p<0.001) but not for those undergoing panniculectomy.

Conclusion: Our findings suggest that prior SARS-CoV-2 infection is associated with significant increases in postoperative complications such as delayed wound healing, even after significant time has elapsed between the initial infection and time of surgery. Further investigation with larger cohort sizes is necessary to fully elucidate the connection between prior SARS-CoV-2 infection and surgical outcomes.

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Abdominal Plication & Postoperative Venous Thromboembolic Events Following Abdominal Body Contouring: A Propensity Score Matching Analysis

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Purpose: Venous thromboembolic events (VTE) such as deep venous thrombosis (DVT) and pulmonary embolism (PE) are rare but potentially devastating complications of abdominal body contouring procedures. With an incidence of around 1%, the VTE rate in these surgeries is significantly lower than that of other surgical specialties but remain a significant cause of morbidity and mortality.1, 2 Rectus abdominis plication, a commonly utilized method to reduce diastasis width, has been associated with increased intra-abdominal pressure.3-5 Though concerns that this increased intra-abdominal pressure may lead to increased DVTs and subsequent PEs exist, there is a lack of literature investigating associations between the two in abdominal contouring procedures and we aim to bridge this gap in knowledge.

Methods: A retrospective review was conducted for all patients who underwent abdominal body contouring procedures at Montefiore Medical Center between 2010 and 2020. Cases were defined as patients who experienced a postoperative venous thromboembolic event and were matched to controls in a 1:4 ratio using the propensity score matching technique. Patient factors of note included demographic data, operative details, ASA, Charlson comorbidity index, and Caprini scores. Postoperative complications were collected for all patients. Parametric, nonparametric, and multivariable regression modeling was utilized for analysis.

Results: A total of 1192 patients underwent abdominal contouring procedures, 19 (1.59%) experienced a postoperative venous thromboembolic event and were matched to 76 controls. The overall cohort was 92.6% female (n=88) with the average age, Charlson comorbidity index, BMI, and operative time being 44.99-year, 1.38 point, 30.25 units, and 284.69 minutes, respectively. Mean BMI differed significantly between cases and controls (32.1 vs. 29.8, $p=0.046$); and cases were more likely to have a prior history of cerebrovascular events (OR: 3.45, $p=0.026$). Additionally, patients with postoperative VTEs were more likely to have received intraoperative blood transfusions (OR: 13.88, $p=0.005$). Postoperatively, cases had significantly longer lengths of stay (6.21 vs. 1.21, $p=0.006$) and a much longer duration of chemophylaxis (6.05 vs. 1.46, $p=0.015$). Cases were significantly more likely to experience concurrent complications including infection, delayed wound healing, and umbilical necrosis ($p<0.001$, $p=0.044$, $p=0.044$ respectively). Plication was not associated with VTE outcomes.

Conclusion: This study demonstrates that abdominal plication does not increases the risk of VTEs after controlling for potentially predisposing factors via propensity score matching. However, in patients who do experience VTEs, further caution must be exercised as there is an increased likelihood of concurrent complications that may further complicate the postoperative course.

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Global Prevalence and Preferences of Quilting Suture Usage in Abdominoplasty

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Background: Since Baroudi and Ferrerira1 described the benefits of quilting sutures in reducing seroma rates in abdominoplasties, multiple studies and randomized clinical trials have further demonstrated significantly lower postoperative seroma rates.2,3 However, despite these potential benefits quilting sutures have not been universally adopted by plastic surgeons.2 Furthermore, quilting suture techniques and material preference vary widely.2 The aim of this study is to determine the prevalence of quilting suture use, reasons for reluctance to utilize them, and variety of quilting suture techniques used by plastic surgeons performing abdominoplasties around the world.

Methods: A 13 question survey was administered via email by ISAPS in November 2021 to 3842 plastic surgeons. Chi-squared and Fisher's Exact tests were conducted.

Results: We received 272 responses (7.08% return rate) from 62 countries. The majority, 58.46%, currently use quilting sutures while 41.54% do not. The 46.49% who were introduced to quilting sutures during training were significantly more likely to currently use them than the 53.51% who were not (p=0.041). Quilting suture usage was not significantly associated with years in practice (p=0.324) or number of abdominoplasties performed annually (p=0.905).

Of the respondents who utilize quilting sutures, most used interrupted sutures, 65.22%, 19.25% utilize running sutures, and 15.53% combine interrupted and running sutures. The majority, 74.05%, combine quilting sutures with drains, while 25.95% do not use drains. 43.59% use 10-20 interrupted sutures, 37.82% use less than 10, 4.49% use greater than 20, and 14.10% utilize

running sutures. Quilting suture technique significantly correlated with years in practice (p=0.036) and abdominoplasties performed yearly (p=0.032). The most commonly utilized quilting suture material was Vicryl, 57.59%, with PDS being the second most popular, 27.92%.

Of the respondents who do not currently use quilting sutures, a little more than half, 53.21%, previously tried them in practice but elected not to use them while 46.79% never tried them. Training exposure to quilting sutures significantly correlated with having tried them in practice (80.5% versus 35.8%; p<0.001) but years in practice (p=0.471) or number of abdominoplasties (p=0.087) performed yearly did not. The most common reason cited for not using quilting sutures was that the plastic surgeon's technique works well without them, 73.27%, which significantly correlated with years in practice (p=0.032). The second most cited reason was that their placement increases operative time, 34.65%.

Conclusion: Globally, the majority of plastic surgeons use quilting sutures in abdominoplasties combined with drains, albeit with varying suturing techniques and materials. Training exposure, rather than years in practice or number of abdominoplasties performed annually, appears to significantly impact utilizing or trying quilting sutures in practice.

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Non-Implant-Based Methods for Gluteal Augmentation: a Systematic Review on Best Techniques and Reported Outcomes

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Purpose: In 2018, the American Society of Plastic Surgeons estimated the death rate for gluteal fat transfers, also known as "Brazilian butt lifts": 1 in 3,000. This is the highest death rate for any cosmetic procedure, and these procedures are increasingly performed by non-board-certified surgeons. The largest consumers of these procedures are women and transgender people, necessitating the need for more transparent data and outcomes for these populations. We conducted a systematic review of non-implant-based methods for gluteal augmentation to summarize what is known in the literature.

Methods: We conducted a systematic review with goals of elucidating: (1) the published non-implant-based techniques for gluteal augmentation, (2) associated complications, and (3) providers performing these procedures (i.e., board certified plastic surgeons vs. others). Six databases were queried: PubMed, Embase, Cochrane, Web of Science, Scopus, and ClinicalTrials.gov. All English-speaking studies with original data on non-implant-based procedures for gluteal augmentation–such as silicone injections, autologous fat grafting, and other surgical procedures–were included. The patient population consists of non-massive weight loss patients undergoing aesthetic gluteal augmentation. Additional outcomes and data that were collected include provider certification, location of procedure, number of patients per study, and gender of patients.

Results: Of the 4188 articles gathered, 1691 duplicates were removed. 5 reviewers screened 2351 abstracts and titles, with disputes resolved by a more senior author. During full-text review, 298 studies were assessed, and 156 studies were included. The majority of the papers were case reports (59.0%) and autopsies/post-mortem analyses (3.8%), describing various complications associated with silicone, fat, and other biopolymer injections, including mortality, buttock plaques and nodules, mycobacterial infections, silicone embolism syndromes (SES), fat embolism syndrome (FES), and silicone pneumonitis. These reports comprised perspectives from non-plastic surgeons, including primary care providers, emergency room physicians, and medical examiners. A total of n=94 patients were identified across the studies involving autopsies and post-mortem exams, with most patients being women (98.0%), and the remaining patients being transgender (2.1%). Unlicensed medical providers were mentioned in 33% of the post-mortem studies. The remaining studies (37.2%), often from board-certified plastic surgeons, also described non-implant-based gluteal augmentation complications, but emphasized surgical techniques and outcomes. Techniques included fat grafting, non-fat injections, and autologous flaps.

Conclusions: This systematic review summarizes available published surgical techniques and outcomes for non-implant-based gluteal augmentation. Board certification in plastic and reconstructive surgery confers the safest outcomes. The most serious of these complications, such as mortality, life-threatening infection, and embolic events are not described as robustly in the plastic and reconstructive literature but are instead seen in non-plastic surgeon driven case reports and autopsies.

Fat Grafting vs. Breast Implants: Who is Happier? A Systematic Review & Meta-Analysis

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Purpose: Breast implants were first introduced in the 1960s and have long been used for augmentation and reconstructive breast surgery. More recently, fat grafting for breast augmentation has gained popularity due to the natural look and lack of implant-related complications. The aim of this study was to conduct a systematic review and meta-analysis comparing patient-related outcome measures between fat grafting and implant-based primary augmentation using the validated Breast-Q questionnaire.

Methods: A systematic review of the literature according to the PRISMA guidelines was conducted into PubMed®, Cochrane Library®, EMBASE®, MEDLINE®, Scopus ® databases. Papers were screened by two independent blinded reviewers. Quality was assessed using MINORS criteria.

Results: Fourteen studies were included in the meta-analysis representing a total of 81 fat grafting augmentations and 1535 implant augmentations. The average overall patient satisfaction mean post-operative scores were 13.0 points higher in the implant group based on meta-regression (95% CI: 2.4 to 23.5; p=0.016). There was no statistical difference in reported post-operative sexual well-being, psychosocial well-being, or physical well-being Breast-Q scores.'

Conclusion: Although implant-based augmentation resulted in higher post-operative overall satisfaction scores, fat grafting remains a highly desirable alternative for augmentation in the right patient. This meta-analysis strongly highlights that careful patient selection and evaluation of patient goals must be assessed when selecting the augmentation method.

Breast and Body Contouring Outcomes After SARS-CoV-2 Hospitalization

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Background: In the United States, over 4.4 million people infected with the novel coronavirus SARS-CoV-2 have required hospitalization. The long-lasting effects of SARS-CoV-2 infection are only beginning to be understood. Patients may be poor surgical candidates for several reasons. Protracted hospitalization may lead to deconditioning and malnutrition. SAR-CoV-2 infection has been shown to promote a thrombogenic state. We investigate breast and body contouring surgery outcomes among patients recently hospitalized for SARS-CoV-2 infection compared to a healthy cohort.

Methods: TriNetX was queried to create two cohorts for comparison. One with a history of admission for SARS-CoV-2 infection within the three months preceding a breast or body contouring procedure, the other with no history of infection. Breast and body contouring procedures were identified using Current Procedural Terminology (CPT) codes. Inpatient admission and SARS-CoV-2 infection were determined using the International Classification of Diseases Tenth Edition (ICD-10) and the inpatient visit designator in TriNetX. The two cohorts were propensity-matched with respect to demographics such as age and body mass index (BMI) and medical comorbidities associated with surgical outcomes, including hypertension and diabetes. Odds ratios with 95% confidence intervals were calculated for endpoints relating to specific surgical complications and healthcare utilization, including emergency room visits, readmission, and reoperation. All statistical analyses were performed within the TriNetX platform, and a P-value of 0.05 was used to determine statistical significance.

Results: Using 17 CPT codes for breast and body contouring procedures, we identified 104,843 surgeries within TriNetX. Two cohorts were generated, with 833 in the SARS-CoV-2 group and 83,514 in the control group. After propensity matching, two similar cohorts of 832 patients were created. When controlling for important risk factors such as age, BMI, tobacco use, and nutrition status, patients with a history of admission for SARS-CoV-2 were significantly more likely to experience a wound disruption (OR 3.4, 95% CI 1.8 – 6.5, $p < 0.0001$) or open wound (3.2, 2.1 – 5.0, $p < 0.0001$) in the 30 days following their breast or body contouring procedure. Rates of postoperative infection were not different between groups (1.4, 0.76 – 2.5, $p = 0.29$); however, the rate of reoperations for incision and drainage, and debridement procedures was higher in the SARS-CoV-2 group (1.7, 1.02 – 2.7, $p = 0.039$). The SARS-CoV-2 group did not experience a higher rate of emergency room visits, but they were readmitted at a significantly higher rate (3.7, 2.8 – 4.9, $p < 0.0001$).

Conclusion: Accounting for crucial predictors of surgical outcomes, patients with a preceding SARS-CoV-2 infection requiring inpatient admission as remote as three months before their breast or body contouring procedure were at a higher risk for wound healing complications and for readmissions. Given the elective nature of many of these procedures, it is possible patients may benefit from longer intervals between their SARS-CoV-2 infection and their operation. The point where postoperative risk begins to equilibrate in these populations has yet to be elucidated. More investigation into the protracted effects of SARS-CoV-2 infection as a predictor of surgical outcomes is required.

Patient Social Media Use and Acceptance of Cosmetic Procedures

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Background/Objectives: Social media platforms such as Snapchat and Instagram have been pivotal in promoting and perpetuating "selfie" culture. Medical professionals have reported a phenomenon of "Snapchat dysmorphia," whereby patients seeking cosmetic surgery bring in photos of filtered versions of themselves that they want to emulate in real life. Data supports that users of Snapchat and photo editing applications are more accepting of cosmetic surgery procedures.1 Given this growing trend, it is important for plastic and aesthetic surgeons to understand what facets of social media usage are specifically associated with greater acceptance of cosmetic procedures.

Methods: We performed a survey study of patients presenting to a Dermatology clinic at an urban hospital. The survey was offered in English and Spanish to patients >18 years old between October 2019 to June 2021. Survey questions included basic demographics and questions pertaining to social media usage and cosmetic procedures. Analyses were performed via chi-squared for between group assessments. Statistical significance was set at $p<0.05$.

Results: Seventy-five (43%) of the 175 total participants, were considered cosmetic patients, 140 (80%) were women, 52 (30%) identified as Hispanic White, and the mean age was 38. Factors significantly associated ($p<0.05$) with an increased desire to have a cosmetic procedure included: filtering selfies on Snapchat or Instagram before sharing; taking 11-20 selfies per day; using photo-editing applications such as FaceTune or Lightroom before sharing, following celebrities and influencers on social media; following plastic surgery, dermatology, or other accounts showing the results of cosmetic procedures on social media; and engaging with plastic surgery or dermatology accounts that showed the results of cosmetic procedures. Additionally, a significant association ($p<0.001$) was found between the desire to have a cosmetic procedure and respondents who followed celebrities, influencers, and people they did not personally know, and also engaging with plastic surgery, dermatology, or accounts that show the results of cosmetic procedures.

Conclusions: This study's findings show that taking an increased number of selfies per day and editing photos with filters or other photo-editing apps is significantly associated with an increased desire to have a cosmetic procedure performed. These findings are important for plastic surgeons to consider in assessing patients' expectations of cosmetic results and guiding discussions. Additionally, there is a positive association between individuals who follow celebrities, influencers, plastic surgery, and dermatology accounts and a desire to have cosmetic procedures. The proper use and leverage of social media is an important platform that plastic surgeons may consider in order to disseminate information about their practice and convert followers to potential patients. Therefore, more studies assessing the background, expectations,

influence, and impact of social media on clinical practice are imperative.

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The Impact of Platelet-Rich Plasma on Patient-Reported Quality of Life in Treatment of Hair Loss

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Purpose: This study aimed to assess the psychological impact of platelet-rich plasma (PRP) treatment for hair loss. While there are many studies reporting the efficacy and safety of PRP for androgenetic alopecia, there is a lack of sufficient research on quality-of-life improvement.

Methods: A prospective study of patients undergoing PRP injections to the scalp for hair loss was conducted. PRP injections were repeated monthly for the first 3 months, then quarterly for 1 year, and annually thereafter. HAIRDEX, a validated scale assessing quality of life (QoL) for patients with alopecia, was administered before PRP and at each visit. Scores were interpolated on a 0-100 scale: 0 representing highest QoL, 100 lowest, and compared using paired t-tests.

Results: Ninety-two patients receiving PRP treatments were analyzed. Seventy-four patients completed pre PRP treatment questionnaires, 50 completed post PRP treatment questionnaires, and 30 completed both. Mean age was 48.2±17.4 years and males accounted for 55%. Twenty-eight percent of male patients had Hamilton-Norwood stage II hair loss, 25% III, 19% V, 11% each I and IV, and 3% each VI and VII. Of female patients, 65% were Ludwig stage II, 30% stage III, and 4% stage I. Prior to PRP, 61% of patients had tried minoxidil, 16% finasteride, and 1% hair transplant, while 20% had not tried any other hair loss treatments. Ninety percent of these patients continued using these treatments concurrently with PRP. Patients had an average of 4±2 treatments; most (60%) had four or more, while 17% had three, 11% had two, and 12% had one.

Differences in pre-PRP QoL were observed between age groups. Younger patients (≤50 years sold) tend to have worse overall QoL (total score 20.4±1.4 versus 16.1±3.0, respectively; p=0.05) and significantly more severe functional detriments (score 29.2±0.0 versus 10.4±6.3 respectively; p=0.028) when compared to older patients (>50 years old). Hair loss tended to

affect QoL of men and women comparably (total score of 20.9±5.6 versus 17.3±5.8, respectively; p=0.446).

Total HAIRDEX scores revealed a significant improvement from a mean of 23.2±15.4 to 19.7±11.3 3-5 months after PRP (p<0.001). There was also a significant decrease in the symptom's domain scores from 10.0±12.0 to 9.6±10.8 (p<0.001) between 3-5 months. Within the functioning domain, scores decreased from 16.1±18.1 at baseline to 13.3±12.6 at 3-5 month follow up (p<0.001). Additionally, the emotions domain revealed a significant improvement from 37.7±24.1 to 32.2±18.9 3-5 months after PRP (p<0001).

For the stigmatization domain, the difference in scores from pre-PRP (21.2±16.8) was significant at both 3–5-month follow-up with an average score of 17.4±12.1 (p<0.001) and 18.9±13.9 at follow-up >6 months (p<0.001). This was also seen in the self-confidence domain, in which scores decreased from 24.8±17.7 to 20.9±15.5 between 3-5 months (p<0.001) and 19.5±18.6 >6 months post-PRP (p=0.008).

Conclusions: PRP treatment was associated with a statistically significant overall improvement in quality of life. Emotional well-being, symptoms, functioning, stigmatization, and self-confidence significantly improved following treatment. PRP should be considered as a safe and effective treatment option for hair loss and included as part of multimodal therapy.

Effectiveness of Pectoral Nerve Block in Breast Reduction: A Single Institution Experience

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Introduction: Pectoral nerve block (PECS) has been demonstrated to significantly decrease opioid consumption in breast cancer surgeries. However, there is little literature on its effectiveness among patients undergoing breast reduction. Given the difference in the nature of the surgeries and patient population, this study aims to explore the effectiveness of PECS block in patients undergoing breast reduction surgeries.

Methods: An Institutional Review Board (IRB) approved retrospective review evaluated patients who underwent breast reduction surgeries from January 2021 to January 2022. Patients were divided into two groups according to whether they received a PECS block or not. Demographics

and patient characteristics were described. Morphine milligram equivalents (MME) were used as an indirect measure to evaluate pain. Perioperative MME was defined as the sum of opioid medications a patient received intraoperatively and in the post-anesthesia care unit (PACU). Comparisons between groups were evaluated using either t-tests (continuous) or $\chi 2$ or Fisher's exact tests (categorical). Differences in MME between groups were evaluated using the Mann-Whitney U test. Multivariate linear regression was used to evaluate whether PECS block can decrease MME.

Results: A total of 199 patients who underwent breast reductions were included in the study. 104 patients (52.3%) underwent PECS block, and 95 (47.7%) patients did not undergo a PECS block. A lower BMI mean (31.75±5.24) was observed in patients who underwent PECS block compared to the no PECS block group (33.33±5.96, P=0.048). No statistical difference was found in surgery length and average surgical resection between groups. The Mann Whitney U test demonstrated a significantly higher total perioperative MME in the no PECS block group (mean: 86.56±27.26) versus the PECS block group (mean: 79.36±28.48, P=0.038). When further subdivided into total intraoperative only or PACU MME, there was no statistical difference. On the multivariate linear regression, the PECS block did not demonstrate to be an independent predictor of narcotic requirement (P=0.063).

Conclusions: Despite the reduction of perioperative MME in the PECS block group, PECS block does not seem to be an independent predictor of narcotic requirement in patients with breast reduction. Currently, studies are being done at our institution to further increase the sample size to power the evaluation of different factors that affect narcotic consumption in breast reduction surgeries.

Safety of Outpatient Plastic Surgery: A Comparative Analysis of Patient, Procedure, and Facility Characteristics Using the TOPS Registry with 286,826 Procedures

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Background: Outpatient plastic surgery at office-based surgery facilities (OBSF) and ambulatory surgery centers (ASC) has become increasingly prevalent over the past 30 years.1,2 Importantly, historical data are inconsistent regarding the safety outcomes of these venues, with advocates for both citing supporting studies.3,4 This investigation's purpose is to provide a more definitive comparative evaluation of outcomes and safety for outpatient surgery done in these

facilities.

Methods: The most common outpatient facial, breast and body procedures done by plastic surgeons without overnight stay were analyzed. Procedures were identified using the Tracking Operations and Outcomes for Plastic Surgeons (TOPS) Database between 2008 and 2016. Procedural outcomes were analyzed for OBSFs and ASCs individually and compared. Patient and perioperative information was also analyzed using regression analysis to identify risk factors for complications.

Results: A total of 286,826 procedures were evaluated, of which 43.8% were performed at ASCs and 56.2% at OBSFs. Most patients were healthy, middle-aged women categorized as ASA class I or II. The incidence of adverse events was 5.7%, and most commonly included antibiotic requirement (1.4%), dehiscence (1.3%), or seroma requiring drainage (1.1%). Overall, there was no significant difference in adverse events between ASCs or OBSFs. When comparing perioperative characteristics among surgical facilities, significantly more cosmetic procedures were performed at OBSFs than ASCs (95.7% vs. 87.6%, $p<0.0001$). General anesthesia was the most common type of anesthesia used, with a higher percentage of utilization among ASC-performed procedures (95.5% vs. 73.3%, $p<0.0001$). An anesthesiologist most commonly provided anesthetic care overall (45.4%) and was the primary anesthetic provider more frequently at ASCs than OBSFs (65.2% vs. 30.1%, $p<0.0001$). However, a certified nurse anesthetist (CRNA) with surgeon oversight was the most frequent provider type among OBSF procedures (46.0%). Age, ASA class, BMI, diabetes, smoking history, general anesthesia, CRNA involvement, operative duration, and non-cosmetic indications were positively associated with adverse events in both facility types.

Conclusions: This study extensively analyzes common outpatient plastic surgery procedures performed in a representative population. With appropriate patient selection, procedures are safely performed by board-certified plastic surgeons in ambulatory surgery centers and office-based settings, as evidenced by the low incidence of complications in both environments. Importantly, increasing ASA classification, BMI, and procedure duration were associated with increased odds of complications, and plastic surgeons should consider these patient attributes and operative factors during surgical planning.

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Safety And Efficacy Of Using A Central Pedicle For Mastopexy And Mastopexy With Implant Augmentation

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The central pedicle is rarely used when performing a mastopexy or mastopexy with implant augmentation. The central pedicle is not commonly performed due to the amount of dissection, the resultant inverted T scar, concerns over perfusion and perceived limitations of the technique. Implant breast augmentation at the same time as a mastopexy using a central pedicle technique has been criticized for theoretical harm to the vascular pedicle. This study was conducted to review one surgeon's experience using a unique central pedicle technique for both mastopexy and mastopexy with implant augmentation.

A retrospective review of all patients who had a mastopexy or mastopexy and augmentation using a unique standardized central pedicle technique from 2015 to 2020 were reviewed. Patient demographics, comorbidities, operative details, postoperative adverse events were reviewed.

205 patients were identified for inclusion (410 breasts). 121 had a bilateral central pedicle mastopexy. 84 patients had bilateral central pedicle mastopexy and implant augmentations performed simultaneously. Mean follow-up was 154 days. The average age was 46.8. Average body mass index was 25.4kg/m². Average size implant was 300 cc, maximum 350 cc and 200 cc was the smallest. Average nipple elevation was 4 cm ranging from 1 to 11 cm. There were 2 (1%) hematomas, one in each group. 8 (4%) patients had significant sensory loss in the nipples. 6 (3%) patients had small separations (<5mm) at the T junction that healed uneventfully. 5 (2.5%) patients had hypertrophic scarring which was treated with steroid injections and laser only. 1(0.5%) patient had an infection in the mastopexy only group. 1(0.5%) patient with large weight loss had bottoming out of her implants but was satisfied and refused surgery. 1(0.5%) patient in the mastopexy group had additional breast augmentation with implants at a later time. 1(0.5%) patient had her implants exchanged for larger implants. No revision surgery to lift or correct asymmetry was requested by any patients. There was no nipple or skin necrosis.

This central pedicle technique uses standardized markings which result in reproducible results. The central pedicle technique allows for the maximal reduction of skin over the breast at the same time as maximal elevation of breast tissue. The technique excels in correcting asymmetry. Breast augmentation with a central pedicle technique can be safely performed below the pectoralis muscle. The safety and efficacy of using this technique is demonstrated.

Risk Stratification of 90-day surgical site outcomes by BMI for Breast Reduction Mammoplasty and Mastopexy: A Retrospective Analysis of 35,652 Patients

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Introduction: Mastopexy and reduction mammoplasty are surgeries that can be beneficial at relieving back pain, intertrigo rashes, or providing patients with renewed self-confidence. Additionally, patients with reduction mammoplasty are reported as having the highest patient satisfaction outcomes.1 With yearly procedures growing 70% since 2000, mastopexy has overtaken breast implants.2 Along with the increase in popularity have come patients with all ranges of Body Mass Index (BMI). With the average American BMI of 26.5, many patients are at risk for unfavorable outcomes following surgery.3 This study utilizes a federated electronic medical record network for analysis of 90-day post-operative outcomes of breast reduction mammoplasty and mastopexy by increasing BMI.

Methods: We used TriNetX, providing statistics from 67 Health Care Organizations globally. The de-identified records of 49,352,702 females, age 18-99 were retrospectively screened. Patients were sorted into a breast reduction mammoplasty group(N=41,908). Patients from this group were further categorized into five BMI cohorts: Normal (N=3,245), Overweight (N=7,808), Class I (N=8,340), Class II (N=4,973), and Class III obesity (N=2,600). The Normal BMI cohort was then compared to each increasing BMI cohort. The BMI strata were analyzed for risk of surgical site occurrences within 90 days of surgery using common procedural terminology codes. Extensive propensity score matching for age, gender, race, neoplastic history, radiation, chemotherapy, and lifestyle hazards including smoking was conducted to eliminate confounders. This analysis was repeated once more for patients undergoing mastopexy(N= 14,891), with sub-categorization by BMI: Normal (N=2,996), Overweight (N=3,214), Class I (N=1,676), Class II (N=581), Class III (N=219) obesity.

Results: Reduction mammoplasty patients had a significant linear increase in risk and risk ratio for post-operative infection across increasing BMI cohorts (Risk Ratio(RR):1.562-3.640,95%Confidence Interval (CI):1.052-5.3111,$p<0.0257$). Similar linear increase was seen in dehiscence from BMI Class I and upwards (RR:2.976-4.211,95%CI:1.945 6.683, $p<0.0001$) (Figure 1). Additional significance was noted for death. For patients undergoing mastopexy, there was a significant increase in risk and risk ratio for post-operative infection, which plateau beyond Class II Obesity (RR:1.974-2.173,95%CI:1.334-4.404, $p<0.033$) (Figure 2). The risk of sepsis was found to be significant at Class II and III obesity (RR:1.745-4.739%, $p< 0.0015$). The risk of dehiscence was found to be significant for Overweight and Class I Obese individuals only (RR:1.095-2.632%, $p<0.043$).

Conclusion: Our analysis examines the risk of 90-day post-operative outcomes following reduction mammoplasty or mastopexy. For both procedures, individuals who are Class II obese and above may have post-operative complications beyond which surgery may not be beneficial.

Particularly, plastic surgeons must make pre-operative decisions based on patient BMI, weighing the risk of complications such as infection, dehiscence, sepsis, and death versus the benefits of operating. Limitations include this study's retrospective nature and reliance on medical coding accuracy; therefore, future prospective studies are warranted.

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Breast Reduction in Adolescents – Analyzing Risk Factors and Complications from a National Database

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Purpose: Macromastia is often a physically challenging and psychologically distressing condition for many adolescent patients, causing back, shoulder, and neck pain, in addition to unwanted attention, introversion, and development of eating disorders.1 Reduction mammoplasty has been shown to improve these physical and psychosocial problems and is often the best treatment in certain groups of patients, including adults.2 However, while risk factors for postoperative complications following adult reduction mammoplasty are well known, the risk factors for adolescent complications remain unclear. The purpose of this study was to investigate predictors of postoperative complications following adolescent reduction mammoplasty using a national database from 2012-2019. We hypothesize that there are both patient and case-based risk factors that can contribute to complications.

Methods: The 2012-2019 American College of Surgeons' National Surgical Quality Improvement Program Pediatric (ACS NSQIP-P) databases were queried to identify primary reduction mammoplasty encounters using Current Procedural Terminology (CPT) code 19318. Based on the World Health Organization Body Mass Index (BMI) classification, patients were stratified into BMI <30, 30-34.9, 35-39.9, and >40. Other patient and case characteristics, and comorbidities were assessed for association for short-term (30-day) wound disruption or surgical site complications. Single variable analysis and a multivariable regression analysis were performed to identify independent predictors for any complications.

Results: There were 1215 patients with an average age of 16.6 years who met inclusion criteria. Overall, the average BMI was 30.7 kg/m2, and 593 (48.8%) were nonobese while 622 (51.2%) were obese. The overall mean operative time was 183 minutes, and most patients (77.3%) were seen in an outpatient setting; the incidence of complications was 5.27%. The most frequent complications were superficial wound disruption/dehiscence and superficial surgical site infections. Following the multivariable analysis, independent predictors of complications included a BMI 35-39.9 (odds ratio [OR], 2.69; P=0.007), BMI >40 (OR, 4.51; P<0.001) and an American Society of Anesthesiologists (ASA) Classification >3 (OR, 2.57; P<0.012). Other risk factors which did not reach statistical significance yet are otherwise notable include a BMI 30-34.9 (OR, 1.46), and a history of asthma (OR, 1.16).

Conclusion: Our results demonstrate that an increased ASA physical status greater than 3 and Class II/III obesity were independent risk factors for short-term postoperative complications in adolescent reduction mammoplasty. The detrimental effect that obesity has in adolescent reduction mammoplasty mirrors its role as a risk factor in adult reduction mammoplasty as well. Being aware of these risk factors can assist in identifying and stratifying higher risk patients for appropriate counseling prior to surgery and closer postoperative monitoring. However, reduction mammoplasty should remain a viable surgery for obese patients as it can significantly improve their quality of life.

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Breast Abstracts

Risk Factors for Upper Extremity Dysfunction after Breast Cancer Treatment: A Single Institution Retrospective Review

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Introduction: Upper extremity dysfunction after breast cancer treatment can range from pain or stiffness to restrictive conditions such as adhesive capsulitis, which threatens patient quality of life. Patients with breast cancer treated with mastectomy are more likely to develop upper extremity dysfunction compared to those treated with breast-conserving therapy.1 Other risk factors associated with upper extremity dysfunction in mastectomy-treated patients have not

been determined. To this end, the authors aim to identify cancer characteristics and treatment modalities that may be risk factors for development of upper extremity dysfunction in patients treated with mastectomy.

Methods: The authors performed a retrospective chart review of patients at the University of Chicago who were treated with a unilateral or bilateral mastectomy from 2010-2020 and developed upper extremity dysfunction based on ICD-10 codes. Patients were analyzed by side of body (left or right). Any side that experienced upper extremity dysfunction was included for analysis. Patient demographics, cancer and treatment characteristics, and type of upper extremity dysfunction was extracted from the electronic medical record. Upper extremity dysfunction was divided into cohorts of pain, limited range of motion, decreased strength, adhesive capsulitis, musculoskeletal dysfunction, peripheral neuropathy, nerve compression, and other dysfunction. Patients may be included in more than one dysfunction cohort if multiple types of dysfunction were documented in their record. Variables of interest were evaluated for association with each cohort of upper extremity dysfunction by univariate analysis and those found to be significant were included in multivariate analysis. Analysis was corrected to account for non-independence of two sides of the same patient.

Results: 259 patients met criteria and were included in our study. 396 upper extremities were recorded as experiencing dysfunction and were analyzed. Mean age was 60 years (range=28-96) and mean BMI was 28.4 (SD=7.5). 41% of patients identified as white, while 49% identified as black and 10% identified as another race. 90% of patients identified as white or black, with a similar distribution between the two races. 54% of patients underwent some type of breast reconstruction (63 autologous, 114 implant-based). Following multivariate analysis, upper extremity pain was found to be associated with ipsilateral radiotherapy ($p<0.001$). Limited range of motion was found to be associated with ipsilateral invasive cancer ($p=0.01$), any ipsilateral mastectomy surgery ($p<0.001$), and ipsilateral radiotherapy ($p=0.03$). Musculoskeletal dysfunction was found to be associated with ipsilateral modified radical mastectomy ($p<0.04$) and preoperative chemotherapy ($p<0.03$). No cancer or treatment characteristics were found to be associated with decreased strength or adhesive capsulitis. Furthermore, breast reconstruction – implant or autologous tissue-based – was not associated with any type of upper extremity dysfunction.

Conclusion: Breast cancer characteristics and treatment modalities may predispose patients treated with mastectomy to developing types of upper extremity dysfunction. This data may be useful for identification of patients who may benefit from early physical therapy or rehabilitation.

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Expanding the Use of Closed-Incision Negative Pressure Wound Therapy system in Patients Undergoing Staged Implant-Based Reconstruction

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Purpose: Wound management following implant-based reconstruction (IBR) warrants further study. Closed-incision negative pressure wound therapy (ciNPT) enables reduction of edema, greater perfusion, infection management, prevention of flap necrosis, and wound approximation. This study aims to elucidate the application of ciNPT in IBR, particularly in patients with large skin flaps and poor perfusion.

Methods: A retrospective chart review of patients who underwent IBR (2017-2021) was performed. Two cohorts were created based on whether closed-incision negative pressure wound therapy with the Prevena™ ciNPT system was used following stage one. Demographic, perioperative, and post-operative complication information was collected and analyzed.

Results: The ciNPT cohort consisted of 136 breasts (77 patients) and the non-ciNPT cohort included 136 breasts (72 patients). The ciPT cohort had a significantly greater proportion of patients with a history of hypertension ($p = 0.033$), neoadjuvant chemotherapy ($p = 0.019$), and increased breast mass ($p = 0.007$). Following stage one, complication rates did not significantly differ between the two cohorts except for increased tissue expander (TE) removal in the ciNPT cohort ($p = 0.002$).

Conclusions: Complications following stage one of reconstruction are relatively comparable between the cohorts, with the use of the Prevena™ ciNPT system as the only factor differing in postoperative care. Patients were deemed appropriate for use of ciNPT based on ptosis and poor perfusion as determined using the SPY Elite Intraoperative Perfusion Assessment System. The use of Prevena™ ciNPT allowed for comparable complication rates to the non-ptotic, better-perfused comparison cohort suggesting its efficacy in minimizing otherwise expected complications.

Risks of Patients with Collagen Vascular Disease undergoing Autologous Breast Flap: An Analysis of 11,557 Adult Patients

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Background: Collagen vascular diseases (CVD) represent a group of immunologically mediated inflammatory disorders with varied affected organs. This group of disorders is characterized by the deposition of immunoglobulins in vascular basement membranes. Therefore, these patients may be at increased risk of flap failure. This risk is compounded by associated hypercoagulability in those with CVD.

Methods: Breast reconstruction patients were admitted and analyzed using the National Inpatient Sample database, 2005-2014. Demographics, clinical data, and outcomes were gathered. The relationships between complications, morbidity, mortality, and the predictors were assessed using a multivariable logistic regression model.

Results: 11,557 patients were analyzed. Of all patients, 11,420 (98.8%) did not have coagulant therapy diagnosis, and 11,428 (99.2%) were females. Patients with coagulant therapy had significantly higher rates of comorbidities such as: rheumatoid arthritis, coagulopathy and diabetes. Furthermore, they demonstrated a higher rate of emergency admission and a higher Modified Frailty Index Score. Collagen vascular disease was not significantly correlated to gender or mortality and did not raise the odds of reoperation or having complications.

Conclusion: Collagen vascular disease was an independent predictor of modified frailty index score for patients undergoing autologous breast reconstruction. These patients also manifested higher rates of comorbidities and emergency admission regardless of the type of autologous reconstruction. Complication rate, reoperation rate and mortality were not correlated to the presence of a CVD. Stratifying patients utilizing these risk factors and the modified frailty index score may be helpful in predicting in-hospital complications for patients with collagen vascular disease undergoing autologous breast reconstruction.

Second versus Third Stage Fat Grafting: A Systematic Review of Patient Satisfaction

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Background: Fat grafting is a common revisionary procedure undertaken in patients undergoing expander/implant-based breast reconstruction. Traditionally, this procedure is pursued as a tertiary stage of reconstruction, to correct contour deformities after placement of the final

implant. However, fat grafting performed during second stage expander to implant exchange can enable patients to reach their desired aesthetic appearance in a shorter time frame. Furthermore, patients do not have to undergo an additional procedure and suffer associated risks/complications. Our group has previously demonstrated that fat grafting during second stage expander to implant exchange did not increase complication rates compared to delayed fat grafting [1]. As a corollary, this study compared quality of life outcomes between second versus third stage fat grafting, to help determine whether second stage fat grafting is not only clinically comparable to delayed fat grafting, but also comparable in terms of patient satisfaction.

Methods: A review of English literature using the PubMed/MEDLINE databases between 2010-2022 was performed to identify articles investigating quality of life in patients undergoing second or third stage autologous fat grafting after implant-based breast reconstruction. Studies using the BREAST-Q tool to investigate patient satisfaction were included, to allow for comparison of outcomes across investigations. BREAST-Q scores were pooled across studies using random-effects modeling and the DerSimonian-Laird method. Post-hoc sensitivity analyses were completed using the Hartung-Knapp-Sidik-Jonkman method. The Haldane-Anscombe correction was used for outcomes with low counts. All study analyses adhered to PRISMA guidelines.

Results: In total, 6 studies met inclusion criteria, encompassing 126 breasts and 89 patients. Pooled random-effects modeling demonstrated that overall BREAST-Q scores between patients undergoing second stage fat grafting versus those who underwent delayed fat grafting were not significantly different ($p=0.19$). Additionally, systematic review of the available data demonstrated that those who underwent second stage fat grafting were not significantly more likely to require further revisions compared to those who underwent third stage fat grafting ($p=0.48$).

Conclusions: Fat grafting has been increasingly recognized as a powerful tool to improve contour after implant-based breast reconstruction. Fat grafting can be undertaken during the second stage expander-implant exchange, or as a delayed procedure. This study provides support for second stage fat grafting. Based on our review of the literature, second stage fat grafting has comparable quality of life outcomes to delayed fat grafting, without increasing the need for further revisionary procedures. Thus, in conjunction with our prior work, this study demonstrates that second stage fat grafting can provide equivalent clinical and quality of life outcomes amongst patients undergoing implant-based breast reconstruction, with less morbidity in fewer procedures.

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May The Fat Stay With You: A Systematic Review Of Active Closed Wash And Filtration In Autologous Fat Grafting

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Background: Autologous fat grafting is a well-established means of improving aesthetic outcomes following breast surgery. The American Society of Plastic Surgeons (ASPS) reports that 62% of plastic surgeons employ fat grafting in breast reconstruction.1 However, the specific means of fat processing remain a matter of physician preference. For example, among ASPS members, 45% use decantation, 34% utilize a filtration system, and 11% use gauze.1 While use of closed filtration systems continues to grow in popularity, the optimal fat grafting technique remains elusive, and outcomes are varied. This systematic review of available controlled studies utilizing active closed wash and filtration systems (ACWF) sought to examine differences in fat processing efficiency, aesthetic outcomes, and revision rates.

Methods: A comprehensive literature search was performed in the following databases from inception-February 2022 following the PRISMA statement in Ovid MEDLINE, Ovid Embase, and The Cochrane Library (Wiley). Studies that (1) utilized ACWF, (2) had >10 patients in their cohorts, (3) employed a comparison or control group, and (4) reported follow-up data from at least one clinic visit were selected for inclusion. Studies were screened by 2 independent reviewers for eligibility against predefined inclusion/exclusion criteria using Covidence systematic review software with discrepancies resolved by consensus. For included articles, bibliographies and citing references were screened from Scopus (Elsevier).

Results: The search identified 3,476 citations, with six studies included. Three studies demonstrated a significantly higher volume of graftable fat harvested with ACWF than with centrifugation, Telfa rolling, or decantation, while three studies reported comparable rates between groups. Additionally, three studies reported a significantly lower mean grafting time with the ACWF than with centrifugation, Puregraft, or Telfa rolling. With respect to adverse events, three studies reported significantly lower incidences of nodule or cyst formation ACWF versus centrifugation or Telfa rolling, while three studies reported comparable rates. Two studies reported a significantly lower incidence of palpable fat necrosis with use of ACWF versus decantation or Telfa rolling, with this trend upheld in two studies with respect to centrifugation or Puregraft, while two studies reported similar rates. Three studies reported significantly lower reintervention rates with ACWF with respect to centrifugation, Telfa rolling, and decantation, while one study reported comparable rates and two studies failed to report reintervention rates.

Conclusions: This study is the first to systematically evaluate postoperative success following fat grafting with ACWF in a heterogeneous population of patients undergoing breast reconstruction and suggests that active filtration yields higher volumes of viable fat in less time than other common techniques, with decreased rates of adverse outcomes and subsequent

revisions. This work supports active filtration as a safe and highly efficacious means of fat processing, the widespread use of which may translate to reduced operative times. Given the relative paucity and largely retrospective nature of these data, further large-scale, randomized, controlled trials are needed to confirm the above trends.

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The Association Between Breast Cancer Related Lymphedema Risk Factors and Area Deprivation Index

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Background: Lymphedema is a common sequela of breast cancer and its treatment that affects up to 34% of patients, with debilitating effects on quality of life and significant medical costs. However, there has been little investigation into disparities in breast cancer-related lymphedema. Some have shown that African American race is associated with increased incidence of lymphedema, while others conclude that other factors such as decreased access to lower-risk procedures drive this difference. Therefore, there is a need for robust analyses of access to care to address the diagnosis and treatment gap known to exist in lymphedema.

The area deprivation index (ADI) is a measure of overall socioeconomic disadvantage of a neighborhood that accounts for factors such as income, education level, unemployment rate, and access to transportation. In this study, we aim to use this objective measure of disadvantage to determine how access to care may affect risk factors for and diagnosis of breast cancer-related lymphedema.

Methods: Records were extracted from a prospectively maintained cancer registry encompassing five sites within our academic multi-hospital system. Patients' nine-digit ZIP codes at time of diagnosis were cross-referenced with the ADI database to determine their deprivation level as a national percentile, with higher percentiles suggesting more socioeconomic disadvantage. Patients were then binned into quartiles of disadvantage, and the most- and least-deprived quartiles were examined. Demographic data, comorbidities, cancer characteristics and treatment

modalities were compared to determine lymphedema risk.

Results: A total of 1,427 breast cancer patients were included in this study, of which 882 (62%) resided in ZIP codes within the most socioeconomically disadvantaged ADI quartile and 545 (35%) in the least disadvantaged quartile. At baseline, patients in the most disadvantaged group were more often Black and insured via Medicaid. In addition, they had a higher incidence of hypertension, diabetes, obesity, and regional spread of disease. Their care also involved more extensive surgeries (7.8% modified radical mastectomy vs 2.4%, $p<0.001$), nodal excision, and chemotherapy. Utilizing the Risk Assessment Tool Evaluating Lymphedema Risk (RATE-L), the most disadvantaged cohort were more often at extreme risk for developing lymphedema (6.0% vs. 2.9%, $p=0.03$). However, the incidence of lymphedema based on ICD-10 diagnosis codes alone did not differ (1.1% vs 1.1%, $p>0.9$). A stratified analysis within ADI groups demonstrates that risk factors for and diagnosis rates of lymphedema do not differ between white and Black patients: in the most-deprived quartile, 6.3% of Black patients and 5.9% of white patients were at extreme risk of lymphedema ($p=0.44$), while 1.7% of Black patients and 0.8% of white patients had an ICD-10 diagnosis of lymphedema ($p=0.21$).

Conclusions: The incidence of lymphedema diagnosis codes in our cohort was low overall and did not differ based on socioeconomic disadvantage, despite risk factors for lymphedema being significantly more common in the most disadvantaged cohort. Our results suggest that lymphedema is extremely under-coded in comparison to literature reports, and in particular, diagnosis rates do not reflect the increased level of risk experienced by patients who are more socioeconomically deprived.

Perceptions of Ideal Breast and Areola Dimensions: A Survey of 2,259 Respondents

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Purpose: In almost all forms of breast reconstruction, mastopexy, and breast reduction, surgeons make decisions about the resulting areola size, and these decisions play an important role in the overall aesthetic result. The goal for female patients with breast cancer who undergo breast reconstruction is to help reestablish their self-confidence. Despite the importance of these decisions, no formal study has yet been conducted that has aimed to identify what the general population views to be the ideal areola size. The objective of this study was to broadly survey the global population in order to better understand the global population's perceptions of ideal areola dimensions.

Methods: A survey was created using Survey Monkey and was completed by participants via the Amazon Mechanical Turk digital platform over a 24-hour period. Participants' demographics (sex, age group, country, state if located in the United States, and race/ethnicity) were collected. Each participant was then provided with 9 composite diagrams of a female torso (every combination of 3 different breast widths and 3 different waist widths). For each composite diagram, each participant was asked to select the most aesthetically pleasing option from 6 available options, with only areola size (ranging from areola diameter: breast width 1:12 to 6:12) being the differing variable.

Results: There were a total of 2,259 participants, with 1,283 male (56.8%) and 976 female (43.2%). The majority of participants were between 25 and 34 years of age (1,012; 44.8%), from the United States (1,669; 73.9%), identified as White (1,430; 63.3%), and had a bachelor's degree (1,426; 63.1%). Among all 9 breast and waist combinations, the participants were most likely to pick the 2:12 (32.89%) areola to breast dimensions ($P < 0.0001$), which shows a tendency to pick a smaller areola size, which looks most aesthetically pleasing irrespective of breast and waist size. The second-most commonly selected was a 3:12 (30.61%) with a medium sized areola ($P < 0.0001$). The gender variation showed that males had more of a tendency to choose the extreme dimensions of 1:12 or 6:12 in comparison to females ($P < 0.0001$). It was found that across almost all races/ethnic backgrounds, the 2:12 dimensions were significantly the most popular except among American Indian/Alaskan Native and Middle Eastern where the 3:12 was the most preferred choice ($P < 0.0001$). Also, across the top 6 countries (United States, India, Brazil, Italy, Canada, United Kingdom), the United States, India and Italy had 2:12 as the most popular choice and Brazil, Canada, and the United Kingdom had 3:12 as the most preferred ($P < 0.0001$).

Conclusions: While there is no substitute for knowing what each individual patient's preferences are for areola size, this study provides the first generalized objective assessment of the public's impression of the ideal areola proportions, and can guide surgical decision making in many reconstructive procedures.

Evaluating the Research Productivity of Plastic Surgery Subspecialists through the Novel National Institutes of Health-Supported Relative Citation Ratio

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Purpose: Research productivity, a crucial component of academic advancement, has previously been linked to fellowship acquisition among plastic surgeons. (1) The relative citation ratio (RCR) represents a novel metric that addresses limitations of the h-index, including the latter's inability to effectively compare researchers in different fields. (2) As plastic surgeons continue to pursue fellowships, an accurate assessment of subspecialists' scholarly output is essential in establishing their academic roles. Here, we determined and compared trends in RCR scores among plastic surgery fellowship subspecialties.

Methods: We obtained listings of physicians from all Accreditation Council for Graduate Medical Education (ACGME)-accredited plastic surgery residency programs. Subsequently, institutional websites and other online resources (e.g., Doximity, Castle Connolly, etc.,) were examined to extract data regarding fellowship training. Fellowships were categorized as craniofacial, hand, microsurgery, aesthetic, pediatric, burn, research, and other. For each physician, mean RCR (m-RCR) and weighted RCR (w-RCR) were obtained from the iCite database. Analyses between groups were performed using the Mann-Whitney U test (for two groups) and Kruskal-Wallis test (for three or more groups), with a predetermined level of significance set at $p < 0.05$.

Results: Most academic plastic surgeons had pursued at least one fellowship (75.81% [n = 724]). Compared to their non-fellowship-trained counterparts, both m-RCR (1.24 vs. 1.05; $p < 0.01$) and w-RCR (20.35 vs. 10.89; $p < 0.001$) were significantly greater. However, acquisition of further fellowships was not associated with greater m-RCR ($p = 0.82$) or w-RCR ($p = 0.19$). Significant differences in m-RCR ($p < 0.01$) and w-RCR ($p < 0.001$) were noted between subspecialties. Physicians with a microsurgery fellowship had the highest median m-RCR (1.37 [IQR, 0.92 – 1.84]) and physicians with a research fellowship had the highest median w-RCR (48.71 [IQR, 12.74 – 90.33]). Physicians with an aesthetic fellowship had the lowest median m-RCR (1.11 [IQR, 0.67 – 1.67]) and median w-RCR (11.48 [IQR, 3.69 – 42.65]).

Conclusions: As plastic surgeons continue to pursue fellowships, discrepancies between subspecialties will likely expand. Therefore, use of the RCR, a field-normalized metric that considers differences intrinsic to distinct disciplines, offers inherent benefits over the h-index. Our findings indicate fellowship acquisition was associated with greater m-RCR and w-RCR scores, suggesting the importance of such training for increasing research impact and productivity. Differences in scholarly output between specialties may reflect differing rates of interest in research or variable representation among senior academic positions. Regardless, these results should encourage institutions to focus mentoring and resources on fellowships associated with decreased academic productivity, especially as it has a role in decisions of faculty hiring and advancement, and allocation of grant funding.

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Changes in Marital Status After Receiving the Diagnosis of Breast Versus Prostate Cancer: A Population-Based Study

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Purpose: We aim to compare dynamic marital status and assess influencing factors related to this change among participants who receive the two most common gender specific cancer diagnoses- breast and prostate cancer. Factors that lead to the dissolution of marital status can be highlighted and addressed with the goal of implementing psychosocial support mechanisms for couples navigating cancer treatments and improving patients' quality of life.

Methods and Materials: Anonymous Qualtrics surveys were administered to Workers via the Amazon Mturk Platform. Workers aged 18-99 who answered "yes" to 3 screening questions were recruited to take the follow-up survey of interest. The follow-up survey included 3 safeguarding questions to reduce the number of incorrect responses. Demographics including gender identity of self and spouse, race, and marital status were gathered. If Workers indicated a change in marital status occurred following cancer diagnosis, the questionnaire continued with information regarding cancer staging, treatment modalities, qualitative assessments of shifting spousal dynamics, and mental health assessments via General Anxiety Disorder (GAD) and Personal Health Questionnaire Depression Scale (PHQ-8) questionnaires.

Results: 249 out of 1032 indicated a diagnosis of breast or prostate cancer on the screening survey and 217 out of 227 completed the follow up survey of interest. 91.4% of women were married at time of diagnosis compared to 84.0% of men (P=0.1854; alpha= 0.05). Women with breast cancer experienced a greater rate of dissolution in marital status following cancer diagnosis compared to men with prostate cancer (83.8% vs 55.8%, respectively. P=0.0465; alpha= 0.05). The qualitative factors listed to influence this change after diagnosis were more open talks (mean=3.92, SD=0.91), becoming foreign to each other (mean=3.70, SD=0.98), and more conflict in relationship (mean=3.85, SD=0.89). PHQ-8 score indicated major depression for both groups (women mean score=14.0, SD=4.0; prostate mean score=13.7, SD=2.5). GAD-7 indicated moderate anxiety for both groups (women mean score=12.3, SD=3.8; prostate mean score=11.9, SD=2.6).

Conclusions: There is a discrepancy in the rate of marital dissolution following a diagnosis of

cancer in these gender specific common cancers with more women experiencing divorce after breast cancer diagnosis than their male counterparts. Factors that contributed to this change were reported as above. More proactive focus should be given to these social determinants to optimize mental health support of couples navigating breast cancer treatments and implement rigorous psychosocial screening measures to promptly intervene before irreparable strain and ultimate marital dissolution occurs. This study supports routine, active and pre-emptive involvement of a mental health provider during the active and recovery phase of breast cancer treatment.

A Comprehensive Update on Pneumothorax as a Complication of Breast Augmentation

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Background: The frequency of pneumothorax as a complication of breast surgery was unknown until a survey of 363 members of the California Society of Plastic Surgeons (CSPS) was completed in 2002. The response rate of the survey was 50%, and the incidence of pneumothorax seemed to be more common than generally appreciated with 1 out 3 surgeons experiencing at least one pneumothorax in their career. A review of the literature determined that no study has attempted to examine the actual incidence of pneumothorax in breast augmentation surgery since the above study was presented at the Annual ASAPS Meeting in 2003 and was published in the journal of Plastic, Reconstructive Surgery (PRS). (Plast. Reconstr, Surg. 2005; 116:1122).

Objectives: This research repeats and expands on the original study by:
1. Continuing to increase awareness of this complication
2. Attempting to determine an incidence of pneumothorax complicating breast augmentation
3. Identifying risk factors for increased incidence
4. Proposing options for risk reduction and management of this complication

Methods: An online survey was sent to approximately 300 current members of the CSPS in 2020, inquiring about their experience with this complication. In addition, a retrospective chart review was completed, in which breast augmentation procedures performed over a 6-year period by 4 plastic surgeons at the UC Davis Health System were screened for pneumothorax. A search of the PubMed/MEDLINE database for articles including the terms "breast augmentation" and "pneumothorax" generated 21 articles between 2005 and 2021. This number was decreased by initial screening by abstract, and by excluding those not written in English, those without access to the full text and duplicates, leaving 11 articles to examine. Finally, data on breast augmentations complicated by pneumothoraces was obtained from the American Association of Accreditation of Ambulatory Surgical Facilities (AAAASF) for the year 2019.

Results: The updated CSPS survey response rate was 18.3%. Out the 55 members responding, 25 reported a total of 43 pneumothoraces in their career. No local or hypodermic needle injections were used in 37.5% of these patients. In the retrospective chart review of 40 breast augmentation procedures performed at UC Davis Health during the study period, no pneumothoraxes were identified. In the literature search, a total of 11 patients who underwent breast augmentation between 2005 and 2021 experienced a pneumothorax as a complication. Seven cases (64%) were bilateral pneumothoraces. Three cases (27%) were tension pneumothoraces. AAAASF found an incidence of 0.000031% (3 out of 97,495) for pneumothorax as a complication of breast augmentation for 2019.

Conclusion: Pneumothorax continues to be a complication of breast augmentation. The literature review indicated that possible risk factors for pneumothorax include low BMI, heavy smoking, preexistence of pulmonary bullae or blebs, and anatomical variations, and the probable causes of this complication are pulmonary barotrauma, local and general anesthesia, iatrogenic pleural trauma and spontaneous rupture of bullae or blebs. This study's findings confirm the conclusions of the 2005 research article that a pneumothorax as a complication of breast augmentation is rare but continues to occur and is not necessarily due to negligence. This study also found that 2 in 5 members of the CSPS had at least one patient who experienced a pneumothorax during breast augmentation in their career, compared to 1 in 3 from the previous survey. As in the first survey published in 2005, it is still recommended to include pneumothorax as a risk factor of breast augmentation in the informed consent and that a chest tube set be available to the surgeon if breast augmentation is performed in a free-standing ambulatory surgery center. Future studies should aim to replicate results in aesthetic centers that perform high volume breast augmentation procedures.

A Cross-sectional Analysis of Preoperative Breast Augmentation Patient Questions: Developing a Predictive Model of Age Groups

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Introduction: According to the ASPS National Clearinghouse of Plastic Surgery Procedural Statistics, breast augmentation continues to be a top cosmetic procedure since 2006 – accounting for over 190,000 procedures annually.[1] The success of the operation, similar to other aesthetic surgeries, depends on a variety of factors including both the surgical technique employed as well as a patient's preoperative subjective expectations of function and appearance. The aim of this

study is to characterize and analyze preoperative questions from patients seeking breast augmentation in order to develop an age-dependent predictive model for adequately addressing patient concerns and developing targeted educational material.

Methods: A cross sectional analysis was performed on 3,059 pre-operative patient questions between January 2018 to December 2021 utilizing an online social media platform, RealSelf. Data was collected utilizing a programmed web crawler software. Questions were manually reviewed by three authors and stratified into categories based on common topics found in the data. Concerns included: breast size, breast shape, breast ptosis, breast symmetry, nipple areola complex size, nipple areola complex shape, nipple areola complex location, scar, technique, implant choice, comorbidities, and perioperative care. Questions regarding other procedures or from patients who had already undergone surgery were excluded. Patients were assigned age groups as follows: [younger than 17], [18 to 24 years old], [25 to 34 years old], [35 to 44 years old], [45 to 54 years old], [55 to 64 years old] and [older than 65]. A Cochran Armitage trend test was used to trend concerns throughout different age groups.

Results: A total of 3,059 pre-operative patient questions were identified and included in this study. Breast size was the most common concern of [younger than 17yo (24.6%)], and [older than 65yo (40.2%)]. Technique was the most common concern of [18-24yo (22.5%)], and [35-44yo (30.2%)]. Breast shape was the most common concern of [25-34yo (29.5%], [45-54yo (19.2%)] and [55-64yo (31.3%)]. There was a statistically significant difference between age groups, with $p=0.016$.

The most common concern in all age groups was technique of choice at 20.1%, and the least common concern was perioperative care at 0.5%.

Conclusion: In this study, we demonstrate a difference in patient preoperative focus across various age ranges. We present a statistical model based on age which can accurately predict preoperative patient concern allowing for an overall more informed clinical experience.

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A Long-Term Analysis of Outcomes in Immediate Prepectoral Breast Reconstruction: An Updated Single-Surgeon Experience with 422 Consecutive Patients

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Purpose: Given the recent momentum towards prepectoral breast reconstruction, long term outcomes in this patient population remain unknown. The authors present an updated analysis of the senior author's prepectoral breast reconstruction cohort, consisting of 422 consecutive women over a period of 5 years.

Methods: A retrospective chart review of all patients having undergone prepectoral breast reconstruction with the senior author from June 2016 to June 2021 was carried out. Data regarding demographics, oncologic characteristics, procedural details, surgical and aesthetic complications were collected. Bivariate analysis was performed using t tests and Chi square/Fisher's exact test to compare complication rates between subgroups.

Results: A total of 422 patients (670 breasts) were included, among which the mean age was 48.7 +/- 11.5 years and the mean BMI was 25.6 kg/m2. The majority (563 breasts, 84.0%) underwent nipple-sparing mastectomies and Wise Pattern type of incision was used in 196 breasts (29.3%). Overall, 230 breasts (34.3%) underwent radiotherapy and Acellular Dermal Matrices (ADM) were used in 325 breasts (48.5%). Patients were followed for an average of 15.3 +/- 12.9 months. There were no significant differences in overall complication rates for (1) ADM use versus non–ADM use, (2) Wise- pattern versus other incision, or (3) radiotherapy ($p > 0.05$). Specifically, patients with and without ADM did not differ in terms of capsular contracture or rippling rates ($p > 0.05$).

Conclusions: Prepectoral breast reconstruction may be unaffected by ADM use, incision type and radiotherapy in the long term. Foregoing ADM may also be non-contributory to capsular contracture or visible rippling.

A Multidimensional Investigation of BIA-ALCL and Systemic ALCL Proliferation Rates in Response to Silicone Implant Shells and the Breast Microenvironment

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Introduction: Breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) is a T-cell-derived lymphoma associated with device-based breast reconstruction, with a reported incidence between 1/1,000 and 1/30,000. Despite the increasing awareness and high correlation

with textured implants, the etiopathogenesis of BIA-ALCL remains largely unknown. Prior investigations of the pathogenesis involve either in vivo models or unidimensional in vitro models. We have developed a tissue-engineered biomimetic platform composed of patient-derived breast tissue derivatives that mimics the three-dimensional breast microenvironment to interrogate the role of the silicone shell in altering cell proliferation behaviors.

Methods: AbbVie Biocell textured and smooth breast implant shells were shaped to line 96-well plates. Patient-derived breast tissue from mammaplasty procedures was digested into adipocytes, stromal vascular fraction, and epithelial duct organoids. These components were embedded in 0.3% type I collagen along with BIA-ALCL cell line IL89 and systemic ALCL cell line SUPM2 (200,000 cells/mL) and plated with and without implant shell lining. Other experimental groups included IL89, TLBR2 (BIA-ALCL), and SUPM2 cultured within either a type I collagen ECM, low serum feeding media, or full serum feeding media with or without implant shell lining. Low serum feeding media (0.5% BSA) was applied to all groups to limit the effect of growth factors on cell proliferation and full serum feeding media (20% FBS) serves as an additional control. Confocal imaging was performed over ten days. Cell proliferation was quantified using ImageJ and MetaMorph software.

Results: IL89 cultured in low serum media proliferated moderately when exposed to smooth implant shells, at a greater rate than was seen with textured implants and no implants ($p<0.05$). However, IL89 embedded in 3D-collagen had limited or decreased proliferation regardless of well lining. Notably, IL89 cultured within the biomimetic platform and a textured implant shell resulted in a significant increase in cell number (21.5%) when compared to those exposed to no implant shell (3.7%) ($p<0.05$). SUPM2 in low serum media exhibited a consistent increase in proliferation without an implant shell and an initial increase followed by a plateau in implant shell groups ($p>0.05$). In collagen only, SUPM2 with all different implant shell linings stabilized or moderately proliferated with significant increases in textured and smooth groups when compared to no implant. In the biomimetic platform, SUPM2 had a higher rate of proliferation when compared to collagen only, which was not significant between groups. TLBR2 exposed to low serum media appeared to have a higher rate of cell proliferation in groups exposed to no implant ($p>0.05$). In full serum media, all cell lines demonstrated increased proliferation over time with no significant difference between groups.

Conclusion: When cultured in a 3D breast biomimetic platform, BIA-ALCL cells proliferate within a simulated breast microenvironment even without the addition of growth factors, while limited or decreased proliferation is seen when cultured in the same ECM without such cellular components. We have shown a difference in the cell proliferation trends that occur when different ALCL lines are cultured in 2-dimensions (media only) versus 3-dimensions (collagen embedded), emphasizing the physiologic relevance of our 3-dimensional model.

A Nationwide Analysis Evaluating the Safety of using Acellular Dermal Matrix with Tissue Expander-Based Breast Reconstruction

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Background: In March 2021, the United States Food and Drug Administration (FDA) safety communication cautioned against the use of acellular dermal matrix (ADM) products in breast reconstruction and reiterated that the FDA does not approve ADM use in breast surgery (1). However, despite its off-label use, ADM is becoming increasingly popular (2, 3). Considering the new FDA safety communication and ADM's consistent utilization, we sought to evaluate a nationally representative large group of patients through the American College of Surgeons National Surgical Quality Improvement Program to understand the trends of ADM use in tissue expander placement for breast reconstruction from 2012 to 2019. Our aims were to 1) demonstrate how the use of ADM has changed over time and to 2) identify the differences in complications when ADM was and was not used for tissue expander-based breast reconstruction.

Methods: Women who underwent ADM and non-ADM assisted tissue expander (TE)-based breast reconstruction were identified using the National Surgical Quality Improvement Program database (2012-2019). Trends of ADM use over time, and 30-day outcomes of surgical site infection (SSI), dehiscence, and unplanned reoperation were assessed.

Results: Of the 49,049 TE-based breast reconstructive cases, 42.4% were ADM assisted and 57.6% non-ADM assisted. From 2012 to 2019, the use of ADM increased from 26.1% to 55.6% (RR=1.10; $p<0.01$). Higher rates of SSI (3.9% vs. 3.4%; $p=0.003$) and reoperation (7.4% vs. 6.0%; $p<0.001$) were seen in the ADM cohort. There was no significant difference seen in dehiscence rates (0.7% vs. 0.7%; $p=0.73$). The most common reoperation within 30-days for the ADM group (17.6%) was the removal of TE without insertion of implant (CPT 11971). ADM-assisted breast reconstruction was associated with an increased relative risk of SSI by 10% (RR=1.10, CI 1.01–1.21; $p=0.03$) and reoperation by 15% (RR=1.15, CI 1.08–1.23; $p<0.001$).

Conclusions: ADM-assisted breast reconstruction more than doubled from 2012 to 2019. Though there are statistically higher complication rates of SSI (0.5%) and reoperation (1.4%) with ADM use in TE-based breast reconstruction, it is unlikely to be of clinical significance.

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A Noninferiority Exam of Loupes-Only Microsurgery

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Background: The use of microscopes for free flaps and microsurgery is the standard practice across many academic programs and in private practice across the United States. However, loupes are a safe and effective alternative that is more widespread, especially in community hospitals and in low and middle-income countries.1 Despite this trend, there is a dearth of literature on the efficacy of loupes for advanced microsurgical procedures. Our study aim is thus to evaluate the literature to determine noninferiority of loupes for free flap procedures, as aggregate data will help surgeons make evidence-based decisions and improve patient outcomes.

Methods: The authors evaluated 463 abstracts for inclusion in this study. A standard search strategy using PubMed, Embase, Cochrane, and Web of Science databases was used. Papers were initially included if they described efficacy of loupes alone or loupes against the current standard treatment option, microscopes. Exclusion criteria included animal studies, specialties outside of plastic surgery (e.g., dentistry), or unrelated, duplicated, unavailable full texts. There were no restrictions on date, country of origin, or patient population for this study. After independent title and abstract screening by four individuals, 40 were selected for full-text reading. Data were then extracted and analyzed for quality before performing statistical analyses.

Results: Of the 40 articles selected, 78% (thirty-one articles) described a discrete advantage in loupes for microsurgical procedures in resource-limited environments as compared to operative microscopes. Additionally, 95% (thirty-eight articles) described free flap procedures performed with loupes to have similar or improved clinical outcomes when compared with microscopes. One article stated the microscopes were superior to loops in experimental studies evaluating accuracy in spacing of sutures placed.

Conclusion: The results of this analysis suggest what has been subjectively discussed for a long time in microsurgery-the use of loupes in place of operative microscopes is safe and effective. While the lack of discrete criteria for when one technique may be preferred over another, numerous studies pointing to the noninferiority of loupes in free flap procedures suggests a global reevaluation of the use of microscopes in this setting given their significant costs and increased operative times. Of note, the ergonomic considerations of both options should also be considered as this may play an important role in establishing preference for one method over another when clinical outcomes do not differ.

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A Recent National Analysis of Breast Reconstruction Outcomes in Patients with Underlying Autoimmune Connective Tissue Diseases

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Background: Previous studies in patients with autoimmune connective tissue disorders (CTDs) who underwent breast reconstruction between 2008-2014 demonstrated higher rates of wound dehiscence, bleeding, seroma, and infection compared to non-CTD patients. Given new immunosuppressive therapies and improved surgical techniques, we aim to characterize postoperative complication rates in patients with underlying CTDs using a larger and more recent national sample size.

Methods: Using Optum's de-identified Clinformatics® Data Mart Database, adult female patients from 2003-2021 were queried. Patients who underwent autologous and implant-based reconstruction, and patients with autoimmune CTDs were identified. Schapiro-Wilk, Chi-Squared, Mann-Whitney-Wilcoxon, and multivariable regression tests were used for statistical analysis.

Results: Of 33,477 patients meeting criteria (mean age 53.1 ± 11.6 years), 5,261 (15.7%) had a CTD diagnosis. On average, those with a CTD diagnosis were less likely to undergo autologous breast reconstruction (OR 0.864; $p = 0.007$) and were more likely to experience one or more

complications (OR 1.127; p = 0.019). Rates of vascular complications (p = 0.002), reconstruction deformities (p = 0.002), and revisions (p = 0.002) were significantly higher among those with a CTD diagnosis. Vascular complications included phlebitis, thrombophlebitis, thrombosis, and embolism. Length of stay was longer among patients with a CTD diagnosis (p = 0.009).

Conclusion: Vascular complications remain a concern in patients with underlying CTDs and the increased possibility of post-operative complications following reconstruction should be included in preoperative discussions in this population. However, wound dehiscence and postoperative infections are not as prevalent as previously reported. These findings suggest that optimization of thromboembolism prophylaxis should be emphasized.

A Systematic Review of BREAST-Q Outcomes following Reduction Mammaplasty

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Goals: Reduction mammaplasty is one of the most frequently performed plastic surgeries worldwide.1 Numerous validated patient-related outcome measures have been utilized to evaluate satisfaction following reduction mammaplasty; however, comparison of outcomes is challenging due to heterogeneity across surveys. The validated BREAST-Q Questionnaire has become increasingly utilized, offering valuable evidence-based data that helps guide standard of care. To date, no systematic reviews or meta analyses of reduction mammaplasty BREAST-Q outcomes have been performed. Our study aims to evaluate the influence of patient characteristics and surgical factors on BREAST-Q scores for patients undergoing reduction mammaplasty.

Methods: A review of the literature was conducted on PubMed® utilizing the following search terms: (("breast q") OR ("breast-q")) AND ("Mammaplasty"[Mesh] OR mammoplast* OR mammaplast* OR (breast n3 reduc*)). Studies reporting pre-operative and/or post-operative BREAST-Q scores following reduction mammaplasty were included. Studies on breast reconstruction, augmentation, oncoplastic reduction, or breast cancer patients were excluded.

Mean differences for pre-operative and post-operative scoring were calculated. Univariate analysis was conducted to compare mean BMI, mean age, mean resected weight, complication rate, pedicle used (superomedial vs. inferior), and incision type (Wise pattern vs. vertical incision) against pre- and post-operative BREAST-Q scores. Linear regression and Spearman's rank correlation coefficients (SRCC) with corresponding p-values were calculated for each of these variables with respect to BREAST-Q scores.

Results: Literature search identified 378 unique articles, of which 14 met our inclusion criteria, yielding 4,337 patients with an average survey response rate of 69.2%.

On average, "Satisfaction with Breasts" increased 52.1 ± 0.9 points ($p<.0001$), "Psychosocial Well-Being" increased 43.0 ± 1.0 points ($p<.0001$), "Sexual Well-Being" improved 38.2 ± 1.2 points ($p<.0001$), and "Physical Well-Being" improved 27.9 ± 0.8 points ($p<.0001$).

Positive correlations were identified between mean age and pre-operative sexual well-being (SRCC +0.61, $p<.05$), BMI and post-operative satisfaction with breasts (SRCC +0.53, $p<.05$), and resected weight and post-operative satisfaction with breasts (SRCC +0.61, $p<.05$). Negative correlations were identified between BMI and pre-operative physical well-being (SRCC -0.78, $p<.01$), superomedial pedicle usage and post-operative physical well-being (SRCC -0.67, $p<.05$), Wise pattern incisions and post-operative sexual well-being (SRCC -0.66, $p<.05$) and physical well-being (SRCC -0.70, $p<.05$), and vertical incisions and post-operative satisfaction with the nipple-areolar complex (SRCC -0.78, $p<.05$). No significant correlations were noted with complication rates and inferior pedicle use. Most notably, none of the analyzed characteristics had a statistically significant correlation with the average difference between pre-operative and post-operative BREAST-Q scores.

Conclusion: Breast reduction surgery consistently and significantly improves patient outcomes according to the BREAST-Q. Although either pre-operative or post-operative scores may be individually influenced by BMI, resected weight, pedicle used, or incision type, these variables demonstrated no statistically significant effect on the average change of these scores. Taken together, the data suggests that breast reductions provide substantial improvement in patient-reported satisfaction regardless of any patient-specific or surgical factors.

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Alternatives to the Gold Standard: The Profunda Artery Perforator and Lumbar Artery Perforator Flaps Compared to the Deep Inferior Epigastric Perforator Flap for Breast Reconstruction a Systematic Review

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Purpose: Breast reconstruction with the deep inferior epigastric perforator (DIEP) flap is the current gold-standard autologous option. The profunda artery perforator (PAP) and lumbar artery perforator (LAP) flaps have been described as alternatives for patients who are not candidates for a DIEP flap. The aim of this review was to compare the survival and complication rates of PAP and LAP to DIEP flaps to determine the LAP or PAP flaps are suitable alternatives for breast reconstruction.

Methods: A literature search was conducted using PubMed, MEDLINE, EMBASE, BIOSIS, Web of Science, and Cochrane databases. Papers were screened by title and abstract, and three independent blinded reviewers reviewed full texts. Quality was assessed using MINORS criteria.

Results: Sixty-three studies were included, for a total of 745 PAP, 62 Stacked PAP, 187 LAP and 23748 DIEP flap breast reconstructions. The PAP (98.3%) had a comparable success rate to DIEP (98.4%), and the Stacked PAP (88.7%) and LAP (92.5%) success rate were significantly lower (p<0.0001). The PAP and LAP groups had a significantly lower fat necrosis incidence than the DIEP group (p<0.01 and p=0.02). However, the revision rate for the LAP group was significantly higher than the DIEP group (p<0.0001). The PAP group also had a significantly higher rate of donor site wound dehiscence (p<0.0001).

Conclusion: In conclusion, PAP stacked PAP, and DIEP flaps demonstrated similar overall survival. LAP flap had a high
survival rate but lower than DIEP. This review highlights that PAP flaps are a safe alternative for autologous breast reconstruction and may be a preferred choice to LAP.

Ambulatory Setting Total Autologous Breast Reconstruction as an Alternative to Implants

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Introduction: Autologous breast reconstruction traditionally requires transfers of large amounts of tissue, frequently involving muscle and necessitating hospitalization. The use of chest wall perforator flaps combined with fat grafting as sole reconstructive modalities, performed on outpatient basis, has not been well documented.

Methods: A retrospective analysis was conducted of all consecutive total breast reconstructive procedures utilizing lateral chest wall perforator flaps and/or fat grafting performed between October 2015 and October 2021. Demographic, intraoperative, and post-operative data were

collected and statistically analyzed. Indication for surgery included absence of breasts, implant failure/loss, capsular contracture, desired autologous reconstruction, lumpectomy, and massive weight loss.

Results: Twenty-three patients aged 59±9 years underwent 43 breast reconstructions (87% bilateral) using lateral chest wall perforator flap (LICAP, area 126±67cm2) with concurrent or subsequent fat grafting (199±103ml). All but 3 patients (87%) did not require hospitalization with 1 patient admitted for cardiac observation for 32 hours and 2 other undergoing contralateral latissimus dorsi flaps.

The most common complication, fat necrosis (19/43 breasts, 44.2%), required drainage in 3 breasts while the remining necrosis resolved with time. Patients who experienced fat necrosis had a significantly higher BMI (p=0.04) and higher average volume of fat grafting (248 vs 154; p=0.003). Additional breast-specific complications included infection (n=8; 18.6%) and flap necrosis (n=2; 8.7%).

Conclusion: Ambulatory setting LICAP flap combined with fat grafting is a safe option for total breast reconstruction. Fat necrosis was the most common complication and could likely be reduced with lower amounts of transferred fat, particularly in higher BMI patients.

An Aesthetic Comparison of Extended Pedicle Technique Vs. Free Nipple Graft Reduction Mammoplasty For Patients With Gigantomastia

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Introduction: Reduction mammoplasty is an increasingly popular procedure for symptomatic macromastia.1 The operation helps patients improve physical and mental quality of life.2 Patients with nipple-to-notch distances greater than 40 cm, or who had greater than 1500 g removed from a single breast during reduction mammoplasty, have been defined as having gigantomastia. Reduction mammoplasty for these patients can involve different techniques, such as free nipple graft (FNG) or extended pedicled (EP) techniques. The purpose of this study was to compare aesthetic outcomes of these two surgical techniques.

Methods: A multi-institutional, retrospective review was conducted examining patients with gigantomastia who underwent reduction mammoplasty at two institutions between from 2017 – 2020. Patients at institution 1 were only operated on via the EP technique. Patients at institution 2 were operated on via FNG. Patient baseline characteristics, pre-operative BREAST-Q, post-operative BREAST-Q, and clinical outcomes were collected. Patients were matched 1:1 across the two groups. Their pre-operative and post-operative photos were compiled into a survey instrument assessing breast aesthetics. The survey was administered to individuals associated with one of the institutions at varying academic stations: attending plastic surgeon, microsurgery fellow, resident plastic surgeon, advanced practice provider, medical student, and non-medical individual.

Results: A total of 52 patients met inclusion criteria across both institutions (21 FNG, 31 EP). Patients who had FNG had higher rates of postoperative cellulitis ($p < 0.05$), but there were no differences in SSI, hematoma, seroma, dehiscence, delayed healing, keloid, NAC necrosis, fat necrosis, pain, hypersensitivity, or numbness. Pre-operative BREAST-Q scores showed no differences between the two groups at baseline. Post-operative BREAST-Q revealed EP patients had increased satisfaction with their nipples vs. FNG ($p = 0.001$). Twenty-eight patients were matched 1:1 for the aesthetic survey. The survey was completed by 22 individuals: 4 attending plastic surgeons, 2 microsurgery fellows, 4 resident plastic surgeons, 4 medical students, 4 advanced practice providers, and 4 non-medical individuals. The EP technique showed significantly better aesthetic outcomes in all domains ($p < 0.001$). Further, this preference held true regardless of institution or academic station ($p < 0.01$).

Conclusion: The results of this multi-institutional, matched, retrospective study show the extended pedicled technique for reduction mammoplasty provides superior aesthetic outcomes for reduction mammoplasty, compared to the free nipple graft technique. Further, patients with the extended pedicled technique had greater satisfaction with their nipples.

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An Assessment of Patient-Reported Outcomes Related to Appearance Following Chest Feminization Surgery

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Purpose: About 0.6% of U.S. adults and 1.8% of youths identify as transgender and gender diverse (TGD).[1] Up to 70% of transwomen seek breast augmentation as part of their gender affirming care.[2] No study to date has investigated TGD patient's perception related to appearance following chest feminization surgery using a validated questionnaire. The aim of this study was to report TGD patient-reported appearance outcomes following chest feminization surgery.

Methods: TGD patients were surveyed preoperatively and postoperatively at 3 time points utilizing the Post-Affirming Surgery Form and Function Individual Reporting Measure (AFFIRM), a validated patient-reported outcome questionnaire.[1] Patients were surveyed about their appearance and answered questions using a 5-point Likert Scale (1-Strongly Disagree, 2-Disagree, 3-Neither Agree nor Disagree, 4-Agree, 5-Strongly Agree). Data was analyzed in IBM SPSS Statistics using the Wilcoxon Signed Rank Test and results were considered significant if $p<0.05$. The latest postoperative responses were used as the postoperative measurements for each patient. Descriptive statistics were reported as percentages, medians, and interquartile ranges (Median, IQR).

Results: There were 44 unique respondents with 34 preoperative responses, 23 postoperative responses, and 13 respondents with paired preoperative and postoperative data. Of those respondents, 93% (4, 3-5) of TGD patients felt their chest had a feminine appearance following chest feminization surgery compared to 23% (2, 1-3) of patients prior to surgery ($p=0.018$). Preoperatively, only 9% of patients reported they could dress the way they would like to do due to the appearance of their chest (4, 3.75-5), which increased to 92.3% of patients postoperatively (2, 1-3, $p=0.001$). Moreover, only 18% of patients felt comfortable allowing sexual partners to look at their chest prior to surgery (2, 1-3) compared to 92.3% (4, 3-5) after surgery ($p=0.002$). Prior to surgery, 21% of TGD patients were comfortable in public because of their chest (3.5, 3-4.25), but following chest feminization surgery, this increased to 61% of patients (2, 1-4, $p=0.012$).

Conclusion: The patients included in this study reported significant improvements in their quality of life related to their chest and their comfortability with their chest following chest feminization surgery. This is the first study demonstrating that TGD patients report a significant positive change in perceptions related to appearance following chest feminization surgery utilizing a validated tool designed for TGD patients. Moreover, The AFFIRM questionnaire puts forward a metric that clinicians can use to assess patient satisfaction that is not centered on nor made for the cisgender population.

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An Evaluation of Early Complications after Prepectoral Breast Reconstruction With and Without Acellular Dermal Matrix

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Purpose: Prepectoral breast reconstruction has become popularized with the concurrent use of acellular dermal matrix (ADM). In March 2021, the FDA published a safety communication recommending that surgeons inform patients that the FDA has not approved or cleared any ADM for use in implant-based breast reconstruction. Little is known about the differences in complication rates between prepectoral reconstructions performed with and without ADM. We sought to compare three-month postoperative complication rates and explantation rates for tissue-expander based prepectoral breast reconstruction with and without the use of ADM.

Methods: A single institution retrospective chart review was performed to identify consecutive patients undergoing prepectoral tissue-expander based breast reconstruction from August 2020 to November 2021. Our institution stopped utilizing ADM for prepectoral reconstruction in May 2021. Chi-squared tests were used to compare demographic categorical variables and multiple variable regression models were used to compare three-month postoperative outcomes between the ADM and no-ADM groups.

Results: We enrolled 120 patients. Sixty patients (105 breasts) were included in the no-ADM cohort and 60 patients (86 breasts) were included in the ADM cohort. Demographics, preoperative risk factors, and radiotherapy rates were similar between the two groups. When comparing prepectoral breast reconstruction with and without ADM we found no significant differences ($p>0.05$) with regard to the incidence of hematoma, seroma, wound dehiscence,

infection, mastectomy skin flap necrosis, unplanned return to the OR, or explanation after controlling for age, BMI, history of diabetes, neoadjuvant chemotherapy, and adjuvant radiotherapy. Explantation and infection were both independently associated with BMI (HR 1.095, p=0.004 and HR 1.066, p=0.029 respectively).

Conclusion: Our study demonstrates that prepectoral breast reconstruction can be safely performed without ADM. Our results reveal no significant differences in postoperative complications, unplanned return to the OR, and explantation between ADM and no-ADM cohorts. Further study is necessary to evaluate long-term outcomes and a randomized controlled trial is needed to further assess the safety of prepectoral breast reconstruction without ADM.

Analysis of Indications and Outcomes of 104 Total En-block Capsulectomies

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Background: Breast augmentation remains the most common procedure in the world, with 1,795,551 performed in 2019 according to ISAPS (1). An estimated 10 million women have implants globally (2). Recently there has been a steep increase in patients undergoing implant removal (3). Patient request for total capsulectomy has become more frequent and is possibly driven by public awareness and concerns of breast implant illness (BII).

Purpose: of this study was to analyze indications and outcomes of total capsulectomies.

Methods: Retrospective chart review of patients who underwent explantation and total en-block capsulectomy between May 2019 and January 2022 was performed. Indications for initial implant placement (reconstructive or cosmetic), indications for explantation, surgery type, complications, aesthetic results, and patient satisfaction were recorded.
Total capsulectomy was performed using electrocautery en-block with the implant. In subpectoral implants, the entire capsule was removed off the rib cage and chest wall. Closed suction drains were used routinely. All capsules were sent for histological assessment. Aesthetic results were assessed on clinical photographs.

Results: A total of 104 total capsulectomies were performed in 55 patients from May 2019 to January 2022. Mean patient age was 49 years (range 25-75). Six patients had unilateral surgery. In 14 (25%) patients implants were initially placed for breast reconstruction. The commonest indication for explantation and capsulectomy was BII in 24 (44%) patients, followed by implant leak in 12 (22%) patients, discomfort, or pain in 11 (20%) patients, aesthetic concerns in 4 patients, capsular contracture in 2 patients and implant folding in 1 patient. Majority of the patients (55%) had a Wise pattern mastopexy at the time of explantation and capsulectomy, 15 (30%) patients had implant exchange and 10 (17%) breast reconstruction patients converted to total autologous reconstruction. 86% of removed implants were textured. 65% of implants were in a subpectoral position. There were 2 (3.5%) complications: one inframammary fold

malposition which required surgical correction and one hypertrophic scar which resolved with conservative management. There were no cases of pneumothorax or exposure, or penetration of the pleura caused by posterior capsulectomy in submuscular implants. Commonest findings on histology were silicone extravasation and foreign body response in 23 (40%) patients and mechanical irritation in 10 (17%) patients. No cases of anaplastic large cell lymphoma (ALCL) were recorded. Aesthetic results were good in 86% of patients. Patient satisfaction was 93%. Of the patients who requested implant removal for BII 87% reported improvement in symptoms.

Conclusion: Total capsulectomy is rapidly becoming a popular patient request, mostly due to concerns about BII and ALCL. Total en-block capsulectomy of subpectoral implants is safe and can be performed routinely without increasing surgical morbidity. To achieve aesthetically pleasing results, explantation and capsulectomy should be combined with either mastopexy or implant exchange.

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ANTHROPOMETRIC BREAST MEASUREMENTS: ANALYSIS OF THE AVERAGE BREAST IN THE MEXICAN FEMALE POPULATION

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Introduction: The elements and perception of beauty vary between populations around the world. To obtain better results, surgical techniques should be planned based on anthropometric characteristics of the race, location, and body mass index (BMI).

Objectives: To determine which are the standard measurements and anatomical proportions of the breast in a healthy Mexican women population.

Materials and Methods: Female Mexican volunteers between 20 and 60 years of age, without

any history of breast illness or breast surgery were studied. Demographic information and standard breast anthropometric measurements were collected manually by one of the authors. For the statistical analysis a Student-T test was performed, and the Pearson correlation coefficient was obtained using the latest version of SPSS software.

Results: 78 volunteers were included in the analysis. Mean height, weight and BMI were 1.6m, 68.9Kg, and 26.6 Kg/m2 respectively. The mean anthropometric values found were: SSN:N (22cm), BV (372.6cc), UBPL (11cm), LBPL (7.7cm), ML: N (10.2cm), NAC-T (4.1cm), NAC-H (4.1cm), BB (13.4cm), UPP:LPP ratio (58.9:41.1). A statistically significant difference between Right and left breast was not found. The UPP:LPP ratio in our population is far different from what is considered internationally aesthetic (45:55). A positive correlation was found between weight/BMI and SSN:N, LBPL, BB, ML:N and LBPL. Also between age and SSN:N, LBPL, BV and BB.

Conclusion: This study sets the Anthropometric grounds in Mexican population for an objective individual patient analysis and comparison with the female population of this and other nations.

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Assessment of Long-Term Pigmentation Changes in the Nipple Areolar Complex Following the use of Free Nipple Grafts

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Introduction: Patients with profound macromastia or large nipple-to-inframammary fold distances are at elevated risk for nipple necrosis with pedicle-bearing breast reduction techniques. In these patients, the use of free nipple grafts (FNG) during breast reduction can decrease nipple areolar complex (NAC) hypoperfusion and subsequent loss. One drawback of this approach is possible hypopigmentation of the NAC. This study seeks to quantify short-term and long-term pigmentation changes in the NAC following reduction mammoplasty with FNG. We hypothesize that patients undergoing breast reduction with FNG who develop initial hypopigmentation will undergo partial re-pigmentation over time.

Methods: This study is a retrospective review of patients who underwent reduction mammoplasty with FNG for symptomatic macromastia or oncoplastic reconstruction from 2000-2020 at our institution. Patients were included if they had pre-operative, early (<3 months), and late post-operative (>6 months) images available for analysis. Images were analyzed for changes in pigmentation using NIH Image J software.

Results: Of the 151 patients identified, 39 patients (78 breasts) had complete images (symptomatic macromastia n=36; oncologic n=3). In our cohort, mean patient age was 45 years. 61.5% of patients were Caucasian (n=24) and 38.5% Black (n=15). Mean resection mass was 1,637 g (SD 850 g). Photographic follow-up time for early post-operative images was 0.2 yrs (0.02-0.54 yrs) and for late post-operative images 1.0 yrs (0.51-3.16 yrs).
All patients had some degree of NAC hypopigmentation on early imaging with 28.1% (SD 20.1%) of the NAC surface area exhibiting hypopigmentation. On late imaging, the majority of patients (63/78 breasts (80.8%)) had re-pigmentation noted with only 8.1% (SD 7.3%) of the NAC area remaining hypopigmented. This represents a 71% resolution of hypopigmentation between these time points ($p<0.001$). 5/78 breasts (6.4%) showed progression of hypopigmentation, with 33.1% of the NAC showing hypopigmentation at the late post-operative time point. 10/78 breasts (12.8%) had no change between early and late images. When performing a subset analysis by patient race, we found that Caucasian patients had significantly greater area of NAC hypopigmentation on early post-operative imaging (Caucasian, mean area 33.6% (SD 21.0%) vs Black, 19.2% (SD 15.2%) $p<0.001$). However, resolution of hypopigmentation was similar between both (Caucasian, mean pigmentation resolution 68.8% (SD 23.7%) vs Black, 76.8% (SD 12.8%) $p>0.01$).) Mean resection weight was not associated with differences in hypopigmentation or trends in re-pigmentation.

Conclusion: While partial hypopigmentation of the NAC is nearly universal following FNG, the majority of patients experience late re-pigmentation with low residual hypopigmentation at 1 year. This result suggests that long term profound hypopigmentation may be less prevalent than commonly anticipated for patients undergoing reduction mammoplasty with FNG. These findings may be useful for counseling FNG patients with early pigmentation changes in addition to guiding surgical decisions about breast reduction with FNG.

Association of DIEP Flap to Mastectomy Mass Ratio with Patient Satisfaction after Breast Reconstruction

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Purpose: Autologous breast reconstruction is associated with superior patient-reported outcomes compared to prosthetic techniques, but little is known about the relationship between autologous flap mass and patient satisfaction. Depending on available donor tissue, the autologous flap can overfill, underfill, or match desired breast shape. We hypothesized that a higher differential mass (ratio of flap mass to mastectomy mass) would be associated with greater patient satisfaction with deep inferior epigastric perforator (DIEP) flap reconstruction.

Methods: In this retrospective study, patients who underwent autologous breast reconstruction between 2015 and 2020 with a DIEP flap completed the BREAST-Q survey, a validated patient-reported outcome measure.1 Modules tested included satisfaction with breasts, sexual well-being, physical well-being of the chest and abdomen, and psychosocial well-being. Differential mass was calculated as the mastectomy mass subtracted from the autologous flap mass divided by the mastectomy mass and multiplied by 100. Multivariate linear regression models were used to examine the relationship between differential mass and patient satisfaction. Models controlled for BMI, age at surgery, reconstruction size preference, number of surgeries, previous surgery failure, and whether reconstruction was unilateral or bilateral.

Results: 45 patients (70 breasts) completed the BREAST-Q survey. Mean age at reconstruction was 52.2 years old and mean time to survey completion following surgery was 21.1 months. Most patients were White (75.6%) and most desired a smaller breast (59.4%) or the same size of breast (34.4%) after reconstruction. The mean differential mass was +26.3% (flap mass greater than mastectomy mass). Overall, patients reported a high degree of satisfaction with their breasts (65.0 ± 26.7), psychological well-being (75.5 ± 23.2), physical well-being of the chest (75.1 ± 23.6), physical well-being of the abdomen (65.5 ± 21.1), and sexual well-being (53.8 ± 26.9). Differential mass was positively associated with all satisfaction measures with results being significant for satisfaction with breasts and sexual well-being scores ($B = 0.288$, $p = 0.006$ and $B = 0.312$, $p = 0.012$, respectively).

Conclusion: In this study using the BREAST-Q survey, a higher ratio of autologous flap mass to mastectomy mass was associated with overall higher patient-reported satisfaction. A 1:1 flap to mastectomy mass ratio may not adequately reapproximate desired breast size or shape even when a smaller size of breast post-reconstruction is desired. Untethering of the breast skin from

the underlying parenchyma and division of Cooper ligaments during extirpative surgery could result in a need for a higher mass of flap tissue to fill the mastectomy pocket. Differences in density between breast and flap tissue may also contribute to these findings. Larger autologous flap mass may be associated with favorable long-term patient satisfaction, and future studies should investigate the relationship between differential mass and breast aesthetics.

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Association of Single Versus Dual-Agent Targeted Anti-HER-2 Therapy With Post-operative Complications: A Retrospective Matched Cohort Study

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Background: Trastuzumab, a targeted monoclonal antibody for HER-2, is the standard of care medical treatment for women with HER-2 positive breast cancer. Dual targeted monoclonal antibody treatment, with the addition of pertuzumab to trastuzumab, significantly improves progression-free survival and outcomes in both early and metastatic breast cancer. Recently, multiple reports have suggested increased wound healing complications associated with dual therapy. In this patient population, open wounds preclude initiation of adjuvant chemotherapy and radiation therapy, and thus can delay further oncologic treatment. In this context, we assessed the impact of dual neoadjuvant anti-HER-2 therapy with trastuzumab and pertuzumab compared to single agent trastuzumab on post-operative wound complications after breast reconstruction, and impact on timing until initiation of adjuvant chemotherapy.

Methods: We performed a retrospective matched cohort study of women with stage 1-3 HER-2 positive breast cancer who underwent mastectomy with reconstruction within 8 weeks of receiving neoadjuvant anti-HER-2 therapy at BWH/DFCI from 2014 to 2019. Eight weeks was chosen as this represents 3 half-lives for pertuzumab. We matched each patient treated with trastuzumab and pertuzumab (T+P) to patients treated with trastuzumab alone (T) using coarsened exact matching (CEM), a matching algorithm that can be utilized for small samples. Patients were matched for age, BMI, mastectomy weight, tobacco use history, immunosuppression, and type of mastectomy performed. Statistical analysis of the matched cohort assessing breast wound healing complications and delay of adjuvant cancer therapy was performed. Secondary outcomes of any complication, major complication and minor

complications were performed.

Results: Two hundred and twenty-four women were identified with HER-2 positive breast cancer of whom 94 were treated with trastuzuamb and 130 were treated with T+P. After CEM matching, 64 women treated with trastuzumab were matched to 55 women treated with T+P. Women treated with T+P (11%, n=6) were significantly more likely to have delayed breast wound healing than women treated with trastuzumab alone (2%, n=1, p=0.048). There was no significant difference in delay of adjuvant chemotherapy between groups (T 5%, n=3 vs. T+P 4%, n =2, p=1.00). Overall (T 27%, n=17 vs. T+P 47%, n=26, p=0.023), major (T 5%, n=3 vs. T+P 18%, n=10, p=0.036), and minor (T 22%, n=14 vs. T+P 42%, n=23, p=0.028) complications were significantly higher in the T+P group compared to trastuzumab alone.

Conclusion: Dual targeted anti-HER2 therapy significantly increases wound healing complications following mastectomy and reconstruction. Multidisciplinary discussion between treating services and the patient is necessary to balance increased operative complications with optimal cancer treatment.

Augmenting Breast Implant Market Pre-Clinical Research: Fabrication of Novel, Low-Cost, Customizable Fabrication of Miniature Smooth and Textured Breast Implants for Preclinical In Vivo Studies

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Background: The association of textured implants with breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) has led to a voluntary recall of textured breast implants. The textured surface of anatomically shaped implants is critical for implant position stability. The lack of a textured implant alternative since this recall demonstrates the need for preclinical studies on breast implant technology and the pathogenesis of ALCL. While these studies have traditionally been undertaken by commercial breast manufacturers due to the complexities of implant manufacturing, we demonstrate that miniature scale breast implants constructed of polydimethylsiloxane (PDMS) can be fabricated in a laboratory setting with similar surface topography on scanning electron microscopy (SEM).

Methods: Two-piece positive molds for a dome-shaped implant measuring 2 cm by 1 cm were constructed in Fusion360 and printed in Polysmooth filament using a Prusa i3 MK2S+ 3D

printer. Smooth molds were sprayed with 200-proof ethanol five times with 20-minute drying intervals in a fume hood and a one-hour drying period in an anoxic chamber. Textured molds were painted with a 2.2:1 ratio of fine sugar to XTC-3D by weight and dried in a fume hood for two hours. PDMS was mixed in a 20:1 silicone to curing agent ratio, mixed vigorously, and degassed for one hour. Red and blue PDMS were created by mixing 3 drops of food coloring with 1 mL of PDMS and centrifuging each type of PDMS at 5000 RPM for 1 minute. A 1 mL slip was used to fill each mold with PDMS, red and blue PDMS were injected into the implant to mark opposite ends of the implant, and each implant was cured at 37C for 24 hours. Implants were removed from the positive mold, cut, and sputter coated with 5 nm of platinum using a Leica EM Sputter Coater. The Electron Optics Instruments Cube II SEM was used to take SEM images at 100X, 200X, and 500X. Allergan Bio-CELL and smooth implant shells were used as controls for imaging.

Results: Implants retained the original dome shape of the 3D-printed molds. Qualitative assessment of SEM images at 100X, 200X, and 500X of two different sections of the smooth implant groups demonstrated similar surface topography of our smooth PDMS implants and a commercially available smooth implant shell from Allergan. For the textured groups, there was no statistical difference in the size of the surface indentations comprising the texture measured from the Allergan Bio-CELL implant compared to the sugar implants fabricated implants ($p<0.05$) or the number of indentations between groups ($p<0.05$), with the Allergan implant having 29.0 ±1.4 indentations of 249.8±88.4 µm per well and the sugar group showing 28.5±0.7 indentations measuring 209.4 ±112.4 µm per 100X field.

Conclusions: This study demonstrates a low-cost customizable approach to fabricating smooth and textured breast implants from PDMS, a biocompatible silicone, which may be readily used for high throughput pre-clinical studies. Additionally, the marking of the implant using colored PDMS is conducive to the reliable assessment of implant positional stability at the time of explantation.

Avoiding Chest Wall Morbidity in Microvascular Free-Flap Breast Reconstruction

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Background: Removal of the rib and adjacent cartilage is a commonly performed step for exposure of the recipient chest vessels in free-flap breast reconstructions. However, this adds both short- and long-term morbidity to the procedure. We describe our experience avoiding rib removal in microvascular breast reconstruction.

Patients and methods: We retrospectively reviewed inflow vessels preparation in free-flap breast reconstructions performed by a single surgeon (SGB).

Results: 556 consecutive patients, totaling 1106 flaps over a 5-year period were assessed.

Bilateral reconstruction with DIEP flaps was the most common procedure (299 patients) followed by unilateral reconstruction with a DIEP flap (62) and unilateral stacked DIEP flaps (98), bilateral stacked DIEP and PAP flaps (30), and bilateral PAP flaps (18), unilateral stacked PAP flaps (41), bilateral GAP flaps (2), unilateral GAP flaps (4), and stacked DIEP/ GAP flaps (2). The internal mammary system was chosen as recipient in 1066 flaps. IMA perforating artery was utilized in 38 flaps and the thoracodorsal artery in 2 flaps. A sequential anastomosis was used in 68 flaps and cross chest anastomosis was used in 18 flaps. In two cases, 20% of the rib was resected to allow for vessel preparation. In no case was complete rib resection performed. No intraoperative complications were observed, and three flaps were lost (one PAP and two DIEP).

Conclusion: Microsurgery in free-flap breast reconstructions has greatly evolved in the past two decades. Exposure of the IMA recipient vessels typically involves removal of a portion of the intercostal cartilage and the rib, allowing a comfortable and safe management of the vasculature during dissection and anastomosis. Nonetheless, excessive removal often leads to short term increased pain and long-term cosmetic and functional complications, such as a noticeable depression of the chest wall especially noted in thin patients with small flaps. Our approach can be safely employed to preserve the anatomy and decrease pain which has allowed for outpatient performance of these procedures.

Balancing Resection and Reconstruction: Resection Volumes Increase with Body Mass Index Independent of Tumor Size In Patients Undergoing Breast Conserving Therapy

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Background: Breast conserving therapy (BCT) with postoperative radiotherapy has become standard of care for early-stage breast cancer, with overall and disease-free survival rates equivalent to those seen in traditional mastectomy. Oncoplastic procedures for breast restoration and symmetry following partial mastectomy must balance adequate resection with optimal aesthetic outcomes. In general, the application of oncoplastic techniques allows for removal of larger volumes of breast tissue while addressing resultant contour deformities associated with resection. Nevertheless, minimizing tissue resection while still obtaining positive margins may allow for a superior aesthetic outcome, especially given the necessity for postoperative radiotherapy and its sequalae. This study aimed to identify which surgical and patient factors result in larger-volume tissue resection to allow for development of strategies which might minimize breast deformity while maximizing oncologic outcomes.

Methods: We performed a retrospective chart review of 115 partial mastectomy patients. Data included demographics, tumor size, total volume of tissue resected, and margin positivity following index resection. Univariate analysis included independent T-tests, chi-square analysis, and analysis of variance (ANOVA) among subgroups. Multivariate linear regression was performed to describe factors contributing to total breast tissue volume excised.

Results: Mean age within this population was 62.5 years (± 9.6 years) and mean BMI was 29.5 (± 6.9). Mean volume resected was 109.1 cm3 (± 99.3 cm3), mean tumor volume was 5.9 cm3 (± 21.5 cm3), and mean percentage of tumor compared to specimen resected was 4.5% (± 0.1%). Multivariate linear regression controlling for breast density and age demonstrated that for each increased point in BMI, increase in volume of breast tissue resected was 5.6 cm3 (95% CI 2.7-8.3 cm3, $p<0.01$). There was no correlation between BMI category and tumor size ($R=0.220$). Tumor volume occupied ≤10% of resected tissue in 91.3% of patients. Neither volume resected nor percentage of specimen occupied by tumor had any correlation with margin positivity.

Conclusions: In this study group, there was a significant increase in tissue resected as BMI increased, although there was no correlation between BMI class and tumor size. There was no association between volume resected and margin positivity, ultimately demonstrating that there is an opportunity for removal of less breast tissue, specifically in patients with higher body mass index. Application of this knowledge in tandem with techniques for precise tumor localization may allow us to further minimize breast deformity to optimize patients' surgical outcomes.

BIA-ALCL Awareness: An Analysis of The Responses to An Institutional Campaign and National Recall

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Background: First reported in 1997, breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) gathered national attention with a manufacturer recall for textured implants on July 24, 2019.1.,2 A multi-channel campaign by the manufacturers was launched on June 1, 2020 to reinforce the initial announcement.3 Prior to these recalls, multiple medical centers, including the Mayo Clinic sent letters to all their patients with known textured implants to inform them of their risk of BIA-ALCL in April 2019. In this study, we assess the clinical impact of our institution's letters and the national manufacturer recall campaigns by analyzing patient responses.

Methods: In April 2019, a letter about BIA-ALCL was sent to patients who had a history of textured breast implant placement at our institution between January 1998 and April 2019. In January 2022, a retrospective review of these patients was performed. Patient demographics included age, state of residence, and clinical history, such as, date of textured implant placement, indication (reconstruction or augmentation), and implant model, size, and brand. Outcome measures included patient response rates, date of the first contact (phone, message, or clinic visit), and rate of textured implant removal. For patients who elected to have their textured implants replaced, we recorded the type of revision surgery, including whether capsulectomy was performed. Pathology reports were reviewed for BIA-ALCL. A multiple logistic regression analysis assessed the association between giving a response and various patient variables.

Results: A total of 1,176 patients (2,120 breasts) received the letters and were included in this study. Mean patient age was 58.7±13.1 at the time letters were sent. One-hundred-fifty-six (13.3%) didn't possess textured implants at the time of letter delivery due to prior implant removal or exchange. In total, 374 patients (31.8%) reached out to discuss their risk of BIA-ALCL and 297 (25.3%) eventually presented to our clinic. One-hundred-twenty-eight (34.2%) patients responded after the letter but before the manufacturer's recall, 186 (49.7%) after the manufacturer's initial recall, and 48 (12.8%) after the manufacturer's multi-channel campaign. One-hundred-eighteen (11.6%) patients with textured implants proceeded with surgery. For the 213 textured implants that were removed, 131 (60.9%) total capsulectomies and 55 (25.6%) partial/subtotal capsulectomies were performed. Of the 174 available pathology reports, none demonstrated a diagnosis of BIA-ALCL while 1 (0.6%) showed recurrent ductal carcinoma-in-situ. Most patients underwent replacement with smooth implants (76 patients, 64.4%), followed by autologous reconstruction including fat grafting alone (23 patients, 19.5%) and flat or simple closure (19 patients, 16.1%). Multivariable analysis demonstrated that patients who had implants placed for reconstruction following mastectomy ($p=0.0003$) or had Allergan implants ($p<0.0001$) had significantly higher odds of response.

Conclusions: A significant portion of patients (31.8%) responded to our letters and the manufacturer's recall/campaigns. Despite the low incidence of BIA-ALCL and the ongoing recommendation for observation in the setting of no symptoms, 11.6% of our patients still elected to proceed with implant removal. Exchange to smooth implants was the most popular surgical option at 64.4%. Patients mostly responded after the initial manufacturer recall and before the manufacturer multi-channel campaign (49.7%).

Breast Cancer Risk Stratification Practices Among Plastic Surgeons – Do We Need to Do Better?

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Background: The average life-time risk of developing breast cancer is approximately 13% in US women. As such, appropriate risk stratification and screening for breast cancer in patients undergoing breast surgery is critical. Unfortunately, there is a lack of consensus regarding standardized breast cancer risk stratification prior to elective breast surgery.[1] Given the recent rise in both cosmetic and reconstructive breast surgery, familiarity of plastic surgeons with available screening tools, appropriate imaging modalities, and understanding which patients require referral to high-risk clinics or genetic counseling is paramount. The purpose of this study is to report breast cancer risk stratification practices among plastic surgeons for patients who present consulting about reconstructive or cosmetic breast surgery.

Methods: From November 2021 to January 2022, an anonymous survey was administered to all members of the American Society of Plastic Surgery (ASPS). The survey included 30 single and multiple response questions summarizing the following: respondent performance of breast cancer risk assessment, knowledge of institutional guidelines for breast cancer screening, referral practices to genetic counseling, respondent understanding of the criteria that warrant further pre-operative screening, respondent level of comfort appropriately risk stratifying patients, and routine use of online risk stratification tools. Questions regarding respondent demographics, surgical training, and length of practice were also included.

Results: One-hundred and fifty-six respondents were included in this study. Most of the respondents were male (61.8%), most had completed general surgery residency followed by a fellowship in plastic surgery (65.4%), and approximately one third had been in practice for 25 years or more (32.8%). Nearly all the respondents routinely performed breast surgery in their practice (99.4%), and most stated that they performed breast cancer risk assessment for both cosmetic and reconstructive patients (79.9%). However, less than half of respondents (47.1%) responded "yes" or "sometimes" when asked if they routinely referred cosmetic patients that met national guidelines for genetic counseling. Approximately one third (33.9%) of respondents stated that they did not know which national guidelines for breast cancer screening their institution followed. Just over 60% of respondents answered "agree" or "strongly agree" when asked if they understood the criteria that warranted further pre-operative screening, and when asked if they felt comfortable appropriately risk stratifying patients. Finally, 41% of respondents checked "none of these," and 24% checked "I have never heard of these" when asked which formal breast cancer risk assessment models they used.

Conclusions: Although most respondents stated that they performed breast cancer risk stratification on patients prior to breast surgery, familiarity with available risk stratification tools and national guideline adherent referral to genetic counseling were somewhat lacking. The findings from this study may indicate the need for further education regarding breast cancer risk stratification and a more formal integration of breast cancer risk assessment tools in plastic surgery residency training curricula.

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Breast Implant Illness: Identifying Patients Concerns from Public Comments on Regulation.gov

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Introduction: Breast Implant Illness is an evolving syndrome that has been gaining traction from the public and the medical community. Patients are experiencing negative emotions towards BII and are dissatisfied with the quality of patient education, as expressed in the public comments submitted in response to the 24OCT2019 FDA draft guidance on breast implant labeling recommendations. To better gauge the patient experience, this study aims to further examine these comments for frequently encountered concerns and themes.

Methods: The comments under the 24OCT2019 Regulations.gov docket were extracted. A team of 14 researchers examined them to detect recurring themes. The comments were then equally and randomly allocated to two independent reviewers to code for the presence of the identified themes, and to a third reviewer for conflict reconciliation. Microsoft Excel was used to quantify theme frequencies.

Results: The docket contained 1321 comments, of which 4 were not in English, 10 were duplicates and 449 represented repetitions of a template expressing dissatisfaction with the guidelines. Amongst the remaining 758 comments, we identified the following recurrent concerns and themes: 1) insufficiency of FDA guidelines (present in 37% of the 758 comments), 2) feelings of betrayal by doctors, implant manufacturers and/or insurance companies (29.7%),

3) requesting a complete list of ingredients and metals (18.6%), 4) requesting a patient checklist (15%) , 5) surgeons, other physicians, or nurses not being able to explain the patient's symptoms (13.5%), 6) requesting all breast implants to be banned (10.4%), 7) doctors not acknowledging patients' BII concerns (8.6%), 8) concern about gel bleed/migration (6.2%), 9) explant not covered by insurance (5.7%), 10) patients recognizing they have BII only after coming across a social media group discussing it, or a friend who has it or read about it (4.2%), 11) requesting advocacy for recognition of BII by insurance companies (3.1%), 12) requesting only silicone breast implants to be banned (2.9%), 13) mention/discussion of the previous silicone implant ban (2.1%).

Conclusion: Patients are expressing several concerns about the safety of breast implants, the FDA guidelines, breast implant illness, and patient education. Notably, the trust towards the medical community is being questioned as patients feel betrayed and dismissed. Breast implants represent one of the mainstay treatments for post-mastectomy breast reconstruction, and their condemnation may compromise the quality of patient outcomes. Therefore, further research is needed to characterize breast implant illness and improve patient advocacy. Interestingly, the FDA updated their labeling recommendation for improved patient communication to include a patient decision checklist which is also reflected by our findings (15% of comments). Our results can serve as a springboard to proactively address patients concerns for optimized patient-physician relationship and restore the trust that qualified plastic surgeons will always have the patients best-interest in mind.

Breast Reconstruction Free Flap Failure: National Outcomes based on Preoperative Comorbidities

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Purpose: The purpose of this investigation was to perform a nationally representative study of breast free flap complications in the context of preexisting comorbidities, specifically investigating whether thrombocytosis is implicated in free flap failure.

Methods: Retrospective cohort study was conducted of female patients undergoing breast reconstruction with free tissue transfer performed in North America between 2015 and 2019 using the NSQIP database. Breast reconstruction with free tissue transfer was defined as CPT 19364. The primary outcomes were wound infection, dehiscence, and flap failure.

Results: During the study interval, 7522 patients underwent breast reconstruction with free flaps.

Overall complication rate was 18.4% (n=1381), including medical complications (3.1%, n=235) and surgical complications (16.6%, n=1251). The most common surgical complications were bleeding requiring transfusion (8.2%, n=619), surgical site infection (6.4%, n=479), flap failure (2.7%, n=203), and dehiscence (2.0%, n=154). Medical complications were exceedingly rare, with the most common being deep venous thrombosis (0.8%, n=58).

On multivariate regression analysis, wound infection was significantly higher in patients with diabetes (p<.001, AOR=1.9, 95%CI 1.4-2.5), smoking cigarettes within the past year (p=.005; AOR=1.6, 95%CI 1.1-2.2), and hypertension requiring antihypertensive medication therapy (p=.040; AOR=1.3, 95%CI 1.0-1.5). Surgical site infections almost always presented in the outpatient setting (94.4%, n=452 of 479) and occurred 18.0 days postoperatively (IQR 13.0-24.0). Almost half of patients with surgical site infections occurring in the outpatient setting required readmission (41.4%, n=187 of 452).

On multivariate regression analysis, dehiscence was significantly higher in patients with diabetes (p=.027; AOR=1.8, 95%CI 1.1-2.9), bleeding disorders (p=.005; AOR=4.6, 95%CI 1.6-13.2), smoking cigarettes within the past year (p<.001; AOR=2.6, 95%CI 1.6-4.1), and hypertension requiring antihypertensive medication therapy (p=.004; AOR=1.7, 95%CI 1.2-2.4). Dehiscence similarly almost always presented in the outpatient setting (88.3%, n=136 of 154) and occurred 21.0 days postoperatively (IQR 15.0-27.0). Less than one third of patients with dehiscence in the outpatient setting required readmission (27.9%, n=38 of 136).

On multivariate regression analysis, flap failure was significantly higher in patients smoking cigarettes within the past year (p=.030; AOR=1.7, 95%CI 1.1-2.8) and dyspnea on moderate exertion or at rest (p=.025; AOR= 2.6, 95%CI 1.1-6.2). Each 50 K/mcL elevation in platelet count was independently associated with an increased odds of flap failure (p<.001; AOR=1.2, 95%CI 1.1-1.4).

Patients experienced significantly higher rates of flap failure with platelet counts above 250K/mcL (p=.004, 3.2% vs 2.0%), which remained significant through progressively increasing thresholds up to 450 K/mcL. Free flap failure for breast reconstruction most commonly presented while patients were still admitted (75.9%, n=154 of 203) and occurred at 1.0 days postoperatively (IQR 1.0-6.0).

Conclusion: Platelet count over 250 K/mcL is associated with progressively increasing risk of free flap failure in breast reconstruction. Preoperative optimization of thrombocytosis may decrease flap failure, especially in patients with a history of tobacco use and hypertension undergoing autologous breast reconstruction. Future studies of personalized patient protocols to optimize platelet counts may improve free flap survival after autologous tissue breast reconstruction.

Breast Reconstruction in the Era of Highly Active Antiretroviral Therapy: A MarketScan Database Study

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Purpose: In the era of highly active antiretroviral therapy (HAART), the human immunodeficiency virus (HIV) has evolved from a rapidly fatal disease to a chronic, but manageable condition with an increasing life expectancy. Breast cancer incidence increases with age, suggesting that there is an increasing number of breast reconstructions (BR) that may be performed in the HIV-positive population. Our goal is to examine characteristics and outcomes of BR in patients with an HIV diagnosis utilizing HAART, as viral suppression has been shown to reduce surgical complications.

Methods: Using IBM® MarketScan® Research Databases, a large multi-payer database, adult patients who underwent autologous or implant-based BR between 2007 and 2016 were identified using Common Procedural Terminology (CPT) codes. HIV-positive individuals were defined as those who had an HIV diagnosis (International Classification of Disease, ninth or tenth edition) code and/or a HAART prescription, identified with National Drug Code Numbers. In both HIV-positive and -negative cohorts, patient demographics and procedure-related complications (seroma, hematoma, dehiscence, acquired breast deformity, infection, fat necrosis, tissue necrosis, deep vein thrombosis or other vascular complication, and non-specified complication of surgical care) were recorded. Schapiro-Wilk, chi-squared, Fisher's exact, and Wilcoxon-Mann-Whitney tests were used for statistical analysis.

Results: Of 55,579 patients who underwent breast reconstruction (mean age 49.3 ± 8.8), 49 met the criteria of having an HIV diagnosis and/or a HAART prescription. . There was no significant difference in complication rates, reconstruction type, gross payment, nor length of stay (LOS) between these two groups, while non-HAART patients were significantly older ($p = 0.003$), and with significant geographic variation ($p = 0.003$). Within the cohort of patients identified as HIV-positive and/or a HAART prescription between 2007 and 2016, 31 underwent implant-based reconstruction and 18 underwent autologous breast reconstruction. Among these, patients who underwent autologous breast reconstruction had higher complication rates ($p < 0.001$) and gross payments ($p = 0.003$) but there was no significant variation in age, surgery year, region, or LOS between the autologous and implant-based HIV-positive subgroups.

Conclusion: BR patients with an HIV diagnosis and/or a HAART prescription did not vary from patients without an HIV diagnosis and/or a HAART prescription with respect to complication rates nor LOS, demonstrating the safety and efficacy of breast reconstruction within this patient population. As HIV-positive patients undergoing autologous breast reconstruction showed higher

complication rates than those undergoing implant-based reconstruction, further examination of the use of autologous breast reconstruction in this subgroup is warranted. Future investigations involving larger sample sizes can additionally supplement understandings of the unique implications of breast reconstruction in this population.

Breast reconstruction with external pre-expansion and autologous fat transfer vs. standard therapy (The BREAST- trial)

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Background: Contemporary techniques for breast reconstruction are implant-based reconstruction (IBR) and reconstruction using autologous free tissue flaps. This study investigates a third autologous, yet less invasive technique: autologous fat transfer (AFT). It was compared to the gold-standard IBR. Currently, there is insufficient evidence that AFT is safe and effective.

Methods: This trial was performed in seven hospitals across the Netherlands. Breast cancer patients opting for breast reconstruction were included. Randomization to AFT or IBR was done in a 1:1 ratio. Primary outcome measure was quality of life (QoL), measured by the BREAST-Q questionnaire, at 12 months after final surgery. Results: A total of 193 patients were included in this study (91 AFT, 80 IBR). Of these, 64 women in the AFT group and 68 women in the IBR group completed the 12-months postoperative BREAST-Q. Main BREAST-Q scores were higher in the AFT group in three of five domains; satisfaction with breasts, physical well-being and satisfaction with outcome. Linear mixed-effects regression analysis showed QoL change over time was dependent on treatment group, in favor of AFT. Average volume achieved was 300.3ml in the AFT group vs. 384.1ml in the IBR group. No differences in oncologic events were found (4 AFT, 5 IBR).

Interpretation: These findings corresponded to higher QoL and an increase in QoL scores over time in the AFT group compared to the IBR group. No evidence was found that AFT is unsafe. This is encouraging news since it provides a third reconstruction option for breast cancer patients.

Capsular Contracture Management Following Breast Augmentation: Systematic Review and Best Practices

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Introduction: Capsular contracture remains one of the most frequent and complex complications following augmentation mammaplasty. While the physiologic mechanisms contributing to this phenomenon are not completely understood, hypotheses point to potential etiologies including microbial contamination, persistent blood, traumatized tissue, and silicone leak. Patients with breast implants developing capsular contracture present along a spectrum which has classically been described by the Baker grading system with surgical management often indicated for patients with grade III and IV capsular contracture. Epidemiologic approximations estimate the incidence of capsular contracture to be 2-15% in primary breast augmentation and slightly higher following secondary augmentation. Plastic surgeons have extensively discussed preventive steps to reduce capsular contracture rates including intraoperative sterility, minimizing tissue trauma, bloodless dissection, and direct delivery of antibiotics, implant plane, and implant texture. While initially techniques focused on capsulotomies, management now focuses on the tenants of capsulectomy, site change, and implant exchange. Still, new approaches continue to be developed. The objective of this review was to synthesize new and old surgical techniques for addressing capsular contracture in revision breast augmentation procedures to establish the clinical evidence of each technique.

Methods: In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review was conducted to characterize the surgical management of capsular contracture following breast augmentation. The MEDLINE, EMBASE, and Cochrane Database of Systematic Reviews were queried for articles published on or prior to November 11, 2021. Included articles were original manuscripts that were either observational studies or clinical trials of cisgender females undergoing revision breast augmentation for capsular contracture. Exclusion criteria included articles published in a non-English language, nonsurgical treatment modalities, and cohorts with less than 1 year of follow-up.

Results: Search parameters yielded 14,163 results. Initial screening generated 1,223 articles for abstract review. Secondary review resulted in 90 articles requiring full-manuscript assessment with 34 articles ultimately meeting inclusion criteria. There was significant heterogeneity in study design, surgical techniques, and follow-up periods thus precluding a meta-analysis from being performed. Studies were subdivided based on the type of surgical intervention employed. Seventeen studies discussed either capsulectomy and/or capsulotomy. Nine studies detailed altering implant placement in revision breast augmentation. Only four of the included studies did not exchange the implants when performing revision for capsular contracture. Eight articles used acellular dermal matrix (ADM) in the management of capsular contracture. Recurrence rates of capsular contracture in studies utilizing ADM ranged from 0-7%. Others report novel variations to reduce capsular contracture recurrence rates in revision breast augmentation including

placement of an antibiotic-impregnated mesh and utilization of hypochlorous acid as an irrigation fluid.

Conclusions: Capsular contracture management remains an important topic with limited high-level evidence for establishing clear evidence-based treatment guidelines. While more evidence is required to assess the effects of capsulectomy, implant exchange and plane change appear to useful mechanisms for reducing recurrent capsular contracture. Evidence suggests ADM has been used more frequently, though still require long-term follow-up studies. New developments regarding textured implants limit the revision breast augmentation surgeon to smooth devices.

Case-mix Adjustment To Compare Nationwide Healthcare Institution Performances After Reconstructive And Cosmetic Breast Implant Surgery

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Background: Differences in patient demographics can confound comparison of healthcare institution performances. This nationwide study aimed to provide a case-mix adjustment model to compare short- and long-term reoperation rates due to a complication for patients undergoing breast implant surgery in the Netherlands.

Methods: Patient and surgery characteristics of patients undergoing reconstructive or cosmetic breast implant surgery between 2017 and 2021 were collected from the population-based, nationwide Dutch Breast Implant Registry (DBIR). Each implant had a follow-up of at least a year. Variation in case-mix variables between healthcare institutions and effects on postoperative outcomes were assessed using multivariable logistic regression. Primary outcomes were short- (<60 days) and long-term (>60 days to 1 year) reoperation rates due to a complication.

Results: In total, 12,961 reconstructive breast implants (8,793 patients) and 45,020 cosmetic breast implants (23,234 patients) were included in 8 academic hospitals, 68 regional hospitals, and 34 private clinics. For reconstructive indications, short-term and long-term reoperation rates were 0.9% and 2.5%, respectively. For cosmetic indications, these rates were 0.3% and 0.2%, respectively. Uncorrected short-term reoperation rates ranged from 0.0% to 3.9% between healthcare institutions for reconstructive indications and from 0.0% to 12.5% for cosmetic indications. Uncorrected long-term reoperation rates ranged from 0.0% to 16.0% between healthcare institutions for reconstructive indications and from 0.0% to 4.5% for cosmetic indications. For both reconstructive and cosmetic indications, significant differences between healthcare institutions were observed for age≥50 years, ASA classification≥III, smoking status,

BMI≥25 kg/m2, primary surgery, bilateral surgery, and preoperative radiotherapy (p-values<0.001). Expected short-term reoperation rates ranged from 0.7% to 1.9% between healthcare institutions for reconstructive indications and from 0.0% to 1.4% for cosmetic indications. Expected long-term reoperation rates ranged from 1.1% to 5.9% between healthcare institutions for reconstructive indications and from 0.1% to 0.8% for cosmetic indications. After case-mix correction, some significant outliers disappeared, but most remained for both reconstructive and cosmetic short- and long-term reoperation rates.

Conclusion: Case-mix adjustment is essential for institutional comparison of short- and long-term postoperative outcomes for patients undergoing reconstructive and cosmetic breast implant surgery.

CD138 Expression is Upregulated in the Breast Tissue of Women with Sub-Glandular Breast Implants

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Background: We previously showed women with breast implants have elevated antibody responses to breast cancer protein. We hypothesize the local foreign body response to the implant may promote development of immunoprotective responses against breast cancer. As such, we compared gene expression of common B cell markers in the breast tissue of women with sub-muscular versus sub-glandular implants to evaluate for a local effect of the breast implant on immune cell phenotypes in the breast.

Methods: Breast tissue was collected at the time of implant exchange surgery from 30 patients. Tissue was stored in RNAlater, total RNA was later isolated and qRT-PCR was performed using iTaq Universal SYBR Green Supermix (Bio-Rad). B cell gene-specific targets were designed using the NIH Primer Designing tool for CD138, PAX5, and CD20. The immune target gene expression levels were normalized by the constitutive gene GAPDH for each sample. Gene expression was compared between women with sub-glandular and sub-muscular implants by the independent samples t-test.

Results: Average age was 45 years (SD 15.1) and average BMI 25.2 (SD 6.1). Of the 30 patients, 53.3% had prior pregnancy, 33.3% were post-menopausal, 80% were Caucasian, and 23.3% had a family history of breast cancer. The majority (80%) had silicone breast implants, with 11 (36.7%) sub-glandular and 16 (53.3%) sub-muscular. Implant location was unknown in 3

patients, and these were excluded. CD138 expression was elevated in the breast tissue of sub-glandular implants (1.22X, p=0.007). There was no difference in CD20 (1.08X, p=0.19) or PAX5 (1.08X, p=0.12) expression between sub-muscular and sub-glandular implants.

Conclusion: CD138 is a marker of activated, antibody-secreting B cells. Its expression is upregulated in the breast tissue of women with sub-glandular implants, further supporting our hypothesis that the breast implant foreign body response may initiate an immunoprotective state against breast cancer development.

Characteristics and Outcomes of Black and White Patients Presenting for Breast Reduction Mammaplasties at a Tertiary Referral Center in the Southeastern United States

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Introduction: Racial health disparities disproportionately affecting Black patients in plastic surgery are well documented in literature. Even as one of the most common procedures in plastic surgery, inequalities in reduction mammaplasties continue to exist. (1) Our study aims to analyze the different characteristics and outcomes in Black and White patients who underwent reduction mammaplasty at a tertiary referral center in the southeastern United States.

Methods: Retrospective analysis of patients undergoing bilateral reduction mammoplasty for symptomatic macromastia between 2015-2021 at a single institution was performed. Patients who underwent concomitant procedures and cancer-related procedures were excluded. Inclusion criteria consisted of those who reported their race as "Black/African American" and "White". Patients were stratified based on the two races. Distance from hospital was determined by billing zip code.

Results: A total of 465 patients were included in the 7 year period, with 175 (37.6%) White and 290 (62.4%) Black. Black patients were likely to be single ($p<0.001$), to have hypertension (17% vs 32%, $p<0.001$), to be younger in age (41 vs 37 years, $p=0.003$), and to have a higher BMI prior to operation (32 vs 36, $p<0.001$). Intraoperatively, Black patients were more likely to have longer duration of surgery (2.7 vs 3 hours, $p<0.001$), have more total grams removed from breast (1317g vs 1987g , $p<0.001$), have more estimated blood loss (101mL vs 117mL, $p<0.001$), and more likely to have drains placed (20% vs 31%, $p=0.007$). Post-operatively, there were no difference between the two races in reoperation and readmission rates. There were differences in

social determinants of health. In our patient population, Black patients lived closer to the hospital (57 vs 31 miles, p=0.011) and had a lower median household income ($62,927 vs $47,583, p<0.001). In a logistic regression model, race and the mentioned social determinants of health did not predict reoperation and readmission.

Conclusion: Despite major differences in characteristics prior to operation and intraoperatively, there were no significant differences in outcomes that would require reoperation or readmission between Black and White patients. Our findings demonstrate that racial health inequalities in reduction mammaplasties can be mitigated, and our results serve as a positive example for fair provision surgical care.

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Closed Expander Salvage with Dual Port Tissue Expander in Implant-based Breast Reconstruction for High BMI Ptotic Patients

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Introduction: The two most common major complications of implant-based breast reconstruction are infections and mastectomy skin flap necrosis. The rates of infectious complications vary widely across various centers; however, published rates range from 8% to 25.8%, with loss of reconstruction secondary to those infections of 27-63%. Additionally, infection rates and complications are highest in high BMI (> 30) and large breast resections. Rates of implant salvage in the setting the active cultures positive also vary widely but are generally low. Here we present outcomes of a continuous series of high-risk patients (BMI greater than 30, with large, ptotic breasts) utilizing a dual port tissue expander with closed washout to the mastectomy pocket after developing of breast erythema.

Methods: Retrospective review of consecutive cases over approximately a one-year period with moderate to high BMI and, Grade II or III ptosis. These patients additionally underwent a Wise pattern skin reduction, use of an adipose-fascial inferior pole lining flap, and placement of a dual port tissue expander with ADM. Two drains were utilized in each case for each breast. Final reconstruction was implant based. Infections were defined by presence of erythema and positive cultures obtained through the dual port mechanism. Patients with erythema underwent a closed

serial washout with Betadine and sterile saline until resolution of erythema, in addition they were started and maintained on two-week course of broad-spectrum antibiotics. These patients were all treated as outpatients.

Results: Over approximately a one-year period 35 patients underwent expander placement with the dual port expander totaling 55 individual breasts. All of these patients were either grade two or three ptosis and underwent skin resection in a wise pattern with a lining flap. The Average BMI was 31, the average breast weight resected was 898 g. An overall infection rate of 20% was identified comprising 11 patients in total. All of these patients had positive bacterial cultures on aspiration of the dual port. Of the infected breasts 6 (45%) were salvaged with closed washout in the office and oral antibiotic, 5 underwent further operative washout, and 3 were salvaged; the total loss of reconstruction secondary to infection was 2 (3.6%).

Conclusions: Infections in implant-based breast reconstruction continue to be a source of high morbidity, particularly in high BMI patients. Here we present a series of high-risk patients with a BMI greater than 30, undergoing wise pattern skin reduction, and expander-based breast reconstruction. These patients are particularly prone to development of postoperative seromas, skins complications, and infections. Utilizing a dual port expander with closed serial washing in the office yielded a 45% salvage rate, and of the 5 patients that progressed to operative washout for continued erythema 60% were salvaged. The total loss of reconstruction was 3.6% in our cohort. Further experience in the device is required; however, this represents a significant improvement in overall loss of reconstruction rates for high-risk patients.

Comparison of Postoperative Opioid Use in Gender-Affirming Mastectomies, Oncologic Mastectomies, and Gynecomastia Mastectomies

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Background: Severe acute postoperative pain is a complication experienced by more than half of oncologic mastectomy patients. Although patients with gender dysphoria seeking chest masculinization undergo similar mastectomies, there remains a paucity of literature describing

the risk of severe acute pain following mastectomy in transgender patients. To better evaluate this risk, gender-affirming mastectomies were compared to oncologic mastectomies without immediate reconstruction and mastectomies for gynecomastia. The short-term burden of post-mastectomy pain was assessed by quantifying postoperative opioid use.

Methods: Charts of 59 transgender, 47 oncologic, and 28 gynecomastia patients who underwent bilateral mastectomies with bilateral regional nerve blocks at a single institution were retrospectively reviewed. Oncologic patients did not have any reconstruction. The following was recorded: patient demographics, surgical characteristics, in-hospital medication use (intraoperative, post-anesthesia care unit, inpatient), outpatient medication use, and postoperative complications. Opioid intake was measured in morphine milligram equivalents (MME). Descriptive statistics and multiple linear regressions were performed with identified predictors of increased in-hospital MME across all cohorts.

Results: In the transgender cohort, heavier breast specimen weight (an objective measure of breast mass) was a significant predictor of increased in-hospital opioid MME, while longer duration of androgen therapy was associated with decreased in-hospital opioid use ($p=0.03$ and $p=0.04$, respectively). Marijuana, baseline home pain medication, ERAS protocol adherence, and surgical approach (i.e., double incision, keyhole incision, inframammary incision, and buttonhole incision) did not significantly influence total in-hospital opioid intake. In both transgender and gynecomastia cohorts, BMI was a significant predictor of in-hospital opioid use ($p=0.02$), while it was not significant in the oncological cohort ($p=0.71$). In-hospital opioid intake was not significantly different between the transgender and oncologic cohorts ($p=0.69$). Compared to the gynecomastia cohort, transgender patients had significantly higher in-hospital opioid MME ($p=0.03$), while controlling for age, BMI, history of chronic pain, prior opiate use, and use of regional anesthesia.

Conclusions: In-hospital post-mastectomy opioid consumption did not differ significantly between transgender and oncologic patients who did not undergo breast reconstruction. It is possible that much of early post-mastectomy pain in the oncologic setting may be due to the reconstructions. The limited follow up cannot determine risk of post-mastectomy pain syndrome (PMPS), but prior reports of reductions in opioid use associated with regional anesthesia ERAS protocols is reassuring for the transgender patients. Within the transgender cohort, duration of androgen therapy was found to be significantly associated with decreased in-hospital opioid use, suggesting a role of androgens in pain perception. Previous studies have suggested patients with greater immediate postoperative pain may be at higher risk for developing chronic post-mastectomy pain syndrome. Future research examining the incidence of PMPS in the gender-affirming cohort may further elucidate patient risk based on acute postoperative pain.

Comparison of the Modified Frailty Index vs Traditional Risk Proxies to Predict Complications Post Mastopexy

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Purpose: Despite the popularity of mastopexy procedures, few studies analyze predictors of complications using national data, and the safety of concurrent mastopexy and breast augmentation remains unclear.1,2 Recent literature suggests measures of 'frailty' may be strong predictors of surgical risk, such as the modified 5-item frailty index (mFI-5) and/or the modified Charlson Comorbidity Index (mCCI).3,4 Thus, the present study aims to assess whether the mFI-5 is more predictive of complications in mastopexy procedures, than other risk proxies.

Methods: A retrospective review was performed of all patients from the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) database who underwent mastopexy with and without implant augmentation, from 2013 to 2019. The mFI-5 scores were calculated for each patient, and complications data were gathered. Risk factors and proxies were compared as predictors of 30-day complications, using univariate logistic and linear regressions. Univariate logistic and linear regression regression analyses were performed to evaluate predictive value ($p<0.05$).

Results: A total of 3,840 patients were analyzed (2,816 augmentation mastopexy and 1,024 mastopexy cases). Augmentation mastopexy patients were younger than those undergoing mastopexy alone (mean 36 years vs. 48 years, $p <0.001$), with lower BMIs (23.6 kg/m2 vs. 27.5 kg/m2, $p<0.001$). This cohort of augmentation mastopexy patients had less overall complications (1.6% augmentation mastopexy vs. 4.5% mastopexy, $p <0.001$). Among augmentation mastopexy cases, the strongest predictor for all-cause complications and complication severity was ASA class. A mFI-5 score of ≥ 2 was the strongest predictor for an overnight stay. Obesity was strongly associated with increased odds of developing any surgical site infection for both augmentation mastopexy and mastopexy. Of the patients who only underwent a mastopexy surgery, risk indices did not significantly predict complications.

Conclusions: Our study found that the mFI-5 score was strongly associated with predicting overnight stays in augmentation mastopexy procedures. As mastopexy is usually an elective outpatient procedure, unexpected overnight stays can be extremely costly and are important considerations for both the patient and provider. While the mFI-5 and mCCI did not statistically significantly predict complications, the present analysis demonstrates the importance of other risk proxies in augmentation mastopexy procedures such as obesity, age and ASA class. Given the low number of complications in this cohort, further research is necessary to determine the ideal predictive tool for surgical risk in mastopexy and augmentation mastopexy.

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Complication and Failure Rates of Human, Porcine, and Bovine Acellular Dermal Matrix in Prepectoral Breast Reconstruction: A Scoping Review

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Purpose: To determine the rates of overall complications and failure of prepectoral breast reconstruction between various types of humans (hADM), bovine (bADM), and porcine (pADM) acellular dermal matrices (ADM).

Methods: Studies examining complications following the use of ADM for prepectoral breast reconstruction were identified using MEDLINE, Embase, the Cochrane Library, LILACS, and the Web of Science from January 2010 to August 2021. Titles and abstracts of 1838 studies were screened, followed by full-text screening of 355 articles. 33 studies were found to meet inclusion criteria.

Results: From the thirty-three studies, 6046 prepectoral reconstructions were examined. Implant loss was comparable across the different types of ADM (pADM 4.0%; hADM 4.0%; bADM 3.7%). bADM had the highest rate of capsular contracture (6.1%), infection (9.0%), skin flap necrosis (8.3%), dehiscence (5.4%), and hematoma (6.1%) when compared to both hADM and pADM. hADM had the highest rate of postoperative seroma (5.3%), followed by pADM (4.6%) and bADM (4.5%).

Conclusion: Among the prepectoral breast reconstruction studies utilizing hADM, pADM, or bADM included in our analysis, complication profiles were similar. bADM had the highest proportion of breast complications in the following categories: capsular contracture, infection rate, skin flap necrosis, dehiscence, and hematoma. Implant loss was comparable across the cohorts. Overall, prepectoral breast reconstruction utilizing ADM leads to relatively low complication rates with the highest rates within the bADM cohort.

Consequences and Predictors of Prolonged Tissue Expander Duration in Breast Reconstruction

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Purpose: Tissue expanders (TEs) are temporary devices used in breast reconstruction, and general practice is to remove them within 1 year. However, there is a paucity of data regarding the potential consequences of longer indwelling times. Thus, we aim to determine whether prolonged expander duration is associated with TE-related complications. The secondary objective is to ascertain the reasons for a delay in final reconstruction.

Methods and Materials: This is a retrospective review of all consecutive adult female patients at our institution who underwent tissue expander-based breast reconstruction from 2015-2021. Complications were compared between patients who had an indwelling TE for > 1 year and < 1 year. Univariate and multivariate regressions were used to evaluate predictors of TE complications. Demographic and oncologic factors predicting TE duration were assessed with generalized linear regression.

Results: A total of 582 patients underwent TE placement and 71 (12.2%) had an indwelling expander for > 1 year. Adjuvant chemoradiation, BMI, overall stage, and diabetes predicted the duration of TE placement ($p \leq 0.006$). Return to the OR rate was higher in patients who had TEs in place > 1 year (22.5% vs 6.1%, $p < 0.001$). On multivariate regression, prolonged TE duration was the only factor that predicted an infection requiring antibiotics, readmission, and re-operation ($p < 0.001$). Reasons for longer indwelling times included need for additional chemoradiation (79.4%), TE infections (12.7%), and patients requesting a break from surgery (6.3%).

Conclusion: Indwelling TEs for > 1 year are associated with higher rates of infection, readmission, and re-operation even when controlling for adjuvant chemoradiation. Patients with diabetes, a higher BMI, advanced cancer stage, and those requiring adjuvant chemoradiation should be advised they may require a TE for a longer time-interval prior to final reconstruction.

Conventional versus Modified Nipple Sparing Mastectomy in Immediate Breast Reconstruction: Complications, Patient Reported and Aesthetic Outcomes

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Background: Nipple-sparing mastectomy (NSM) followed by immediate breast reconstruction (IBR) is an optimal surgical treatment for appropriate breast cancer so far. However, investigations are continuing to improve the surgical technique for achieving better results. In this study, we compare the outcomes of conventional and modified NSMs in patients who underwent IBR.

Methods: We retrospectively reviewed patients who underwent NSM followed by IBR using autologous tissue or implant between January 2014 and January 2021. We divided all operated breasts into two groups: 1) c-NSM (conventional NSM) followed by IBR and 2) m-NSM (modified NSM) followed by IBR. We compared two mastectomy types in terms of postoperative complications, patient reported outcomes using Breast Q and aesthetic outcomes using panel assessment scores by physicians.

Results: A total of five hundred sixteen patients (580 breasts) with NSM (143 breasts with c-NSM and 437 with m-NSM) followed by IBR were reviewed. The overall complication rate among the included patients was 39.7% in c-NSM group, while it was 17.8% in m-NSM group ($p<0.05$). The ischemic complications were more common in c-NSM ($p<0.05$). The Breast Q results showed higher rates of psychosocial and sexual well-being ($p<0.05$) in m-NSM group, although the responses to other questions were not significantly different between groups. The mean five panel assessment scores given to c-NSM group and m-NSM group were 3.0 (good) and 2.4 (fair), respectively ($p<0.05$).

Conclusions: Preserving the anterior lamellar fat in NSM associated with overall lower rates of complications including the ischemia of mastectomy flap and nipple-areolar complex, while it has increased the patient reported as well as aesthetic outcomes.

Cost Analysis of Pre-pectoral Implant-Based Breast Reconstruction

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Background: With improvement in mastectomy skin flap robustness and increasing recognition of animation deformity, there has been a shift in implant breast reconstruction in favor of pre-pectoral placement.[1] While studies have explored the cost effectiveness of implant-based breast reconstruction, few investigations have evaluated cost with respect to pre-pectoral vs. sub-pectoral implant breast reconstruction.[2]

Methods: A retrospective review of 548 patients who underwent mastectomy and implant-based breast reconstruction was performed from January 2017 to December 2020. Demographic, oncologic, and surgical characteristics were compared based on pre-pectoral vs. sub-pectoral implant breast reconstruction. Institutional costs were converted into normalized ratios and analyzed relative to the plane of reconstruction, with subgroup analyses based on laterality and staging.

Results: The pre-pectoral and sub-pectoral cohorts were well matched, except for reconstructive staging, as patients who underwent pre-pectoral breast reconstruction were more likely to undergo single stage reconstruction instead of staged reconstruction. The pre-pectoral cohort had a lower overall frequency of revision procedures (27.1% v 39.6%). While there was no difference in re-operation due to immediate complications, the increased number of elective revisions in the sub-pectoral cohort led to the overall difference in frequency of follow-up procedures. In terms of complication endpoints, the two reconstructive approaches differed only in the incidence of delayed complications, with the sub-pectoral cohort being more strongly associated with capsular contracture and animation deformity. Comparison of cost ratio by implant plane revealed that the sub-pectoral approach was more costly (1.70 +/- 0.44 v 1.58 +/- 0.31, $p < 0.01$). However, stratification by laterality and type of reconstruction demonstrated no difference in cost between reconstructive techniques. These results were confirmed by multivariable linear regression, which did not reveal reconstructive technique to be an independent risk factor for cost.

Conclusion: This study demonstrates that the pre-pectoral approach to breast reconstruction is a cost-effective alternative to sub-pectoral implant placement and may confer cost benefit as it is

more strongly associated with direct-to-implant breast reconstruction. With both procedures sharing a similar safety profile, pre-pectoral breast reconstruction is a safe and cost-efficient alternative to sub-pectoral breast reconstruction.

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Cost Implications of Enhanced Recovery After Surgery Protocols in Microvascular Breast Reconstruction

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Introduction: Surgical advancements in breast reconstruction have allowed for optimizing patient-reported outcomes and efficiency measures. The Enhanced Recovery After Surgery (ERAS) protocol has been instrumental in improving outcomes, but the effect of these protocols on healthcare spending has not been examined. This study aims to assess the effect of ERAS protocols on length of hospital stay and costs associated with microsurgical breast reconstruction

Methods: In 2018, the authors implemented an ERAS protocol for patients undergoing microsurgical breast reconstruction that included all aspects of perioperative care and interventions. Subjects included patients who underwent deep inferior epigastric perforator flap breast reconstruction at the authors' institution between 2016 and 2019. Data was gathered from the electronic medical record and the hospital system's finance department and patients were divided into pre-ERAS (2016, 2017) and ERAS (2018, 2019) cohorts. A Two-Sample T-test was used for statistical analysis.

Results: The study included 269 patients with no statistically significant differences in demographic data between the cohorts. The average length of hospitalization was 3.46 days for the pre-ERAS group and 2.45 days for the ERAS group ($p=0.000$). In a linear regression model, the ERAS protocol predicted a 1.04 day decrease in the length of stay ($p=0.000$). The ERAS cohort demonstrated cost reductions in all categories including room and board (-18.5%),

pharmacy (-4.5%), surgery labor (-11.8%), and postoperative care labor (-30.8%).

Conclusion: The rising cost of healthcare presents a challenge for providers to reduce the cost burden placed on our health system while providing the highest quality care. This study demonstrates that the use of standardized ERAS protocols can achieve this two-fold goal.

Decreased Use of Anti-Inflammatory Medications in Autoimmune Connective Tissue Disease Patients Following Breast Implant Removal: A National Analysis

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Background: Studies dating back to the 1970s examined the development of connective tissue diseases and associated symptoms in women with breast implants. Recent case studies demonstrate resolution of rheumatologic symptoms following implant explanation, raising concern around breast implant illness, and associated inflammatory and connective tissue disease-related symptomatology. Using patients with established connective tissue diseases and breast implants, we sought to quantify the number of anti-inflammatory medications as a proxy for inflammation and disease burden before and after implant removal at a national level.

Methods: Using the Clinformatics® Data Mart Database, a national de-identified commercial claims data warehouse, adult female patients from 2003-2021 were queried. Common procedural terminology (CPT) codes were used to identify those who underwent implant-based reconstruction and implant removal, and International Classification of Disease (ICD-9 and ICD-10) codes were used to identify patients with autoimmune connective tissue disorders (CTDs), including systemic lupus erythematosus, rheumatoid arthritis, systemic sclerosis, Sjögren's, sarcoidosis, spondyloarthritides, antiphospholipid syndrome, psoriatic arthritis, dermatomyositis, polymyositis, and large, medium or small vessel vasculitides. Patient demographics and complications requiring and not requiring surgical intervention were recorded. Filled prescriptions of anti-inflammatory drugs were quantified for each patient during the preoperative (180 days to 8 days prior to surgery), perioperative (7 days prior to 7 days after surgery) and postoperative (8 days to 180 days after surgery) windows surrounding breast implant removal. Patients not continuously enrolled for at least 6 months before and after the index procedure were excluded. Scapiro-Wilk, chi squared, Wilcoxon signed-rank, and multivariable regression tests were used for statistical analysis.

Results: Of 1015 patients meeting criteria (mean age 56.5 ± 11.6 years), 821 (81.0%) filled at least one anti-inflammatory prescription in the preoperative window, 753 (74.3%) filled at least one anti-inflammatory prescription in the perioperative window, and 735 (72.5%) filled at least one anti-inflammatory prescription in the postoperative window. While filling one or more

preoperative prescriptions was associated with filling at least one preoperative prescription ($p < 0.001$), patients filled significantly fewer postoperative prescriptions than preoperative prescriptions ($p < 0.001$). Younger age was associated with greater odds of filling at least one anti-inflammatory prescription in the preoperative period (OR 0.960, $p = 0.002$). Statistically significant predictors of the number of anti-inflammatory prescriptions filled in the postoperative window included the number of anti-inflammatory prescriptions filled in the preoperative ($p < 0.001$) and perioperative windows ($p < 0.001$) and higher levels of education ($p \leq 0.005$). Experiencing one or more complications (requiring or not requiring surgical intervention) was not associated with the number of anti-inflammatory prescriptions filled in the postoperative window ($p = 0.260$).

Conclusion: Given the scope of anti-inflammatory medications without comparable conversion factors and the lack of available data regarding pre- and post-operative serum inflammatory markers, we utilized the number of filled anti-inflammatory prescriptions before and after explanation as a proxy for inflammation status. Our study found a significant decrease in the number of filled anti-inflammatory prescriptions in the same population of patients following implant removal, suggesting that breast implants may incite an inflammatory response in predisposed patients.

Defining the Standard for DIEP Donor Site Outcomes: A Decade Long Study on Microvascular Breast Reconstruction

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Purpose: The DIEP autologous flap has become the gold standard for breast reconstruction due to lower risks of post-operative complications compared to other flaps as well as superior outcomes. The current literature describes different aspects of abdominal donor site complications for DIEP flap breast reconstruction, but no individual study has reported on global complications or specified classifications of complications. This study aims to report global complications of abdominal donor sites and compare degrees of complications to set a standard for discussion and comparisons.

Methods: This is a retrospective study that evaluated post-operative outcomes of patients who underwent DIEP autologous flap breast reconstruction at an academic center between January 2011 and December 2021 performed by one of two reconstructive surgeons. Primary outcome variables included abdominal donor site complications and number of complication types. Secondary outcome variables included degree of complication; distinction between minor and

major complications depended on outpatient or inpatient treatment, respectively. Covariates included demographic information, comorbidities, cancer treatment, and smoking status.

Results: 501 patients underwent DIEP flap breast reconstruction with 131 (33%) patients having reported any type of abdominal donor site complication. Sub-setting complication types, 120 (30.2%) patients had minor complications and 38 (9.6%) had major complications. Wound separation was the most frequent complication reported in both minor (53, 44.2%) and major (18, 47.4%) complications. Preservation of umbilicus was associated with increased risk of minor complication (OR 1.780, $p = 0.015$). BMI, hypertension, and diabetes were significantly associated with increased risk of major complication.

Conclusion: This study is one of the largest and most comprehensive studies reporting on abdominal donor site complications post-DIEP breast reconstruction. Stratification of complications shows that the majority of complications are minor which require outpatient or no treatment, with patient comorbidities being significantly associated with major complications. Thus, patient optimization pre-surgery and close follow-up post-operatively should be considered for patients with comorbidities.

Development of New BREAST-Q Scales to Measure the Experience of Breast Implant Illness

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Purpose: Breast implant illness (BII) is a term used to describe a constellation of systemic symptoms reported by women post-implant-based breast reconstruction (IBRR). Research is underway to understand the pathophysiology of BII and no diagnostic tests currently exist. Hence, understanding the patient experience of BII is of utmost importance. Patient-reported outcome measures (PROMs) are tools designed to facilitate the inclusion of patient voice in clinical care. The purpose of this study is to develop a long- and short-form of BII symptom severity questionnaires. These new questionnaires will be part of the BREAST-Q – a rigorous, validated, gold standard PROM for breast cancer surgery.

Methods: An international, multistep, multiphase approach consistent with established PROM development guidelines will be used. In Step 1, a review of published and gray literature was conducted to identify a comprehensive list of symptoms associated with BII, followed by an online, Delphi survey and consensus meeting with stakeholders (patients, clinicians, researchers, and a regulatory member) to identify top 20,10 and 5 symptoms associated with BII. In Step 2, we conducted a web-scraping study of 9 publicly available BII-specific web forums to extract

de-identified BII-relevant posts and comments. In Step 3, using an interview guide, we conducted in-depth, one-on-one interviews with women with BII-like symptoms recruited through patient partners from the United States and Canada. The interviews were audio-recorded and transcribed verbatim. The data from Steps 2 and 3 were analyzed line-by-line to extract relevant concepts and constant comparison was used to develop a conceptual framework for BII and an item pool. The item pool was used to develop the draft of the long- and short-form of the BREAST-Q BII symptom severity scales.

Results: In Step 1, 44 symptoms were reviewed by the Delphi panel (N=25) and a consensus was reached on the top 19 and 6 symptoms to be included in the long- and short-form of the scales. In Step 2, we found that pre-implant surgery, women were concerned about the risks of developing BII with certain types of implants. Women who were experiencing BII-like symptoms post-implants described their symptoms, were worried about worsening of symptoms and identified the need for more resources on BII and explant surgery. In Step 3, 20 women (age, 32-58y) elaborated on the health-related quality of life impact of BII, including appearance and body image (eg, skin/hair changes, weight loss/gain), and physical (eg, fatigue, pain, gastrointestinal issues), psychological (eg, anxiety, depression), social (eg, participation in recreation, work), and sexual (eg, vaginal dryness, low libido) well-being. Participants' words were used to develop draft versions of the BREAST-Q BII symptom severity scales.

Conclusion: The BREAST-Q BII symptom severity scales are designed to be used in clinical practice and research to monitor and evaluate BII from the patient perspective and may be used for patient education pre-IBBR. The next steps in the development involve pilot testing and refining of draft scales followed by a field test with a large sample to establish psychometric properties.

Did We ERAS(e) the Oxy? The Association Between BMI and Narcotic Use in ERAS Pathway DIEP Flap Breast Reconstruction

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Background: Inadequate postoperative pain relief places patients at risk for increased morbidity, including surgical complications and chronic postoperative pain. Past studies have demonstrated that higher body mass index is associated with increased postoperative pain. Previously we have shown that a methadone-based Enhanced Recovery After Surgery (ERAS) pathway significantly

decreased postoperative opioid use in deep inferior epigastric perforator (DIEP) flap patients. This study aims to evaluate the role of body mass index on postoperative narcotic requirements for patients undergoing DIEP flap reconstruction in a methadone-based ERAS pathway.

Methods: This is a prospective study of a consecutive series of patients who are undergoing or have undergone DIEP flap breast reconstruction with two attending plastic surgeons at a single tertiary care institution between April 2021 and January 2022 using a methadone-based ERAS pathway. The ERAS protocol included a single dose of intraoperative weight-based methadone and specific management guidelines, such as patient education, medication optimization, and fluid management. The ERAS pathway was strictly adhered to for all patients. Pearson correlation coefficient was calculated to determine association between body mass index and postoperative opioid use at 12 hours postoperatively, 24 hours postoperatively, and throughout admission.

Results: Over the 10-month period, 51 patients underwent DIEP flap breast reconstruction in the methadone-based ERAS pathway. They had an average age of 51 and average BMI of 28 kg/m2. The average opioid usage was 11.17 morphine milligram equivalents at 12 hours postoperatively, 38.69 morphine milligram equivalents at 24 hours postoperatively, and 79.98 morphine milligram equivalents throughout admission. Higher body mass index was associated with significantly increased narcotic requirements at 12 hours ($R = 0.37$, $p = 0.007$), at 24 hours ($R = 0.41$, $p = 0.003$), and throughout admission ($R = 0.53$, $p < 0.001$).

Conclusions: Even in a methadone-based ERAS pathway, higher body mass index is associated with significantly higher postoperative opioid use. Our results suggest that while the ERAS pathway lowers postoperative opioid use for most patients, there is still a subset of patients who have higher narcotic requirements to achieve adequate pain control. In DIEP flap patients with higher body mass index, plastic surgeons should be mindful of the higher threshold for pain management when prescribing pain medications.

Discord Between Mastectomy and Breast Reconstruction Rates: A National, Racially-Stratified Analysis

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Purpose: Previous studies demonstrate a significant discrepancy in number of patients undergoing reconstruction following mastectomy when stratified by racial demographics. These

studies are mainly limited to patient populations up until 2014 and concluded that African American women were less likely to undergo reconstruction following mastectomy. To the best of our knowledge, this is the first study that examines racial discrepancies in patients undergoing mastectomy and reconstruction on a national level with a more recent patient population.

Methods: Using the Nationwide Inpatient Sample (NIS), adult female encounters were queried from 2012–2019. International Classification of Disease tenth edition, Clinical Modification (ICD-10-CM) procedure codes were used to identify those who underwent mastectomy and any subsequent autologous or implant-based breast reconstructions. Demographics and comorbidities were recorded. Discharge weights were used to extrapolate national estimates. Schapiro-Wilk, Wilcoxon-Mann-Whitney, and multivariable logistic regression tests were used for statistical analysis.

Results: 318,310 encounters (mean age 56.8 ± 13.9 years) met criteria having undergone mastectomy between 2012 and 2019. Of these, 167,310 (52.5%) underwent implant-based or autologous breast reconstruction. Minority women were less likely than White women to undergo reconstruction following mastectomy (OR 0.584 for Black women; OR 0.732 for Hispanic women; OR 0.564 for Asian or Pacific Islander women; OR 0.373 for Native American women; $p<0.001$), even after adjusting for hospital region and insurance type. Women who were enrolled in Medicare or Medicaid (OR 0.305, $p<0.001$) or who did not have insurance (OR 0.280; $p<0.001$) were much less likely to undergo reconstruction than those covered by private insurance. Women were more likely to undergo reconstruction in the Northeast than in the Midwest (OR 0.696), South (OR 0.773), or West (0.658)($p<0.001$). Those who underwent reconstruction were significantly younger (mean age 51.4 ± 10.8) than those who did not (mean age 62.8 ± 14.4) ($p<0.001$). Women with diabetes diagnoses were less likely to undergo reconstruction (OR 0.889; $p<0.001$), whereas women with a history of breast radiation were more likely to undergo reconstruction (OR 1.418; $p<0.001$).

Conclusion: Minority women who undergo mastectomy continue to receive reconstruction at a significantly lower rate than their White counterparts, a trend that has propagated over time. Additional work is needed to address the underlying reasons as to why this gap in postmastectomy care exists.

Do ADMs Improve Aesthetics in Implant-based Breast Reconstruction?

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Background: Acellular dermal matrices (ADM) and synthetic meshes are routinely used in two-stage and direct-to-implant reconstructions. Numerous benefits have been reported with the use of ADMs in breast reconstruction including improved aesthetic outcomes as well as decreased capsular contracture rates and post-operative pain.[1] Increased infection rates, seroma, hematoma, skin flap necrosis, and increased cost are the most reported complications with this approach.[2,3] A paucity of large studies exists on the effect of ADMs and synthetic meshes on aesthetic revisions rates for breast reconstruction.

Methods: We report a single institution's implant-based-reconstruction (IBR) experience between 2007 and 2020, including cases performed by 51 plastic surgeons. 1,643 patients (1,379 subpectoral, 264 prepectoral) underwent immediate tissue expander or permanent implant-based reconstruction following therapeutic or prophylactic mastectomy. For each stage of IBR, data on age, comorbidities, type of mesh used, and acute complications that required reoperation were tabulated. Total aesthetic reoperations recorded included revisions for asymmetry, contour issues, capsular contracture, and scar concerns.

Results: 1,379 (84%) underwent subpectoral IBR and 264 (16%) underwent prepectoral IBR. 937 patients had subpectoral IBR. Of these, 763 (55.3%) received ADM, 153 (11.02%) had Vicryl mesh, 22 (1.6%) had SERI, and 442 (32.1%) did not receive any type of mesh or ADM. By contrast, 256 patients underwent prepectoral IBR. Of these, 253 (95.8%) received ADM, 3 (1.1%) had Vicryl mesh and 8 (3.0%) had no mesh or ADM. Infection and wound dehiscence reoperation rates were highest for patients who underwent prepectoral IBR with a mesh or ADM (7.4%). Patients who had subpectoral IBR with a mesh/ADM had a higher rate of infection and dehiscence requiring reoperation than those who did not receive a mesh or ADM (7.26% vs. 4.07%, respectively, p=0.006). Prepectoral IBR with a mesh or ADM had the lowest rates of aesthetic revisions (2.34% risk of aesthetic reoperation). Capsular contracture rates requiring reoperation were lowest (2.34%) for patients who had prepectoral IBR with a mesh or ADM. Patients who underwent subpectoral IBR without either ADM or mesh had higher rates (8.37%) of capsular contracture compared to those who underwent subpectoral IBR with a mesh (5.76%).

Conclusion: This study evaluates the overall aesthetic reoperation rates associated with synthetic and biologic meshes used in IBR. Patients who received prepectoral IBR with mesh or ADM had the smallest number of revisions due to unfavorable aesthetic outcomes or capsular contracture. Revision rates were highest in subpectoral IBR. However, infection and wound dehiscence rates requiring reoperation were notably higher for patients who underwent prepectoral IBR with a mesh or ADM. Identifying risk factors contributing to reconstructive failure would help in patient selection for each of these options.

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Does the Final Implant Size Correlate with Complications? Putting Things into Perspective for a 2-stage Subpectoral Implant-Based Breast Reconstruction

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Purpose: Previous studies have shown that a larger implant size is a risk factors for complications in stage implant-based breast reconstruction (IBR). Nonetheless, implying that the implant size, as an absolute number, increases or decreases the incidence of complications would be impractical and inaccurate, as the preoperative breast size and inherent structural conformation of the breast envelope may play an important role. The aim of this study was to determine the effect of the definitive implant's size with respect to mastectomy specimen weight and final TE volume on the outcomes and complications following 2-stage IBR. Also, we determined the risk factors for complications after definitive implant placement

Methods: We evaluated the clinical outcomes for all patients undergoing total mastectomy and immediate subpectoral IBR between January of 2011 and December of 2020. Women aged 18 years and older undergoing immediate two-stage reconstruction with placement of a TE at the time of mastectomy were included. We evaluated if a higher implant size with respect to the mastectomy weight increased the risk of complications after definitive implant placement.

Results: 194 patients who underwent 324 reconstructive procedures using a 2-stage subpectoral approach were identified. The average age and BMI of patients were 52.56 years and 26.93 kg/m2 respectively. The average mastectomy weight was 591.702±323.75 g, the mean final tissue expander volume was 453.941±156 ml, and the definitive implant's size was 512.448±148.3cc. There was a positive correlation between the mastectomy weight and the volume of the definitive implant (r: 0.512, 95CI% 0.427-0.589, p<.001). Patients were followed for 47.9±28.5 months, on average. In non-irradiated breasts, capsular contracture was significantly higher in reconstructions that received a larger implant size with respect to the mastectomy weight (14.3%) versus reconstructions that had a smaller implant size with respect to the mastectomy weight (4.1%, p=0.003). In reconstructions that did not have simultaneous fat grafting during TE-to-implant exchange (SFG-TtE), capsular contracture was significantly higher in reconstructions that received a larger implant size with respect to the mastectomy weight (17.1%) versus reconstructions that had a smaller implant size with respect to the mastectomy weight (8.5%, p=0.048). On multivariate analysis, not using ADMs (OR 2.89,

p=0.023), radiotherapy (OR 5.398, p=0.002) and a longer follow-up (OR 1.018, p=0.009) were independent predictors for capsular contracture; while the implant volume (OR 1.003, p=0.007), SFG-TtE (OR 5.388, p<.001), radiotherapy (OR 5.951, p<.001), adjuvant chemotherapy (OR 2.083, p=0.028), and longer follow-up (OR 1.021, p<.001) were independent predictors for complications.

Conclusion: Although a large implant size does not increase the rate of implant removal or IBR failure, reconstructions receiving a larger implant with respect to the mastectomy weight have an increased rate of capsular contracture in non-irradiated breast or breasts that do not receive SFG-TtE. Overall, beyond the final TE volume, the implant's size, the nonuse of ADM's and adjuvant radiotherapy or chemotherapy were found to be independent predictors for overall complications.

Effect of Air vs. Saline Tissue Expanders on Post-Stage 2 Breast Reconstruction Outcomes

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Purpose: Intraoperative expansion with air versus traditional saline has been shown to be associated with fewer complications following stage 1 of two-stage breast reconstruction. However, the effect on post-stage 2 outcomes of using these different tissue expander (TE) mediums has not been well investigated.

Methods: A retrospective review was conducted of 69 patients (119 breasts) who underwent two-stage prepectoral breast reconstruction after mastectomy between 2017 and 2018 at our institution. All patients had air or saline-filled TEs in stage 1 and underwent implant-based reconstruction in stage 2. Anterior coverage with acellular dermal matrix was used in all cases. Opioid refills, breast pain, and complications within 30 days following stage 2 and length of time and number of office visits between stages were assessed. Complications evaluated included infection, dehiscence, hematoma, seroma, and fat necrosis.

Results: Of 69 patients, 47 (68.1%) received air fill and 22 (31.9%) received saline fill. Initial and final TE fill volumes were similar between study cohorts (p=0.576 and p=0.133, respectively). In multivariable regression analysis that adjusted for potential confounders (ASA III+, BMI, diabetes, hypertension, and smoking history), air-filled TEs were associated with significantly lower odds of opioid refills (aOR=0.21; p=0.008) and breast pain (aOR=0.15; p=0.003) during the 30-day period following stage 2 breast reconstruction. Air-filled TEs were also associated with significantly lower odds of overall complications (OR=0.15; p=0.033) in

univariate analysis during the same time period but had low statistical power (<0.8) in post hoc analysis due to rare incidence of post-stage 2 complications. The difference in length of time and number of office visits between stages was not statistically significant (p=0.322 and p=0.150, respectively).

Conclusion: The medium used for tissue expansion in stage 1 of two-stage breast reconstruction appears to impact post-stage 2 outcomes. Air-filled TEs may be associated with lower odds of post-stage 2 complications, but larger studies are needed to confirm this finding. In addition, while timing and office visits between stages do not appear to be affected, air-filled TEs were associated with significantly lower odds of opioid refills and breast pain.

Effects of COVID-19 on Mastectomy and Breast Reconstruction Rates: A National Surgical Quality Improvement Program Analysis

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Background: The COVID-19 pandemic profoundly impacted breast cancer treatment in 2020 by initially halting elective procedures. When surgeries resumed, guidelines encouraged less invasive surgical procedures and restricted breast reconstruction options. We examined the effects of COVID-19 on rates of oncologic breast surgery and breast reconstruction during the first year of the pandemic.

Methods: Using data from the National Surgical Quality Improvement Program (NSQIP), we performed an observational longitudinal examination of female breast cancer patients who underwent surgery from 2017–2020. We analyzed annual rates of lumpectomy, mastectomy (unilateral, contralateral prophylactic, bilateral prophylactic), and breast reconstruction (alloplastic and autologous) and compared the 2019 and 2020 breast reconstruction cohorts to evaluate the effect of COVID-19.

Results: From 2017–2020, 175,949 female breast cancer patients underwent lumpectomy or mastectomy with or without breast reconstruction. From 2019–2020, patient volume declined by 10.7%, unilateral mastectomy rates slightly increased (70.5% to 71.9%, p = 0.003), and contralateral prophylactic mastectomy rates decreased (26.7% to 25.7%, p = 0.003). While overall reconstruction rates were unchanged (46.6% to 46.7%, p = 0.859), tissue expander

reconstruction increased (64.0% to 68.4%, p<0.0001) and direct-to-implant (DTI) and autologous reconstruction decreased (DTI: 20.7% to 18.2%, p<0.0001; autologous: 15.2% to 13.4%, p<0.0001). Outpatient alloplastic reconstruction increased (65.7% to 73.8%, p<0.0001), and length of hospital stay decreased for all reconstruction patients (p<0.0001).

Conclusions: In 2020, the first year of the COVID-19 pandemic, there was a nearly 11% decline in breast cancer surgeries, comparable mastectomy and reconstruction rates, increased use of outpatient alloplastic reconstruction, and significantly reduced in-hospital time across all types of reconstruction. The impact of COVID-19 will likely continue to affect breast cancer surgery and reconstruction practice patterns for the foreseeable future.

Effects of Testosterone Therapy on Estrogen Signaling in the Transmale Mammary Gland

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Background: Although prior studies report lower rates of breast cancer for trans men on testosterone, the rate of breast cancer does not decrease to zero, even after mastectomy. There is conflicting information about testosterone's role on breast epithelial cells and breast cancer potential. Testosterone can be converted into either estrogen or dihydrotestosterone, which have opposite effects on breast epithelial proliferation. Estrogen signaling is important in this context as most breast cancer cases are positive for estrogen and progesterone receptors. We aim to use single cell RNA sequencing (scRNAseq) to study the effects of testosterone on estrogen signaling in the testosterone-treated trans breasts and impact on breast cancer risks.

Methods: Breast tissues were obtained from double-incision mastectomies and breast reductions. The tissues were enzymatically digested to obtain epithelial tissue microfragments (1) and cryopreserved. To perform scRNAseq, frozen epithelial tissues were thawed and digested to single cells, labelled with patient-specific barcodes (2), then pooled and sequenced using the Chromium (10X Genomics) and NovaSeq6000 (Illumina) sequencing platforms.

For immunofluorescence staining, the epithelial tissues were cryosectioned, then stained for ERa and PRa/b with Tyramide Superboost kits (Thermo) to assay estrogen signaling activity. Epithelial fractions were measured with cytokeratin-19. Slides were imaged on a Nikon spinning disk confocal microscope. Image segmentation was performed with Fiji and ilastik.

Results: We performed scRNAseq on tissues from seven patients on testosterone and seven not on testosterone. We performed immunostaining on tissues from eight patients on testosterone and 10 patients not on testosterone. Patients were of similar ages and BMIs.

Differential gene expression on hormone receptor-positive luminal epithelial cells showed that patients on testosterone have significantly decreased expressions of genes downstream of estrogen signaling ($p<0.05$).

Consistent with this trend, immunostaining also showed decreased expression of progesterone receptors in patients on testosterone ($p=0.012$). Because estrogen signaling upregulates progesterone receptors, the decreased expression of progesterone receptors further suggests decreased estrogen signaling in these patients.

Conclusion: Understanding the downstream effects of testosterone on breast epithelia will help direct breast cancer screening guidelines for trans men on hormone therapy. Our molecular analyses demonstrated that there is decreased estrogen signaling in the mammary epithelium of patients on testosterone, which may suggest a protective effect of testosterone against breast cancer. Additional analyses of these patients will be performed to confirm this trend.

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Elective Replacement of Shaped Textured Implants with Round Smooth Implants: Is it Worth it? An Evaluation of Patient- and Surgeon- Reported Outcomes in 530 Consecutive Cases

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Background: The number of patients undergoing exchange of shaped, textured implants for round, smooth devices has greatly increased in the setting of BIA-ALCL. To date, there are no published studies evaluating long-term outcomes following these replacements. The objective of this study is thus to examine long-term patient- and surgeon-reported outcomes in terms of aesthetics, comfort, and complications.

Methods: A prospectively collected database of all patients who underwent postmastectomy, implant-based reconstruction by a single surgeon (PGC) was analyzed. All patients who

underwent initial reconstruction with shaped, textured implants which were then replaced with round, smooth implants between 1994-2022 with a minimum follow-up of 1 year were included. Demographics and peri-operative complications (hematoma, cellulitis, seroma) were recorded. Patient-reported outcomes (PROs) were collected using the BREAST-Q Reconstruction Module as well as a 5-point Likert scale surveying aesthetic outcome and comfort level. The BREAST-Q is a PRO measure administered to all patients undergoing breast reconstruction at our institution at the pre-operative visit followed by 3 months, 6 months, 1 year, 2 years, and 5 years post-operatively. Patients who had scores at least one year post-operatively were included. The following domains were evaluated in this study: Satisfaction with Breasts, Psychosocial Well-being, Physical Well-Being (Chest), and Sexual Well-Being. Values were converted to summary scores ranging from 0-100, and a difference of 4 points was considered clinically significant. Surgeon-reported outcomes included evaluation of aesthetics using a 5-point Likert scale and Baker classification of capsular contracture.

Results: In total, 530 patients were reviewed and 307 met inclusion criteria with a mean age of 46 and mean BMI of 23.25. Mean follow-up was 3.8 years. 74% of cases were bilateral and 22.8% had a history of radiation. Pairwise comparison of BREAST-Q data demonstrated statistically significant, long-lasting improvement in all domains. At one-year follow-up after exchange of shaped, textured implants to round, smooth implants, psychosocial well-being (72.68 to 76.45; p=0.0075) and physical well-being (78.79 to 81.88; p=0.0078) significantly increased. Overall breast satisfaction (61.94 to 67.27; p=0.0082) and sexual well-being (53.89 to 57.98; p=0.0002) were also significantly higher in parallel with a clinically significant increase in BREAST-Q score of 5.33 and 4.09 points, respectively. Most patients felt they looked better (56.4%) or the same (27.3%) and were more comfortable (54.4%) or the same (39.4%) after the exchange procedure. The senior surgeon rated 40.1% of patients as a better aesthetic grade after replacement and 50.3% as the same aesthetic grade. 36.8% of patients were rated as having a decrease in Baker capsular contracture grade and only 4.3% with increased contracture. 2.9% of patients experienced a peri-operative complication and there were no reconstructive failures. Conclusion: Exchange of textured to smooth implants is safe, does not appear to sacrifice aesthetic outcome, and provides a more comfortable and satisfactory outcome for patients with a low rate of complications. These results should be given consideration when counseling patients with textured implants and can aid in making an informed decision regarding exchange.

ERAS(ing) the Pain: Predicting Narcotic Requirements in ERAS Pathway DIEP Flap Breast Reconstruction

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Background: Inadequate postoperative pain relief places patients at risk for increased morbidity, including surgical complications and chronic postoperative pain. Previously we have shown that a methadone-based Enhanced Recovery After Surgery (ERAS) pathway significantly decreased postoperative opioid use in deep inferior epigastric perforator (DIEP) flap patients. Even after the implementation of an ERAS protocol, patient narcotic requirements are still variable. This study aims to evaluate patient characteristics that may likely lead to higher narcotic requirements following DIEP flap breast reconstruction using a methadone-based ERAS pathway.

Methods: This is a prospective study of a consecutive series of patients who are undergoing or have undergone DIEP flap breast reconstruction with two attending plastic surgeons at a single tertiary care institution between April 2021 and January 2022 using a methadone-based ERAS pathway. The ERAS protocol included a single dose of intraoperative weight-based methadone and specific management guidelines, such as patient education, medication optimization, and fluid management. The ERAS pathway was strictly adhered to for all patients. Multivariate regression analysis was performed to compute associations between patient characteristics and postoperative opioid use at 12 hours postoperatively, 24 hours postoperatively, and throughout admission.

Results: Over the 10-month period, 51 patients underwent DIEP flap breast reconstruction in the methadone-based ERAS pathway. The average opioid usage was 11.17 morphine milligram equivalents at 12 hours postoperatively, 38.69 morphine milligram equivalents at 24 hours postoperatively, and 79.98 morphine milligram equivalents throughout admission. At 12 hours postoperatively, body mass index was a positive predictor of higher narcotic requirements ($p = 0.02$). At 24 hours postoperatively, age was negatively correlated with narcotic use ($p = 0.03$) while body mass index continued to be a positive predictor of narcotic use ($p = 0.01$). Overall, throughout the entire hospital stay, higher age was a negative predictor ($p = 0.01$) while higher body mass index was a positive predictor of narcotic requirements ($p < 0.001$).

Conclusions: In a methadone-based ERAS pathway, higher body mass index was a positive predictor or narcotic requirements at all time points postoperatively. Age was a negative predictor of narcotic requirements beginning 48 hours postoperatively. Our results suggest that patients with higher body mass index should be closely monitored for adequate pain control postoperatively given their higher narcotic needs. In contrast, in older patients, it may be prudent to start at a lower dose of postoperative pain regimen to avoid excessive analgesic use.

Erector Spinae Plane Nerve Block Catheters Decrease Hospital Length of Stay for Autologous Breast Reconstruction Patients

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Background: Patients undergoing autologous breast reconstruction require intensive post-operative care and often spend multiple days in the hospital after their reconstruction. Adequate pain control can expedite the process of patients working with therapy, ambulating, and physically or mentally feeling more confident at time of discharge. This in turn assists the hospital with resource allocation and associated costs to the patient. The erector spinae plane (ESP) nerve block was first introduced in 2016 and has shown to decrease postoperative opioid use and subjective pain scores in breast and thoracic surgery patients. (1) We hypothesize that erector spinae plane nerve block catheters contribute to a shorter total length of stay in the hospital for patients undergoing autologous breast reconstruction.

Methods: A retrospective review of patients treated with autologous breast reconstruction at our institution was performed. Patients were then categorized as having ESP nerve block catheters placed or not. All patients' length of stay was then collected. Mann-Whitney comparison tests were run to analyze the ESP cohort against the non-block cohort.

Results: A total of 85 patients underwent autologous breast reconstruction between December 2015 and June 2021. 50 patients received ESP nerve blocks and had a median length of stay of 3 days, whereas 35 patients did not receive ESP nerve blocks and had a median length of stay of 4 days ($p = 0.0002$). Demographic factors including age and BMI were analyzed between both cohorts and found to be not significantly different.

Conclusion: ESP nerve blocks are a relatively new technique for post-operative pain control and their use is still being explored. Our study shows that patients that underwent ESP nerve blocks after autologous breast reconstruction had a shorter median length of stay.

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Establishing the Oncologic Safety of Prophylactic Nipple-Sparing Mastectomy

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Background: Nipple sparing mastectomies (NSM) have become widely available for breast cancer prophylaxis. A select number of studies have demonstrated low rates of complications and no regional occurrences of malignancy with prophylactic NSM in patients with short term follow-up ranging from 2-3 years6-7. However, limited data exists on the oncologic safety of prophylactic NSM with longer follow-up intervals. There is concern that this remaining tissue posterior to the nipple-areola complex can serve as a future nidus for breast cancer development, particularly as patients receiving prophylactic mastectomies typically are at a heightened risk for breast cancer development.8-10. The objective of this study was to report the largest cohort to date examining the incidence of breast cancer in patients who underwent prophylactic NSM.

Methods: All patients undergoing prophylactic NSM at a single institution from 2006-2019 were retrospectively reviewed. Therapeutic mastectomies, defined as patients with known or suspected malignancy as indicated by a pre-operative biopsy indicating a breast cancer or im-aging suggestive of breast malignancy, were excluded. Patient demographic factors, genetic predispositions, mastectomy specimen pathology, and oncologic occurrences were recorded. Descriptive statistics were performed where necessary to classify demographic factors and oncologic characteristics.

Results: A total of 871 prophylactic NSMs were performed on 641 patients. Mean and median follow-up was 84.0 ± 31.5 and 82.0 months (standard error 1.24), respectively. Average age at the time of NSM was 46.0 ± 9.7 years while average current age of patients was 53.1 ± 10.3 years. Mean body mass index was 23.9 kg/m2. The majority of patients underwent bilateral NSMs (94.4%), though only the prophylactic mastectomy side was considered in the present study. Nearly a quarter (23.7%) of patients were current smokers or had a previous history of smoking at the time of mastectomy. A total of 19 patients (3%) had prior radiation and 50 patients (7.8%) had received prior chemotherapy. Known genetic predispositions were present in 43.7% of patients, with BRCA1 present in 24.2% of patients and BRCA2 present in 15.9% of patients. Other mutations identified included CHEK2 (1.2%), PALB2 (0.6%), and TP53 (0.6%). The majority of prophylactic mastectomies specimens had no identifiable pathology present (69.6%). Atypical lobular hyperplasia (9.5%) and lobular carcinoma in situ (9%) were the most frequently observed histologies on examination. A total of 38 (4.4%) mastectomy specimens had cancer identified in pathologic analysis with the most frequent histology being ductal carcinoma in situ (n=35, 92.1%). Intra-operative frozen subareolar biopsies were sent in the majority of mastectomies (68.6%). Five frozen sections were positive for atypia or cancer (0.9%) while 12 patients had sub-areolar tissue that was positive on permanent pathology for either atypia or cancer. Eight patients (1.2%) required nipple-areola complex resection. The total incidence of breast cancer occurrence following prophylactic mastectomy was 0.11% (n=1) per breast and 0.16% (n=1) per patient.

Conclusions: Overall primary oncologic occurrence rates are very low in high-risk patients undergoing prophylactic NSM. Continued surveillance for these patients remains important to assess at longer follow-up intervals.

Evaluation of Morphometric Measurements on Pre-Operative CT Angiograms to Determine Risk of Abdominal Donor Site Complications- A Retrospective Review of 174 Patients

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Purpose: Abdominally based autologous breast reconstruction remains a popular surgical option following mastectomy; however, it is not without complications, particularly at the abdominal donor site.1,2 Pre-operative CT angiograms (CTAs) are often obtained for surgical planning. Patient morphometric data, such as fat and muscle distribution, can be measured using these scans.3,4 The purpose of this study was to assess if patient CTA morphometric data predicts abdominal donor site complications in patients undergoing abdominally-based autologous breast reconstruction.

Methods: A retrospective cohort study was performed for all patients who underwent abdominally-based autologous breast reconstruction from January 2013 to December 2018 at a single institution. Along with population characteristics and operative factors, morphometric variables from pre-operative CTAs were assessed for the following: total volume subcutaneous adipose tissue, total volume visceral adipose tissue, the ratio of subcutaneous to visceral adipose tissue, skeletal muscle area and index, rectus and psoas cross-sectional area, and bone density. Statistical comparison of these variables with abdominal donor site complications was performed using logistic regression analysis for every 100-unit change.

Results: A total of 174 patients were included in this study. Overall, 48 patients (27.6%) developed delayed abdominal wound healing, thirty patients (17.2%) developed postoperative abdominal infections, twelve patients (6.9%) developed epidermolysis, five patients (2.9%) developed hematomas, and nine patients (5.2%) developed seromas. No CTA variables were significantly associated with delayed abdominal healing. Visceral adipose tissue was significantly associated with development of infection ($p= 0.005$), epidermolysis ($p= 0.031$), and seroma ($p= 0.04$) postoperatively. Subcutaneous adipose tissue, the ratio of subcutaneous to visceral adipose tissue, skeletal muscle index, cross-sectional muscle area, and bone density were not associated with abdominal donor site complications. Obesity (BMI>30.0 kg/m2) ($p=0.024$), history of smoking ($p=0.049$), and the number of perforators harvested ($p = 0.035$) significantly increased the likelihood of delayed abdominal healing. The average follow-up time was 882.1+643.4 days.

Conclusions: This study demonstrates that increasing visceral adipose tissue, as measured by CTA, is significantly associated with an increased risk of abdominal donor site complications,

specifically abdominal infection, epidermolysis, and seroma, in patients undergoing abdominally based autologous breast reconstruction. CTA morphometric data, along with the identification of high-risk patient characteristics, can help guide preoperative counseling and better inform patients regarding surgical risks.

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Evaluation of Xenograft Efficacy in Immediate Prosthesis-Based Breast Reconstruction

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Introduction: The advent of acellular dermal matrix (ADM) has revolutionized prosthesis-based breast reconstruction, conferring soft tissue reinforcement to the mastectomy skin flap. However, paucity of human cadaveric tissue has resulted in limitation of supply and increased associated costs, prompting concerted effort to identify alternatives to human ADM, such as xenograft surgical adjuncts, to minimize cost burden to the patient and institution, while maintaining adequate soft tissue support. Although various studies have examined the safety of Artia, a porcine-derived ADM, in prosthesis-based breast reconstruction, few studies have evaluated its clinical efficacy as soft tissue reinforcement. This study uniquely compares clinical efficacy of Artia with AlloDerm, a commonly used human-derived ADM, by examining objective

parameters of initial tissue expander (TE) fill volume at the time of mastectomy, number of TE fills, and time interval between exchange of TE for final implant.

Methods: IRB approved retrospective chart review was conducted to identify 273 consecutive TE-based procedures performed at a tertiary academic medical center between March 2017 and March 2021. Of these, 89 cases utilized Artia and 184 utilized AlloDerm. Univariate and binomial logistic regression analyses were conducted to compare patient characteristics and clinical endpoints between Artia and AlloDerm groups.

Results: Patients who underwent Artia-based breast reconstruction achieved comparable initial TE fill volume relative to those who underwent AlloDerm-based breast reconstruction (335 ± 198 mL versus 289 ± 158 mL, $p = 0.10$) and similar time interval to TE-implant exchange (232 ± 124 days versus 242 ± 131 days, $p = 0.70$) via univariate analysis. However, patients who underwent Artia-based reconstruction experienced fewer number of tissue expansions (3.92 ± 2.97 fills versus 4.99 ± 2.98 fills, $p < 0.01$). When normalizing for final implant size, which serves as a surrogate for body composition, the Artia group exhibited significantly higher perioperative fill (0.65 ± 0.34 v. 0.49 ± 0.19, $p < 0.01$). Rates of explantation were higher in the AlloDerm group; however, when controlling for confounding variables, no statistical significance was observed following binomial regression analysis. Otherwise, rates of post-operative complication were similar among groups.

Conclusion: This study demonstrates efficacy of Artia as an alternative to human-derived ADM in immediate TE-based breast reconstruction. Demonstration of clinical efficacy of non-human cadaveric surgical adjuncts is of paramount importance to facilitate widespread acceptance of these materials and further decrease healthcare costs. This work, therefore, serves as a framework for future studies evaluating xenograft efficacy in breast reconstruction and can guide development of emerging biomaterials and techniques.

Expanding Surgical Options to Patients over 60: Safety of Immediate Breast Reconstruction following Nipple-sparing Mastectomy

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Purpose: While nipple-sparing mastectomy (NSM) and immediate breast reconstruction (IBR) have long been praised for excellent cosmetic results and the resultant psychosocial benefits, the feasibility and safety of these procedures in patients over 60 years of age has yet to be demonstrated in a large population. We present herein the comparison of complication rates in women over 60 compared to a younger cohort.

Methods: Patients undergoing NSM and IBR at MedStar Georgetown University Hospital between December 1998 and December 2017 were included in this IRB-approved retrospective cohort study. Patient demographics, surgical intervention, and complication events were retrieved from electronic medical records. Primary outcomes were complication rates by age groups over and under 60 years. Statistical analysis included chi-square, Fishers's exact, or student's t-test where appropriate.

Results: There were 652 breasts from 383 patients included in this study, with 51 (7.8%) over 60 years of age and 601 (92.1%) under 60 with overall mean follow-up of 5.42 (3.20) years. Age was significantly different by group [over 60 = 63.76 (3.27) years vs. under 60 = 43.17 (7.84) years, $p<0.001$). The over 60 group had significantly higher BMI, prevalence of diabetes, rates of therapeutic and unilateral NSM, and mastectomy weight. However, there were no significant differences by age group in overall complication rate, nor in individual rates of nipple-areolar complex or flap necrosis, implant loss or exchange, infection, wound dehiscence, unintended reoperation, or hematoma.

Conclusions: Based on similar complication profiles in both age groups, we demonstrate safety and feasibility of both NSM and IBR in the aging population. Despite increased age and comorbidity status, older women were able to achieve similar outcomes to younger women undergoing NSM with IBR. We conclude that patients over 60 who have historically been excluded from both procedures based on age are entitled to understand available options, particularly NSM with IBR for superior cosmetic outcomes. Prior studies have found that attitudes and feelings towards breasts do not dramatically change with age and that older women experience both improved quality of life and psychological wellbeing through NSM with IBR, further highlighting the importance of updating indications to offer these procedures to this population.[1,2] In all patients, surgeons should elicit discussions surrounding patient preferences for appearance, with older patients being counseled that they can expect similar rates of good outcomes and satisfaction that younger patients experience. Future investigations with larger populations are necessary to formally expand indications for both NSM and IBR to include traditionally marginalized populations and improve patient-centered outcomes.

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Modifiable Post-Mastectomy Radiation Therapy Factors and Impact on Breast Reconstruction Outcomes

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Purpose: Prior studies have demonstrated significantly higher reconstructive failure rates when implant-based breast reconstruction (IBBR) is followed by post-mastectomy radiation therapy (PMRT). Still, IBBR not only remains the most common whole breast reconstructive technique, rates of IBBR in the setting of PMRT are increasing. Intensity modulated radiation therapy (IMRT) is becoming more commonly used for PMRT. It allows for the delivery of a more conformal and relatively homogenous radiation dose to the target volume, minimizing higher doses to surrounding organs and tissues. IMRT and other modifiable radiation factors have been associated with decreased radiation toxicity and could theoretically allow for improved reconstructive outcomes. However, this has not yet been well-studied in breast reconstruction.

Methods: We performed a retrospective chart review of patients who underwent mastectomy with immediate tissue expander placement followed by PMRT at UCSF, with radiation occurring between 2016 and March 2021. Surgical and radiation characteristics were collected, including incision location, tissue expander plane, radiation technique, voltage modality, fractions of treatment, maximum radiation hot spot, and tissue volume receiving >105% or >107% of the prescription dose. Reconstructive outcomes were analyzed with respect to radiation technique and these modifiable radiation characteristics.

Results: 68 patients (70 breasts) were included in this study. The overall complication rate was 47.1%, with infection being the most common complication (30.0%), requiring removal of the tissue expander in greater than half of infections (15.7% expander loss rate). 29 breasts were treated with IMRT and 41 breasts were treated with 3D conformal radiation therapy (3DCRT). 38 breasts were treated with mixed voltage PMRT and 32 breasts were treated with low voltage PMRT. Six breasts received hypofractionated treatment and 64 breasts received conventional treatment. The average maximum radiation hot spot (expressed as a multiplier of the prescribed treatment dose) was 1.12 +/- 0.05, average tissue volume receiving >105% the prescription dose was 34.3 +/- 20.5%, and average tissue volume receiving >107% the prescription dose was 12.1 +/- 14.6%.

Patients with periareolar incisions compared to inframammary fold incisions had similar complication rates, as did patients with tissue expanders placed in the sub-pectoral compared to the pre-pectoral plane.

The maximum radiation hot spot was greater in patients who required explant of their tissue expander due to infection after PMRT, and this approached statistical significance (1.15 +/- 0.07

v. 1.11 +/- 0.03, p=0.059). The volumes of tissue receiving greater than 105% and 107% the prescription radiation dose were also markedly greater in patients who required explant after PMRT, but this was not statistically significant (42.1 +/- 17.1% v. 33.0 +/- 20.9%, p=0.18; and 16.4 +/- 14.5% v. 11.3 +/- 14.6%, p=0.31). There were no significant differences in complication rates between patients receiving IMRT v. 3DCRT, low modality v. mixed modality voltage, or hypofractionated v. conventional PMRT.

Conclusions: Minimizing the radiation hot spots and volumes of tissue receiving greater than the prescription dose of radiation may improve reconstructive outcomes in patients undergoing IBBR followed by PMRT.

Morbidity of the Donor site and Complication Rates of Breast Reconstruction with Autologous Abdominal Flaps: A Systematic Review and Meta-Analysis

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Background: Numerous studies have evaluated the use of autologous abdominal tissue for breast reconstruction; nevertheless, complications and donor-site morbidity rates vary significantly. The study aims to compare the literature regarding morbidity of the donor site and complication rates of breast reconstruction with autologous abdominal flaps.

Methods: The databases of PubMed, Scopus, and Web of Sciences were searched for studies that compared different flaps in terms of complications and donor-site morbidity. The procedures studied included pedicled transverse rectus abdominis myocutaneous flap (pTRAM), free TRAM (fTRAM), deep inferior epigastric perforator (DIEP), and superficial inferior epigastric artery perforator (SIEA) flaps. A total of 34 studies were included. Of these, 28 were retrospective studies, and 9 were prospective cohort studies.

Results: When compared to DIEP, fTRAM flaps were found to have a decreased incidence of flap fat necrosis, hematoma, and total thrombotic events, yet a higher risk of donor site hernia/bulging. pTRAM flaps were also associated with an increased risk of hernia/bulging at the donor site and surgical flap, as well as wound infection, yet flap hematoma was less common. On the other hand, SIEA flaps showed the lowest risk of donor site hernia/bulging while still having a high risk of wound infection.

Conclusion: fTRAM procedures comparatively had the least complications. However, regarding flap choice, patients would benefit most from a case-by-case analysis, taking into consideration individual risk factors and preferences.

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Exploring Infectious Complications Following Breast Reconstruction Tissue Expander Placement in Penicillin-Allergic Patients

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Introduction: In an effort to avoid anaphylaxis, penicillin-allergic patients are often given vancomycin or clindamycin as alternative perioperative antibiotics.1 In implant-based breast reconstruction patients, many of whom are at heightened risk for surgical site infections, it is prudent to evaluate the complication profile of those receiving alternative antibiotic coverage. Without additional risk factors for infection following breast reconstruction, the risk of infection is below 5%.2 However, seldom do studies consider patient allergies to penicillin a risk factor. When given via the intravenous route, it takes clindamycin 45 minutes to reach peak serum concentrations whereas it takes cefazolin 15 minutes to reach peak serum concentration.3,4 We hypothesize that patients who experience penicillin allergies experience increased infection rates with different speciation compared to their penicillin nonallergic counterparts because current recommendations do not facilitate sufficient time for the prophylactic antibiotic to reach peak concentration and efficacy.

Methods: This was a retrospective review of consecutive patients who underwent breast reconstruction with tissue expander placement between 1/1/2010 and 12/31/2018. Demographic data was collected, and the primary outcome of this study was development of infection. Infection-related complications were defined as those infections requiring re-admission for intravenous antibiotics or reoperation. Type of infection, culture speciation, treatment regimen, and time between operation and onset of infection were recorded. Other implant-based complications were recorded and analyzed including seroma, hematoma, wound dehiscence, mastectomy flap necrosis, capsular contracture, implant malposition, implant rupture, fat necrosis, premature tissue expander or implant explantation, and flap donor or recipient site morbidity.

Results: One-hundred fifty-three (153) patients were included in the review. Thirty-five (35) had a penicillin allergy and received alternative perioperative antibiotic coverage. Infection-related complications occurred in 45.7% of penicillin-allergic patients and 28.0% of those without penicillin allergies (p=0.048). Premature explantation of a tissue expander was performed in 25.7% of penicillin-allergic patients and 11.9% of controls (p=0.0441).

Conclusions: In this population, penicillin-allergic patients experience significantly higher rates of infection-related complications than patients without penicillin allergies. This may be due to decreased effectiveness of alternative regimens due to dose timing or the community specific antibiogram. This suggests inadequate antibiotic coverage by the alternative antibiotics most commonly used. There is a need for further reform of perioperative antibacterial guidelines to optimize outcomes in this patient population, whose oncologic therapy increases their infection risk from the outset of reconstruction.

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Female-Born Transgender Individuals Show Improvement in Several PROMIS Instruments After Undergoing Gender-Affirming Mastectomy

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Background: A population- and procedure-specific patient-reported outcome instrument is yet to be developed/validated for gender-affirming mastectomy (GAM). Patient-Reported Outcomes Measurement Information System (PROMIS) was developed to measure patient-reported health status for physical, mental, and social well-being in studied populations. In our study, we aimed

to measure perioperative changes in PROMIS scores of female-born transgender individuals (FBTIs) undergoing GAM.

Methods: Retrospective review of a single-institution, prospectively maintained database on FBTIs undergoing GAM was conducted, including sequential cases between October 2016 and October 2021. Demographics, hormone therapy status, and gender identity were collected. Patients were surveyed at the preoperative and at the 1-month, 3-month, and 6-month post-operative visits (PreV, POV1M, POV3M, POV6M). The survey included the following PROMIS instruments: Satisfaction with Social Roles and Activities (SSRA), Anxiety, Depression, Social Isolation, and Anger. All instruments had the US general population (US-GP) as their baseline population. Statistical analysis of PROMIS T-Scores was performed using Tukey-Kramer adjustment for multiple parameters. A Linear Mixed Effect Model was employed to accommodate both fixed and random effects from non-independence in the data with adjusted $p < 0.05$ being considered statistically significant. PROMIS T-Scores have a mean of 50 and standard deviation of 10. Clinical significance was defined as a change in PROMIS T-Score (ΔT-Score) greater than 3.

Results: A total of 122 sequential patients were included in the study. Average age was 23.7 years. Seven patients (5.7%) were non-binary, 111 (91%) received pre-operative hormonal therapy. The survey was completed by all 122 patients preoperatively and by 107 patients at POV1M (87.7%), 83 patients at POV3M (68.3%), and 58 patients at POV6M (47.5%). Preoperatively, patients performed clinically worse than the US-GP in SSRA, Depression and Anxiety. In the postoperative period, SSRA, Anxiety, Depression, Social Isolation and Anger demonstrated clinically- and statistically significant improvement at POV1M, POV3M and POV6M.

Conclusion: FBTIs undergoing GAM demonstrate clinically- and statistically significant improvement in PROMIS scores on SSRA, Anxiety, Depression, Social Isolation and Anger, persisting for at least 6 months after surgery.

Free Nipple Graft Breast Reduction, Is It Obsolete?

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Background: Reduction mammoplasty is one of the most common plastic surgery procedures conducted in the United States, with more than 33,000 procedures performed in 2020. It

improves the quality of life as well as the aesthetic appearance. There are several well-documented approaches to breast reduction, including inferior pedicle, superomedial, and breast reduction with free nipple grafting among other less used pedicles. Current practice favors a free nipple graft technique when the nipple-to-inframammary fold (N-IMF) distance is >15cm due to concerns that a longer pedicle may lead to an increased complication profile. However, few contemporary studies have evaluated the relationship between N-IMF distance and postoperative complication following inferior pedicle breast reduction mammoplasty.

Objective: Evaluate the relationship between N-IMF distance in inferior pedicle breast reduction, and postoperative nipple necrosis.

Methods: A retrospective analysis of procedures performed by a single surgeon at an academic institution was conducted. Patient eligibility for inclusion required inferior pedicle technique, complete documentation of pre-operative breast measurements (breast base width, N-IMF distance, and sternal notch to nipple (SN-N) distance), documented weight of resected breast tissue, and minimum post-operative follow-up of 3 months. Patients were excluded if they had undergone prior breast surgery. The primary outcome measured was incidence of post-operative complications characterized by any of the following: infection, wound dehiscence, or nipple necrosis. Statistical analysis was performed utilizing Fisher's exact test with bivariate analysis, with a p-value < 0.05 set for significance.

Results: A total of 84 patients (152 breasts) were identified from 2013 to 2021. The mean breast base width was 14.4 cm (standard deviation [SD]: 1.2; range [r]: 13.0-17.0), the mean sternal notch to nipple (SN–N) distance was 35.1 cm (SD: 4.2; r: 23-48), the mean mid-clavicle to nipple (MC-N) distance was 35.0 (SD: 4.7; r: 23.0-49.0), and the N-IMF distance was 17.2 cm (SD: 3.3; r: 7.5-28.0). The mean resection weight was 736.3g (SD:412.6; r: 505.0-2,028.0). The overall nipple areolar complex necrosis rate was 0.7%; the overall complication rate was 8.6%. As both resection weight and SN-N distance increased, there was a marked increase in the rate of overall complications ($p = 0.03$ and $p = 0.001$ respectively). However, no significant correlation between increasing N-IMF distance and rate of complication was measured ($p = 0.06$).

Conclusion: Our data demonstrates no difference in postoperative complications in patients with N-IMF distances >15cm, suggesting that the inferior pedicle approach is a safe alternative to free nipple grafting in patients with severe symptomatic macromastia undergoing breast reduction mammoplasty. The finding of only 1 breast developing nipple necrosis may suggest that the inferior pedicle breast reduction is a safe approach in preserving the nipple, obviating the need for free nipple grafting in reduction mammoplasty.

Gender Affirming Top Surgery in Trans Male Patients: A Review of 1921 Consecutive Outpatient Bilateral Mastectomies in Regards to Surgical Technique and Outcome as well as Patient Reported Psychosocial Outcomes

Abstract Presenting Author:
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Purpose: The author will present his surgical technique and outcomes for the largest cohort of male to female top surgery published to date. He will also present results of a prospective questionnaires sent to a subset of his patients assessing their pre and post operative satisfaction following the gender affirming mastectomies.

Methods: The author reviewed his database of 1921 bilateral mastectomies performed on transgender males from 2011 to 2021. Data collected included patient demographics, surgical technique utilized, post operative complications and revision rate. Two main techniques were used with two subsets. The first was double incision with free nipple grafting, the nipple either included with the areolar graft if small or taken as as separate graft if too large. The second was peri-areolar approach with subcutaneous mastectomy either by partial areolar edge incision or complete circumareolar incision with closure by purse string mastopexy. Also evaluated was a prospective assessment survey of pre and post operative lifestyle and satisfaction with the surgery. Survey items were statistically validated.

Results: Between 2011 and 2021 the author performed bilateral mastectomies on 1921 trans men. 78% or the surgeries were double incision mastectomies with free nipple grafting and the remaining 22% were subcutaneous mastectomies via a peri-areolar approach. All surgeries were performed in the outpatient setting under general anesthesia with adjunctive tumescent technique local anesthesia to limit blood loss and ease post-operative pain. All patients also underwent concomitant liposuction of the central and lateral chest and pre-axillary region to further define the chest musculature. No patients needed to be admitted overnight. No patients required transfusion or were ever hospitalized for post-operative infection. Hematoma rate was approximately 3%. In the first 5 years of the study large hematomas were evacuated in the OR and the patient sent home following evacuation. In the subsequent 5 years all hematomas were treated with ice and compression and then successfully evacuated under local via 4mm liposuction cannula in an office procedure room 5 days later. In regards to the survey, there were statistically significant improvements post-operatively in patient satisfaction with chest shape, symmetry, and overall appearance, with and without clothes. 98% of patients were either satisfied or very satisfied with the procedure and 95% would encourage individuals in similar circumstances to undergo the surgery.

Conclusion: The author presents the largest cohort of gender affirming trans masculine double mastectomies. His outcomes are comparable to the literature and demonstrate that these procedures can and should be performed on an outpatient basis. The survey results indicate that for the vast majority of these patients the operation was a positive life changing event. In these times of increasing politicization of transgender care, it is imperative that we as plastic surgeons present data to inform our colleagues and the public of the safety and positive effects of gender affirmation surgery in the trans population.

Herniated and Pseudoherniated Nipple Areola Complex - Diagnosis and Treatment

Abstract Presenting Author:
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Introduction: Herniated or pseudoherniated nipple areolar complex (NAC), also called protuberant or "domed nipple" is an entity that can be present both in males and females and represents a therapeutic challenge. [1] It can be an isolated deformity, but in most cases is found within another breast deformity, such as tuberous breast or can appear following pregnancy. Its diagnosis and appropriate treatment become important when patients search for correctional breast surgery. [2,3]

Purpose: The aim of this study was to determine the right etiology of the protuberant NAC, diagnose it properly and choose the right type of treatment.

Method: We performed a retrospective study that included all patients operated from December 2013.-December 2021. We reviewed existing techniques which in addition to our personal experience helped us to create an algorithm to assist surgeons in this matter. The simplified algorithm could be helpful if there is a suspicion of herniated or pseudoherniated NAC. [Fig. 1.]

Results: A total of 125 patients with herniated or pseudoherniated NAC were treated. There were 87 women and 38 men. The average age of the patients was 30,8±8.1 years (ranging from 20 to 63). We analyzed the results of four following techniques: periareolar mastopexy (52 patients), release of fibrous tissue in combination with lipofilling (19 patients), resection of herniated breast tissue (23 patients) or controlled electrocoagulation of relaxed erectile muscle (31 patients). The minimal follow up for all cases was 4 months. We present the indications, technique, and complication rates for each suggested treatment.

Conclusion: The achievement of a successful aesthetic result is possible in a single-stage procedure with initial surgery. It depends on careful individual preoperative evaluation of anatomical features and a surgical approach chosen accordingly.

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Hospital Discharge After 24-48 Hours is Safe and Effective in Appropriately Selected Patients Undergoing Free Flap Breast Reconstruction

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Background: Enhanced recovery after surgery (ERAS) protocols after microsurgical breast reconstruction have improved quality of care and reduced hospital stays. Despite this, average length of stay remains over 3 days. We have found, in appropriately selected patients, that hospital length of stay can be safely reduced to less than 48 hours.

Methods: Retrospective chart review was performed of patients undergoing microsurgical breast reconstruction by the senior author (MH) from April 2019 to December 2021. Data collected included demographics, operative details, length of stay, and post-operative complications. Complications are reported to assess for safety of discharge within 48 hours, with the primary outcome measure being flap loss.

Results: In total, 188 flaps were performed on 107 patients. Average age was 51.4 years (SD 10.1 years) with average BMI 26.6 (SD 4.8). Average hospital stay was 1.98 days (SD 0.61 days) and 96 patients (89.7%) were discharged within 48 hours. Six flaps (3.2%) required operative takeback with one flap loss (0.5%). Five of the six (83.3%) takebacks occurred on post-operative days zero or one and all five of these flaps were salvaged. The one flap that was lost presented in delayed fashion on post-operative day six. With regard to other complications, there were four breast hematomas (2.1%), four breast seromas (2.1%), eight breast infections (4.3%), 13 breasts (6.9%) with wound dehiscence, four partial flap losses (2.1%), and 24 breasts (12.8%) with mastectomy flap necrosis.

Conclusion: Hospital discharge in 24-48 hours is safe in appropriately selected patients undergoing autologous tissue breast reconstruction.

How Big Is Too Big? Predicting Breast Skin Necrosis Using Clinical Measurements

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Background: Mastectomy skin flap necrosis can lead to poor healing, re-operation, and unaesthetic reconstructive outcomes. Further, the prolonged recovery can delay important adjuvant oncologic regimen for cancer patients. Previous studies have shown that larger resection specimens are associated with increased rates of necrosis. This study aims to explore the role of breast surface area as an independent risk factor for mastectomy skin flap necrosis and identify predictive clinical measurements.

Methods: The authors retrospectively identified patients who underwent immediate breast reconstruction (n = 926 breasts) by two surgeons at a single tertiary care institution between 2011 and 2021. Preoperative breast measurements such as nipple-notch distance, nipple-inframammary fold distance, chest width, breast circumference, and breast height were used to estimate breast surface area. Univariate analysis and receiver operating characteristic curves were used to determine predictive measurements and optimal cutoff values.

Results: When approximated using either a cone without base or a half ellipsoid, larger surface area was a significant risk factor for mastectomy skin flap necrosis ($p = 0.027$ and $p = 0.022$, respectively). Larger measurements for nipple-notch distance, nipple-inframammary fold distance, chest width, breast circumference, and breast height were positive predictors of necrosis ($p < 0.05$ for all). On receiver operating characteristic curve analysis, surface area (cone without base) > 212 cm2, surface area (half ellipsoid) > 308 cm2, nipple-notch distance > 27 cm, nipple-inframammary fold distance > 8.5 cm, chest width > 15 cm, breast circumference > 29 cm, and breast height > 10.5 cm are associated with increased incidence of mastectomy flap necrosis. Of the five measurements, area under curve was greatest for chest width (AUC = 0.67).

Conclusions: Larger breast surface area is an independent risk factor for mastectomy skin flap necrosis. Pre-operative breast measurements can be a useful adjunct for predicting necrosis in post-mastectomy patients. Of the five clinical measurements, chest width has the greatest predictability with the largest area under the receiver operating characteristic curve. In these high-risk patients, intraoperative skin flap viability assessment using laser angiography should be considered to determine which skin can be removed and when skin ischemia protocols should be utilized. In instances when this technology is not available, it may be prudent to offer these patients delayed reconstruction.

How Many Operations Does It Take to Rebuild a Breast?

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Background: Implant-based breast reconstruction (IBR) remains the most common reconstructive approach following mastectomy. Data is conflicting on the risk of acute

complications with prepectoral and subpectoral implant placement. Identifying risk factors associated with increased postoperative complications is vital to successful breast reconstruction. Surgical success is often gauged by absolute rates of postoperative complications such as infection, wound complications, and capsular contracture. There is a paucity of data that evaluates the rates and indications of unplanned reoperation following post-mastectomy IBR. We sought to determine the rates of unplanned reoperation following post-mastectomy IBR at a large community academic medical center and focused on a variety of factors such as breast implant plane, body mass index, age, and post-mastectomy radiation status to determine factors that altered the odds of unplanned reoperation for a given patient.

Methods: We report a single institution's IBR experience between 2007 and 2020, including cases performed by 51 plastic surgeons. 1,643 patients underwent immediate tissue expander or permanent implant-based reconstruction (1379 subpectoral and 264 prepectoral) following therapeutic or prophylactic mastectomy. For each stage of IBR, data on age, body mass index, radiation status, tumor characteristics, reoperation, and indications for reoperations were tabulated.

Results: 1379 patients underwent subpectoral IBR (median age = 57 years, median BMI = 24.1 kg/m2) and 264 underwent prepectoral IBR (median age = 52, median BMI = 24.2 kg/m2). Infection and healing complications requiring reoperation trended higher for prepectoral IBR (5.8% vs 4.6% for subpectoral, $p > 0.05$), and higher BMI patients (BMI > 24.2 kg/m2: 6.3% vs. BMI < 24.2 kg/m2: 2.5% $p < 0.001$). The highest rates of these complications occurred in prepectoral IBR patients with BMI > 24.2 kg/m2 and the lowest rates in subpectoral patients with BMI < 24.2 kg/m2 (7.6%, 2.5%, $p = 0.01$). Additionally, unplanned reoperation rates due to infection and wound complications were highest in patients who underwent radiation and had prepectoral IBR (7.6%). Higher rates of aesthetic reoperations occurred in subpectoral IBR with radiation (11.4%) in comparison to prepectoral IBR with radiation, where the rate hardly increased at all (1.3%) ($p<0.05$). Unplanned reoperation rates trended higher for subpectoral IBR compared to prepectoral IBR (63.0% vs. 41.0%). Similarly, aesthetic revisions trended higher for subpectoral IBR compared to prepectoral IBR (9.7% vs. 1.2%; $p<0.05$).

Conclusion: Prepectoral IBR and high BMI were associated with higher rates of reoperation due to infection and wound complications, particularly after radiation therapy. BMI was the most important factor predicting reconstructive failure. Patients who underwent prepectoral IBR had fewer aesthetic revisions compared to subpectoral IBR, regardless of radiation status. Patients who underwent subpectoral IBR had higher rates of unplanned reoperation compared to prepectoral IBR. BMI and radiation status should be considered in the discussion of risk factors associated with different IBR techniques.

HyPAD: Hybrid Microsurgical Breast Reconstruction with Flap and Stacked Prepectoral Acellular Dermal Matrix

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Background: Conventional reconstructive options for patients following mastectomy have been limited to autologous reconstruction, an implant-based approach, or more recently a combination of the two in those with insufficient flap volume (1). With the latter two options, however, patients are still disadvantaged by existing limitations and complications of saline or silicone implants (2). The authors propose an innovative alternative described as the Hybrid Flap, Prepectoral Acellular Dermal Matrix (HyPAD) technique.

Methods: Initial patients who underwent hybrid microsurgical reconstruction with flap and stacked prepectoral acellular dermal matrix were reviewed. In lieu of an implant, ADM is folded onto itself and secured in the pre-pectoral position, immediately posterior to the free flap. Patient demographics, flap and ADM weights, and complications were noted.

Results: Nine consecutive patients underwent the HyPAD technique. All patients had insufficient flap volume (average BMI = 25) and desired implant avoidance. The majority of patients (8/9) had been treated for breast cancer, with some patients requiring neoadjuvant chemotherapy (n=2), adjuvant chemotherapy (n=2), and adjuvant radiation therapy (n=2). The average mastectomy specimen weight was 428.1g, while flap weight was 345.6g. The average ADM weight was 98.7g. There were no cases of seroma, infection, ADM loss, or need for additional surgery. Two patients did have partial mastectomy skin flap necrosis that was managed conservatively in the office with local wound care.

Conclusion: ADM is malleable and provides a benefit in patients who lack adequate adiposity for flap only breast reconstruction. It enhances the breast core projection and control of the inferior pole, improving the aesthetic outcome. Given its safety, longevity, and low complication rates, the authors recommend the HyPAD technique as a promising alternative to implant-based or hybrid flap and implant reconstruction in the appropriate patient.

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Hyperbaric Oxygen Therapy for Threatened Nipple-Sparing Mastectomy Flaps: An Adjunct for Flap Salvage

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Background: The established oncologic safety, increased patient satisfaction, and superior aesthetic outcomes compared to traditional skin-sparing mastectomy has led to an exponential increase in nipple-sparing mastectomy (NSM) over the past decade. However, due to increased perfusion requirements of the additional skin envelope and nipple-areolar complex (NAC), ischemia or necrosis of the NAC or mastectomy skin flap is a frequent complication reported in up to 30% of patients. Hyperbaric oxygen therapy (HBOT), well-established in the treatment of chronic wounds, has emerged as a potential adjunct to improve blood flow and oxygenation to threatened flaps. However, although there is some emerging data supporting its use, it is generally limited to isolated case reports and its use is currently not a widely-accepted practice. Here we review our institution's experience using a protocol of HBOT in patients with early signs of flap ischemia/necrosis following NSM.

Methods: Retrospective review identified all patients treated with HBOT at our institution's hyperbaric and wound care center due to signs of ischemia following NSM. Treatment parameters consisted of 90-minute dives at 2.0-atm once or twice daily. Patients unable to tolerate dives were considered a treatment failure, while those lost to follow-up were excluded from analysis. Patient demographics, surgical characteristics, and treatment indications were recorded. Primary outcomes assessed were flap salvage (defined as no operative revision), need for revision procedures, and treatment complications

Results: 28 patients met inclusion criteria, of which 11 were lost to follow up, 16 completed their prescribed course, and one was aborted due to severe sinus pain. Mean time to treatment from surgery was 9.47±12.7 days with an average of 19.4±10.7 dives per patient. Mean age was 46.7±10.4 years with a mean follow up of 35.6±25.6 days. None of the patients had diabetes, one was a former smoker (5.9%), and two received pre-operative radiation therapy (11.7%). NSM indications included invasive cancer (41.2%), DCIS or LCIS (29.4%), and prophylactic mastectomy (29.4%). The most common post-mastectomy reconstruction was tissue expander (TE) placement (47.1%), followed by deep inferior epigastric perforator (DIEP) flap (29.4%) and direct-to-implant reconstruction (23.5%). Of patients referred for HBOT, 9 (52.9%) had partial necrosis of the mastectomy or nipple-areolar complex (NAC) flap, while the remaining 8 patients (47.1%) had early signs of ischemia.
Flap salvage was achieved in 14/16 patients (87.5%) who completed their prescribed courses. In the patients with unsuccessful salvage, revision procedures included one TE removal followed by a two-stage DIEP flap reconstruction with implant augmentation and one mastectomy debridement with NAC reconstruction. Three patients (17.6%) suffered from mild ear pain but completed treatment, while one patient had severe sinus pain leading to treatment abortion (5.9%).

Conclusion: NSM is an invaluable tool for breast and plastic surgeons to achieve oncologic and cosmetic goals with appropriate patient selection. However, ischemia or necrosis of the NAC or mastectomy skin flap remains a frequent complication. HBOT has emerged as a possible intervention for threatened flaps. Our case series demonstrates the utility of HBOT in this population of patients to achieve excellent NSM flap salvage rates.

Immediate Prepectoral Tissue Expander Breast Reconstruction Without ADM is Equally Safe in Both Skin-Sparing and Nipple-Sparing Mastectomies

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Purpose: Recent data demonstrates that prepectoral breast reconstruction without acellular dermal matrix (ADM) can yield favourable outcomes and substantial health care savings. However, when relying exclusively on the mastectomy skin flap to support the prosthesis the theoretical risk of complications in immediate breast reconstruction rises, particularly in nipple sparing mastectomy (NSM) compared to skin sparing mastectomy (SSM). This study aims primarily to compare surgical outcomes of immediate prepectoral breast reconstruction with tissue expanders without ADM in NSM compared to SSM.

Methods: A retrospective chart review was performed on consecutive patients who underwent NSM or SSM with immediate prepectoral tissue expander placement, without ADM, at our institution from June 2020 to June 2021. Patient demographics, mastectomy and reconstructive characteristics, and 90-day postoperative complications are reported. A regression analysis was completed to correlate risk factors to complications.

Results: Fifty-seven breasts (46 patients) were included in this study. There were no statistically significant differences in demographics between the NSM and SSM. Mastectomy weight and tissue expander size were both greater, on average for the SSM group ($p = 0.001$, and $p = 0.015$ respectively). Overall complications were 23.2%, which compared well to published outcomes for prepectoral breast reconstruction with ADM. There were no statistically significant differences in the total or individual complications assessed between the NSM (28.6%) and SSM (19.4%) groups.

Conclusions: Immediate tissue expander placement in the prepectoral plane without ADM yields similar, safe results in patients with both nipple sparing and skin sparing mastectomies. Widespread adoption of this technique, independent of mastectomy type, can provide reliable breast reconstruction outcomes to patients at a substantially reduced cost.

Impact of COVID-19 on Breast Reconstruction: A Nationwide Analysis Using the National Surgical Quality Improvement Program Database

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Purpose: The coronavirus disease (COVID-19) global pandemic prompted several changes within the surgical field, including an unprecedented contraction in surgical volume. We utilize the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) database to assess the impact of COVID-19 on breast reconstruction surgery throughout the four quarters of 2020 and compare surgical volumes to their baseline in 2019.

Methods: The NSQIP Database, which includes data from over 700 hospitals, was utilized to gather data for analysis. Data from 2019 and 2020 was included. Relevant breast reconstruction surgeries were identified by the following CPT codes: mastectomy (19303-19307), tissue expander placement (19357), direct to implant reconstruction (19340) and free flap reconstruction (19364). Immediate reconstruction was defined as a surgery with concurrent mastectomy and any reconstruction CPT code. Data was broken down by quarters of the year with Q1 representing January - March, Q2 representing April – June, Q3 representing July – September, and Q4 representing October – December. We provide descriptive statistics in the form of mean (SD), median (IQR) and range for continuous variables and counts (%) for categorical variables. A Kruskal-Wallis test was used to compare average age, height, and weight, Fisher's exact test was used to compare sex and ASA class, and a chi-squared test was used to compare other demographic categorical variables from 2019 to 2020.

Results: The effects of COVID-19 on breast reconstruction surgery were most evident in Q2 of 2020. There was a ~27% decrease in breast reconstruction procedures reported in NSQIP in Q2 2020. Further analysis by breast reconstruction type revealed an increase in the proportion of reconstructions that were immediate tissue-expander based reconstruction following mastectomy compared to Q2 2019 values (53.5% vs 41.1%, $p<0.001$). Immediate direct to implant reconstruction percentages were similar in both quarters but delayed direct to implant reconstruction (without concurrent mastectomy code) was decreased in Q2 2020 (12.8% vs 17.5%, $p<0.001$). The proportion of reconstructions that were free flap-based breast reconstruction overall was significantly decreased in Q2 2020, including immediate free flap reconstruction (5.3% vs 9%, $p< 0.001$) as well as delayed free flap reconstruction (5.7% vs 9.1%, $p<0.001$). While immediate implant-based reconstruction continued to favor tissue-expander

based reconstruction as opposed to direct-to-implant reconstruction for the remainder of the calendar year, free flap-reconstruction volumes returned to 2019 baseline levels in Q3 and Q4. Age, gender, BMI, and diabetes status of patients were similar between the quarters of 2019 and 2020.

Conclusion: Breast reconstruction surgery was most heavily impacted in Q2 of 2020, with a ~27% decrease in surgical volume. There was a clear trend toward immediate tissue-expander based reconstruction, with a drop in both direct to implant reconstruction and free-flap based reconstruction.

Impact of Intraoperative Expansion with Air and Outcomes in First Stage Implant-Based Breast Reconstruction: A Propensity-Matched Analysis

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Purpose: Despite the growing literature in implant-based breast reconstruction (IBR), there are few studies evaluating the impact of different expansion protocols after tissue expander (TE) placement and the type of element filling the TE. While some surgeons have evaluated new breast TE devices that use compressed carbon dioxide to accomplish a full expansion solely with this gas, most studies use saline solution to intraoperative fill TE and continue the expansion in the outpatient setting. No study has evaluated the outcomes of using air for intraoperative expansion followed by an exchange to saline for further outpatient expansion. Therefore, the aim of this study was to investigate the efficacy and safety profile of the air-to-saline exchange expansion (A-SEE) protocol and saline-only expansion (SOE) for the intraoperative fill of TEs during the first stage of IBR.

Methods: We retrospective reviewed the medical charts of patients who underwent two-stage IBR from January 2017 to December 2020. Female patients who underwent mastectomy for oncologic or prophylactic indications and either immediate or delayed breast reconstruction with TE were included. Patients in the A-SEE group were intraoperatively expanded with air during TE placement. Then, air was exchanged with saline when outpatient expansions were started. Patients in the SOE group had the TE intraoperatively expanded with saline and further expansions were done with saline. Analyses were conducted between the two groups using propensity score matching.

Results: Overall, 174 patients representing 299 reconstructive cases were included. According to

the estimated propensity score, 136 reconstructions were selected after 1:1 matching, each group with 68 cases. The intraoperative air volume in the A-SEE group (260 ± 137 ml) was significantly higher (164 ± 111.04 ml, p <.001) than the intraoperative saline volume of the SOE group. The expansion time was significantly shorter in the A-SEE group (62.6 ± 50.32 days) when compared to the SOE group (83.95 ± 76.24 days, p = 0.047). Evaluating the 30-morbidity after TE placement, a lower rate of periprosthetic infection was found in the A-SEE group (2.9%) in comparison to the SOE group (14.7%, p=0.016). Although we did not find a significant difference in the 30-day wound-related complication rate between groups (p=0.573), the requirements of debridement/excision and closure for wound-related complications was marginally higher in the SOE group (8.8%) versus the A-SEE group (1.5%, p = 0.052).

Conclusion: Higher intraoperative volumes without increasing morbidity are possible with intraoperative air expansion instead of saline solution. Concomitantly, higher volumes on the last tissue expansion are conceivable in a shorter period when compared to SOE protocol. These results are most relevant for patients requiring PMRT in which prompt administration of adjuvant therapy can improve oncologic outcomes, as once the air is exchanged for saline in the first outpatient expansion, the A-SEE protocol follows the same sequence of reconstruction of most reports in literature for a 2-stage IBR.

Impact of Intraoperative Hypothermia on Autologous Breast Reconstruction

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Purpose Statement: Studies have identified perioperative hypothermia as a risk factor for impaired wound healing, prolonged recovery, increased hospital length of stay, and surgical site infection.1-3 Autologous breast reconstructions are prone to extended operative times and require exposure of a large body surface area which presents intraoperative hypothermia as a modifiable risk factor. This study examines the effect of intraoperative hypothermia on postoperative outcomes in autologous microvascular free flap breast reconstruction.

Methods and Materials: This was a retrospective review of 55 patients with intraoperative hypothermia, defined as <35.0°C, and 99 normothermic patients who underwent autologous based microvascular free flap breast reconstruction from 2013-2021. Demographics, comorbidities, smoking status, intraoperative warming devices, surgical drains, laterality of surgery (unilateral/bilateral), type of autologous reconstruction, hypothermia (and its duration),

and length of surgery were collected. The outcomes assessed were infection rate, reoperation within 90 days, skin necrosis, wound healing complications, hematoma, seroma, and readmission for infection or other complications in the postoperative period.

Summary of Results: In the study population of 154 consecutive patients, 8.4% had Type 1 or Type 2 Diabetes, 33.8% had hypertension, and 3.2% were current smokers. 90.3% (139) of patients underwent DIEP flap reconstruction, 7.1% (11) SIEA flap reconstruction, and 4 (2.6%) another flap type. 35.7% (55) of the patients experienced intraoperative hypothermia defined as <35.0°C. In the hypothermic group, a higher proportion of patients had wound healing complications (52.7% versus 29.3%, $p<0.05$), hematoma (16.4% versus 5.1%, $p<0.05$), and readmission for postoperative complications (34.5% versus 14.1%). Both groups had similar incidence of seroma (7.3% versus 5.1%), surgical site infection (12.7% versus 9.1%), skin necrosis (12.7% versus 9.1%), and unplanned reoperation within 90 days (10.9% versus 7.1%). Further analysis demonstrated intraoperative hypothermia predicted postoperative hematoma (OR 3.68, 95% CI: 1.17-11.60, $p<0.05$), readmission for any complication (OR 3.20, 95% CI: 1.45-7.08, $p<0.05$), and wound healing complications (OR 2.69, 95% CI: 1.36-5.33, $p<0.05$).

Conclusion: This study demonstrates that intraoperative hypothermia, <35.0 °C, is a significant risk factor for postoperative wound healing complications, hematoma, and readmission within 90 days for any complication in autologous breast reconstruction. Our results support that maintaining strict normothermia during autologous breast reconstruction can significantly improve patient outcomes and reduce morbidity by reducing the risk of postoperative wound healing complications, hematomas, and unplanned readmissions.

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Impact of Nicotine Replacement Therapy on Breast Surgery Outcomes

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Background: Smoking cessation therapy, including nicotine replacement therapy (NRT), is used perioperatively to assist patients to reduce their tobacco smoke intake and consequently decrease their risk of smoking-associated complications. NRT, however, is not without its own risks, as nicotine-induced peripheral vasoconstriction theoretically could impair wound healing by limiting blood flow to wounds and tissue flaps. While several studies have demonstrated that use of NRT as part of smoking cessation therapy reduces postoperative complications compared to active cigarette smoking, there is little research on the impact, if any, of NRT itself on complication rates. This purpose of this study is to investigate the effect of NRT on postoperative outcomes in patients undergoing breast surgery.

Methods: A retrospective chart review of patients undergoing breast surgery within the Yale New Haven Health System from the years 2014-2020 was performed. Active smoking was defined as documented cigarette use during any hospital or office visit within six months before surgery, and each chart was manually reviewed to ensure documented smoking within the time frame. Those with documented NRT use or a prescription of NRT, whether by patch, gum, or lozenge, was noted. Breast surgeries included were lumpectomy/partial mastectomy, complete mastectomy with or without lymph node dissection, free flap breast reconstruction, regional flap breast reconstruction, breast implant/removal, and breast reduction. Wound complications of interest including infection, wound dehiscence, tissue necrosis, hematoma, seroma, fat necrosis, and return to OR within 30 days. Demographic and complication data were compared between patients with NRT usage and those without using t-tests, chi-square analyses, and Mann-Whitney U tests. Multivariable logistic regression models were built to predict the effect of NRT usage on the occurrence of postoperative complications.

Results: 613 breast procedures met inclusion criteria, of which 105 (17.2%) had documented NRT use. The NRT cohort and the non-NRT cohort were well balanced with respect to demographics and procedural variables. When analyzing each complication type individually, the NRT cohort had higher rates of infection (9.5% vs 5.3%, p=0.102), though significance was not reached. Upon multivariable modeling for risk of any surgical complication, NRT was not a significant predictor (OR 1.199, p=0.607 and OR 0.974, p=0.912, respectively) while procedure type, increased BMI, and increased age were.

Conclusions: NRT use was not associated with an increased risk of postoperative complications compared to not using NRT as part of smoking cessation therapy prior to operation. On the other hand, elevated BMI was associated with increased complications. Optimizing patients for surgery should focus on mitigating other risk factors such as obesity rather than concern about the possible wound-healing effects of NRT.

Implant-Based Breast Reconstruction in the Elderly: Complications and Patient-Reported Outcomes in Women Over 70

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Background: Breast cancer most commonly affects women over 50, with median age diagnosis of 62.1 Breast reconstruction is an important component of therapy for women undergoing mastectomy. Despite clear quality of life benefits, immediate implant-based breast reconstruction (IBBR) is less likely to be performed in the elderly patient population due to concerns about underlying health issues, higher complication rates and the perception that body image is less important in this population.2-4 The aim of this study is to evaluate clinical and patient-reported outcomes after IBBR in women over 70.

Methods: Using a prospectively maintained database, 400 patients were identified undergoing IBBR with either implant or tissue expander after mastectomy for breast cancer at our institution over a 6-year period. Patient, disease, and reconstructive details were compared between women over and under 70 years of age. Clinical outcomes including need for secondary procedures, and complication rates including infection, seroma, hematoma, and mastectomy skin flap necrosis, were compared for the two groups. Lastly, the validated BREAST-Q questionnaire was used to quantify and compare patient-reported satisfaction rates after IBBR in physical, psychosocial, and sexual domains.

Results: Of the 400 patients, 25 were ≥70 (6.25%) with a mean age of 72.88, range of 70-79, and 375 were <70 (93.75%) with a mean age of 50.27, range 25-69. Diabetes was more common in the elderly group, with an incidence of 12.00% in patients ≥70 and 2.13% in those <70 (p 0.026). The ≥70 cohort had higher incidence of unilateral reconstruction, 42.86% versus 16.28% (p <0.001). The elderly cohort had a mean mastectomy specimen weight of 434.2 grams versus the under 70 at 622.0 grams (p 0.004). There was no difference between radiation exposure, pathological diagnosis, or reconstruction with implants vs expanders between the cohorts. There was no significant difference in complication rates between the groups in rates of overall infection (8.57% vs 8.55%, p 0.591), or other complications such as seroma, skin necrosis, and hematoma (14.29% vs 11.51%, p 0.387). 5 patients (20.0%) in the ≥70 cohort and 90 (24.3%) in the <70 cohort had secondary procedures done, not including tissue expander to implant exchange, (p 0.416), with fat grafting being the most utilized procedure. 57 patients completed the BREAST-Q survey, 22 of ≥70, and 35 of <70. Overall satisfaction rates were high in all categories in the elderly cohort: psychosocial (84.36/100), sexual (67.95/100), breast satisfaction (79.68/100), and physical well-being (75.09/100). There was no significant difference between the average scores in the ≥70 cohort versus the <70 cohort.

Conclusions: Implant-based breast reconstruction can be completed safely and with high satisfaction rates in women over 70. With advances in current treatments for breast cancer allowing for increased life expectancy after diagnosis, more women of advanced age may be candidates for breast reconstruction.

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Influences of Patient-Specific Factors on Immediate Post-Mastectomy Reconstruction at an Academic Medical Center

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Introduction: With increases in post-mastectomy reconstructive options available to breast cancer patients, the number of government initiatives targeting access to reconstruction has increased. Given the paucity of literature examining disparities in access to immediate breast reconstruction, we aimed to study the barriers to care at our institution.

Methods: We performed a retrospective study of mastectomy patients with immediate reconstruction at Weill Cornell Medical Center from 1998 to 2019. Chart review identified demographic, socioeconomic, and clinical data. The primary outcome was the reconstruction type received. Quantitative data was subjected to chi-squared tests and multivariate logistic regression analysis.

Results: 1976 patients were included in our cohort. There were 1609 (81.4%) White, 123 (6.2%) Black, 135 (6,8%) Asian American Pacific Islander, and 33 (1.7%) Other –identifying patients with 76 (3.8%) patients declining to respond. 1432 (72.4%), 313 (15.8%), 197 (10.0%), and 25(1.3%), of the patients were privately-insured, publicly-insured, had unspecified insurance coverage, and self-pay, respectively. 1584 (80.2%), 258 (13.1%), and 134 (6.8%) of patients underwent implant, pedicled, or free flap reconstruction, respectively. Reconstruction type varied by Hispanic status ($p < 0.05$) but did not vary by race or insurance status. Multivariate regression

determined no difference in implant vs. flap-based reconstruction for race or known Hispanic status (Table 1a). However, when compared to those with private insurance, having Medicare/Medicaid approached significance (p = 0.056; OR: 0.70, (95%CI: 0.50, 1.00)) as a predictor of implant-based reconstruction. Multivariate regression of pedicle flap vs. free flap reconstruction similarly found no difference based on race or known Hispanic status (Table 1b).

Conclusion: While these preliminary data indicate the mitigation of healthcare disparities amongst socioeconomic and demographic cohorts, we aim to incorporate a larger cohort from multiple hospitals in our network to further study the intersectionality of patient demographics and how they may influence trends in post-mastectomy breast reconstruction. In 2010 New York State Breast Cancer Provider Discussion Law which mandated disclosure to all patients of the options for breast reconstruction and insurance coverage of these procedures. These data underscore the importance of this bill and encourages its adoption in other states.

Initial Results of a Lateral Flow Assay for Diagnosis of Breast Implant Associated- Anaplastic Large Cell Lymphoma (BIA-ALCL) in Peri-Implant Seromas

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Purpose: Approximately 80% of women with BIA-ALCL present with a peri-implant delayed effusion (seroma). Most peri-implant seromas are due to other (benign) causes. Current patient management involves fluid analysis by cytology supplemented with CD30 immunohistochemistry and/or flow cytometry. ELISA offers an alternative method but requires special equipment and is not suitable for point of care testing. Here we present results of a new CD30 lateral flow assay (LFA) which can distinguish BIA-ALCL from benign seromas in minutes using less than one milliliter of fluid.

Methods: We used Universal LFA strips that consist of a nitrocellulose membrane containing a test line of immobilized anti-Ulfa-Tag antibody that binds an Ulfa-Tag conjugated capture antibody which further binds the analyte, in this case CD30, in complex with a Gold-detection

antibody. A red T-line appears when CD30 is present, and the line intensity varies depending on CD30 concentration. Universal LFA strips also contain a control line to show the test is valid, and an absorbent pad to promote and control flow of sample through the membrane. Previously confirmed malignant (N=5) and benign (N=5) seromas were analyzed and compared using the LFA for detection of CD30 in undiluted and 1:10 diluted seromas. Detection of CD30 at the test line was visualized in 20 minutes or less.

Results: Five malignant and five benign cryopreserved seromas were tested with LFA. A positive red test line was observed for all malignant seromas at undiluted and 1:10 dilutions. A faint red test line was observed in three undiluted benign seromas but not in two benign seromas. No red test line was observed in the five benign seromas at 1:10 dilution enabling distinction from malignant seromas. The current analysis was done on cryopreserved repeatedly thawed seromas; it is anticipated that decisive results will be obtained in undiluted or lower dilutions of fresh seromas. The distinction of malignant from benign seromas remained possible in clinically bloody seromas.

Conclusion: LFA provides a rapid, easily accessible alternative to ELISA for diagnosis of BIA-ALCL. When confirmed in a larger series of cases and made available to surgeons and radiologists, this point of care test may more readily distinguish BIA-ALCL from benign seromas.

Is This Plane Safe? A Comparison of Breast Skin Necrosis Rates Among Reconstructive Sites

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Background: In recent years, there has been a trend toward using the prepectoral plane during implant-based breast reconstruction. Prepectoral plane-based reconstruction has been shown to reduce recovery time, bleeding, postoperative pain, muscle spasms, and rates of animation deformities.(1,2) Despite these benefits, dual-plane and total submuscular approaches remain popular. It has been hypothesized that the additional layer of coverage above the tissue expander help reduce rates of mastectomy skin flap necrosis given that the tissue expander is not directly against the ischemic skin flap. This study aims to compare the difference in mastectomy skin flap necrosis rates across reconstructive planes.

Methods: The authors retrospectively identified patients who underwent immediate breast reconstruction by a single surgeon at a single tertiary care institution between 2011 and 2021. Patient demographics, medical comorbidities, reconstructive plane, necrosis rate, and infection rate were reviewed. The primary outcome is mastectomy skin flap necrosis, defined as any skin

compromise requiring any topical wound care or excision in the 6-month postoperative period. Univariate analysis was performed to compare necrosis and infection rates across reconstructive planes.

Results: Over the 10-year period, a total of 295 patients (515 breasts) underwent mastectomy and immediate reconstruction with tissue expanders. Of these, 221 breasts (43 percent) were reconstructed using the prepectoral approach, 277 breasts (54 percent) using the dual-plane approach, and 17 breasts (3 percent) using the total submuscular approach. The 3 cohorts were comparable in age, body mass index, smoking status, medical comorbidities, and oncologic regimen ($p > 0.05$). In the prepectoral cohort, mastectomy skin flap necrosis occurred in 37 breasts (17 percent); in the dual-plane cohort, necrosis occurred in 41 breasts (15 percent); in the total submuscular cohort, necrosis occurred in 2 breasts (12 percent). There was no significant difference in necrosis rates between the 3 cohorts ($p = 0.83$). In each cohort, mastectomy skin flap necrosis was a significant predictor of subsequent skin flap cellulitis ($p < 0.001$).

Conclusions: There was no difference in rates of mastectomy skin flap necrosis between patients undergoing implant-based reconstruction using the prepectoral, dual-plane, and total submuscular approaches. Our results suggest that a prepectoral approach is a safe and effective alternative to dual plane and submuscular approaches without the need to sacrifice the pectoralis muscle. Regardless of the reconstructive plane, once mastectomy skin flap necrosis occurs, patients are at significantly higher risk for skin flap cellulitis and tissue expander infection. These patients should undergo aggressive wound care regimen with low threshold to begin antibiotic treatment or revisional surgeries.

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Language Disparity Predicts Poor Patient-Reported Outcome and Follow Up in Microsurgical Breast Reconstruction

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Purpose: Patients with limited English proficiency (LEP) have starkly different healthcare experiences compared to their English proficient counterparts. LEP has been associated with

lower patient satisfaction, worse outcomes, delays in seeking care, and lower utilization of preventative services.1-3 These disparities have been well investigated in a variety of fields, including obstetrics and gynecology, neurology, and otolaryngology.4 However, no study to date has examined language disparities in both plastic surgery as a whole and the field of reconstructive microsurgery. The authors aim to examine the link between LEP and postoperative outcomes in patients undergoing microsurgical breast reconstruction.

Methods: A retrospective review of all patients who underwent abdominal-based microsurgical breast reconstruction at our institution between 2009 and 2019 was performed. Variables of interest include patient demographics, preferred language, interpreter usage, postoperative clinic follow ups, postoperative ED visits, self-reported outcomes (Breast-Q), and postoperative complications. Statistical analysis was conducted using Pearson's $\chi 2$ test, two tailed t-tests, odds ratio analysis, and multivariable regression modeling.

Results: In total, 405 patients were included in the analysis, with 22.22% of patients identifying as non-English speakers and 41.4% identifying as Hispanic. 75% of non-English speakers utilized interpreter services and received corresponding consent forms in their preferred language. A two-year, longitudinal analysis of patient-reported outcomes adjusting for time revealed that non-English speaking patients reported significantly lower physical well-being scores than English speaking patients. The chest physical well-being scores were 13.6 (95% CI: 6.9 – 20.2) units lower and the abdomen physical well-being scores were 19.6 (95% CI: 11.7 – 27.6) units lower. Multivariable regression models adjusting for patient comorbidities, insurance status, and complication rates demonstrated that non-English speaking status was significantly associated with 0.87 days longer length of stay ($p=0.006$) and 1.58 fewer postoperative clinic visits ($p=0.041$). Interestingly, within the non-English cohort, interpreter use was associated with 1.89 more postoperative clinic visits when compared to those who did not use an interpreter ($p=0.027$). There were no significant differences in emergency room visits or complications between English and non-English speakers.

Conclusion: Our findings suggest that language disparities exist within microsurgical breast reconstruction and underscore the importance of effective, language-conscious communication between surgeon and patient.

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Latissimus Dorsi Flap: A Deceivingly Perilous Terrain for Nipple Reconstruction

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Background: Nipple-Areola Complex (NAC) reconstruction completes the post-mastectomy reconstructive process to restore the aesthetic breast. Success of local flap NAC reconstruction depends on the design of the flap, as well as on the composition and blood supply of the underlying breast mound. It is commonly assumed that such reconstruction tends to be more reliable on flap beds than mastectomy skin over implants.1 We hereby present a single surgeon experience of local, subdermal pedicle NAC reconstruction over implant-based, latissimus dorsi flap, and abdominally-based flap reconstructions to scrutinize this assumption and identify factors contributing to partial nipple necrosis.

Methods: We conducted a retrospective review of patients from 2012 to 2020 who underwent C-V subdermal pedicle flap nipple reconstruction by a single surgeon over implant-based, latissimus dorsi flap, and abdominally-based flap breast reconstructions. Exclusion criteria included non-primary nipple reconstruction procedures. Patient demographics, orientation of C-V flap, history of radiation, and complications including nipple necrosis were recorded.

Results: Three hundred ninety-seven nipple reconstructions in 264 patients were included, consisting of 34 latissimus dorsi flap breast mound reconstructions, 40 deep inferior epigastric perforator flaps, 176 staged tissue expander-to-implant reconstructions, 109 direct to implant reconstructions, and 38 pedicled transverse rectus abdominis muscle flaps. NAC reconstruction over a latissimus flap yielded a 26.4% rate of nipple necrosis compared to a rate of 1.8% to 2.8% among other breast reconstruction modalities. Among NAC reconstructions over a latissimus dorsi breast mound, the majority of C-V flaps had a superior orientation, yet superiorly oriented flaps demonstrated the highest rate of nipple necrosis (36.8%) whereas lateral based flaps did not exhibit necrotic events.

Conclusion: We uncover an unanticipated but interesting outcome regarding nipple reconstruction over various common reconstructed breast mounds. Given the single surgeon consistency in design and technique, it is plausible that this finding could be representative of the subdermal vascular plexus anatomy of the latissimus dorsi skin paddle. While increased awareness in nipple reconstruction over a latissimus dorsi flap can minimize such complications, further studies may help confirm a potentially directional relationship between the C-V flap pedicle and the axial pedicle of the underlying flap, and even sway how we view the subdermal vascular plexus in general.

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Liposomal Bupivacaine Reduces Intraoperative Narcotic Use in Reduction Mammaplasty Patients

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Background: Intraoperative fentanyl is one of the most frequently administered intraoperative narcotics and may increase the risk of perioperative complications including nausea, constipation, antiemetic use, and respiratory complications.

Methods: A retrospective review of 168 reduction mammaplasty patients was performed. We analyzed the total use of intraoperative fentanyl in patients with intraoperative administration of liposomal bupivacaine vs. patients without liposomal bupivacaine use.

Results: Intraoperative administration of liposomal bupivacaine resulted in an average of 43.75% reduction (225mcg in patients with liposomal bupivacaine vs. 400mcg in patients without liposomal bupivacaine) of fentanyl use (P=0.018).

Conclusions: Liposomal bupivacaine decreases intraoperative fentanyl use by nearly 50%.

Lumpectomy and Radiation followed by Completion Mastectomy and Immediate Autologous Reconstruction—A New Treatment Paradigm for Locally Advanced Breast Cancer

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Background: The mainstay treatment for women with locally advanced breast cancer is lumpectomy or mastectomy with adjuvant chemoradiation therapy. Some women opt for mastectomy for symmetry reasons or BRCA status. For these patients, their mastectomy status alone places them in a higher radiation treatment category compared to undergoing lumpectomy for the same sized tumor. We propose a new treatment paradigm for women with locally advanced breast cancer who desire mastectomy; these patients should undergo lumpectomy with radiation therapy followed by completion mastectomy and immediate reconstruction. We present a case series of patients who have successfully undergone the above treatment plan.

Methods: A single-surgeon retrospective chart review was performed from 2014 through 2020. Inclusion criteria were women with operable locally advanced breast cancer (defined as tumors > 5 cm, tumors of any size with direct extension to the chest wall or skin, or presence of regional lymphadenopathy regardless of tumor stage) who underwent lumpectomy and radiation therapy followed by mastectomy and immediate autologous reconstruction. Variables of interest included timing of lumpectomy, radiation, and mastectomy with definitive reconstruction, flap outcomes (partial or total flap loss or necrosis, fat necrosis, infection, seroma, hematoma, wound dehiscence, and acute reoperation), and breast cancer recurrence.

Results: Ten patients met inclusion criteria; average age and BMI at the time of reconstruction were 53.6 years and 29.5. The cancers were stage IIB-IIIA invasive ductal carcinoma requiring radiation therapy. There was no primary cancer recurrence; one patient had a chest wall desmoid tumor occur 1 year after mastectomy. The average time between lumpectomy and completion mastectomy with autologous reconstruction was 39.8 months; average time between completion of radiation and reconstruction was 30.6 months. Average time from lumpectomy to last follow up was 4.7 years; time from reconstruction to follow up was 18.4 months. There was one incident of fat necrosis and no other flap complications.

Conclusion: Our treatment approach to locally advanced breast cancer has not been previously described in the literature. Benefits include less radiation exposure to the patient, bypassing the tissue expansion phase and its potential complications with radiation therapy, and greater cosmesis and symmetry. Limitations include small sample size and short follow up time to determine ultimate oncologic safety. We believe using lumpectomy with radiation prior to mastectomy and autologous reconstruction maximizes the surgical, medical, radiotherapeutic, and reconstructive modalities available to this patient population.

Management of Post-Burn Breast Deformities: 35 years Experience of a Single Surgeon

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Introduction: Burns of the anterior chest are very common in females of all age groups. While post pubertal patients present with deformed breast mound, parents of prepubertal girls discover the absence/ hypoplasia of breast only at thelarche. A number of patients have several other associated contractures of the adjoining regions like neck, axillae and upper abdomen. Reconstruction of the post-burn breast deformity is essential as it affects the psychological well-being, especially of a growing adolescent girl.

Purpose: To assess the long-term outcome of resurfacing of post-burn breast deformities with split thickness skin grafts

Methods and Materials: Between January 1987 and December 2021, 153 breasts in 92 female patients presenting with post-burn breast deformity were treated by the senior author. All patients underwent release of contracture, with or without excision of overlying scar and resurfacing the defect with an intermediate to thick split thickness skin graft. The surgery on the anterior chest and breast region was done only after all the contractures of the neck, axillae and abdomen were taken care of and sufficient mound developed. Nipple was reconstructed with various techniques described for post-mastectomy reconstruction. Illusion of areola was created by tattooing.

Summary: A retrospective study was done to analyze the surgical outcomes in these patients by review of clinical records. Assessment of breast symmetry, restoration of inframammary fold, projection, ptosis, and scarring was done. Post-operatively, the patients were advised to massage the grafted areas with bland oils and were prescribed pressure garments for a period of 6-9 months. No customized splints were used.

Experience and Results: The patients' median age was 16 years, ranging from 14 years to 45 years. The cause of burns was flame in 61 patients while 25 had scalds and 6 had chemical burns. Twenty-six breasts had complete destruction of nipple-areola complex while 43 had partial loss only. Thirty-seven patients had vitiligo patches associated with the deformity. Fifty-six patients had associated contractures of the neck, axilla(e) and/or abdomen. Symmastia was present in 17 patients. Symmetry was achieved in 87 patients while inframammary fold was restored in all patients. Adequate projection and ptosis were seen in 150 breasts. Mean follow-up was 13.5 years. None of the patients required use of flap/ implants to restore symmetry/projection. Thirty-five patients required two or more surgeries to accommodate the developing breast, all of them were prepubertal at the time of burn.

Conclusion: The mound is always present and only needs release for growth to its full potential. With the growing size of the breast during puberty, the skin graft may repeatedly fall short, and a further release and graft may be required. The results are highly satisfying with respect to symmetry, inframammary fold, projection, and ptosis. The spontaneously healed post-burn scars and grafted areas blend with each other very well. The hyperpigmentation of the grafted areas is minimal as there is no exposure to sunlight. The reconstructed nipple fails to maintain its projection and becomes flattened. The areola can be reconstructed only by tattooing with a colour that is much darker than the opposite areola for it to show through the grafted skin, especially in our patients.

Mastopexy Technique Following Explantation Utilizing a Lateral Dermoglandular Flap for Breast Reshaping

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Introduction: With the rise in cases of Breast Implant Illness (BII), explantation without desire for implant replacement is becoming increasingly popular. After implant removal, the patient is left with deflated breasts comprised of excess skin and often minimal breast tissue (1). This gives rise to a unique challenge for the plastic surgeon as the ultimate goal is to create an aesthetic, well-shaped breast even after explantation.

There is a paucity of literature describing reproducible techniques for reshaping the breast after explantation. Mastopexy is currently the main technique used, and some authors have also described auto-augmentation and fat grafting as adjuncts (1, 2, 3). However, there are few papers that outline a detailed solution to this challenging surgical problem. Thus, we present a novel mastopexy technique for breast reshaping following explantation using a lateral dermoglandular flap.

Methods: We describe a step-by-step review of our unique surgical approach, beginning with initial breast markings, implant removal with capsulectomy, design of the lateral dermoglandular flap, inset of the flap and final closure. This technique was used in a total of 65 women between 2019 and 2021. A retrospective chart review was performed on this series of patients with variables of interest including age, date of initial implant placement, time until explantation, implant fill type, volume of implant removed, reason for explantation and post-operative complications.

Results: Using this technique, all patients demonstrated retained lateral breast shape and volume, improved medial fullness, lifted nipple areolar complex, and overall breast symmetry post-operatively. All patients reported happiness with their decision to proceed with explanation. Only one desired her implant to be replaced, as her reason for implant removal was not BII. The only complication in a three-year period was hematoma in two cases. Overall, all patients were satisfied with the size and shape of their breasts after explantation and reconstruction using this technique.

Conclusion: We describe a novel lateral dermo glandular flap as a useful technique for breast reshaping after explantation. Our technique elegantly provides medial fullness, lateral definition, as well as reinforcement and repositioning of the inframammary fold. In our experience, this is a reliable technique that produces consistent aesthetic results following breast implant removal.

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More than Medications: The Evolution of Our ERAS Protocol in Microsurgical Breast Reconstruction

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Purpose: Multimodal analgesia and enhanced recovery after surgery (ERAS) interventions have led to improved patient outcomes in plastic surgery. However, descriptions of the evolution of protocols are lacking in the literature. We reviewed our experience implementing multimodal analgesia and then a full ERAS pathway for autologous breast reconstruction patients.

Materials and Methods: Three groups of autologous breast reconstruction patients from 2016 to 2022 were retrospectively reviewed: prior to multimodal analgesia implementation, after instituting multimodal analgesia components of ERAS, and following the implementation of a comprehensive ERAS protocol including guidelines on early postoperative diet advancement, early Foley catheter removal, and early mobilization. Outcomes measured included length of stay (LOS), average pain score, and total inpatient and discharge prescription morphine milligram equivalents (MME). A sub-group analysis was performed among multimodal analgesia patients with and without pain catheters.

Results: We identified 69 patients in the pre-multimodal group, 58 patients in the multimodal analgesia group, and 61 patients in the full ERAS pathway group. Implementation of multimodal analgesia decreased total inpatient MME from 795 to 164 ($p<0.001$) and discharge prescription MME from 512 to 186 ($p<0.001$) while average pain scores and LOS remained similar between groups. Full ERAS pathway resulted in a decreased LOS from 4.1 to 3.3 ($p=0.002$), decreased average pain score (3.5 to 2.7, $p=0.009$), decreased inpatient total MME (164 to 112, $p=0.002$), and discharge prescription MME (186 to 98, $p<0.001$). The use of pain catheters in the multimodal analgesia group did not result in significantly decreased inpatient MME (182 vs 147, $p=0.184$) and paradoxically increased discharge prescription MME (126 to 241, $p=0.002$).

Conclusion: Autologous breast reconstruction patients will not benefit from multimodal analgesia alone. While narcotic prescriptions are reduced, LOS remains unchanged unless diet restrictions are lifted, the Foley catheter is removed, and patients undergo early mobilization. Regional pain catheters did not make a clinically significant difference. Our experience highlights the need to comprehensively implement ERAS in the autologous breast reconstruction population in order to decrease opioid use, LOS, pain scores, and overall cost.

No Cancer Occurrences with 10-year Median Follow-up After Prophylactic Nipple-Sparing Mastectomy

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Background: Prophylactic mastectomies have been performed at higher rates in recent years secondary to more widely available genetic testing for both hereditary breast cancer and genes with heightened breast cancer susceptibility. It is important to assess the long-term safety of prophylactic nipple-sparing mastectomies (NSMs) in achieving cancer-free survival amongst patients, particularly to justify its use for improved aesthetics given alternatives to NSMs for breast cancer prophylaxis have been established to effectively reduce the risk of subsequent disease. Studies describing cohorts with follow-up beyond five years are lacking in the literature. The objective of this study was to assess for locoregional oncologic occurrence in a cohort undergoing prophylactic NSM with 10-years of median follow-up.

Methods: All patients who received prophylactic NSM at a single institution beginning in 2006 were retrospectively reviewed and included to accrue a patient cohort with 10-years of median follow-up. Prophylactic mastectomy was defined as patients receiving both bilateral NSM for identified genetic predisposition for breast malignancy and patients with extensive family histories of breast malignancy. In cases where a patient underwent bilateral mastectomies entailing just a unilateral therapeutic mastectomy, the contralateral prophylactic mastectomy was included. Prophylactic NSMs were maintained within the study based on the intention-to-treat. Patient demographics, genetic mutations, operative details, and specimen pathology were recorded, and all post operative patient visits and documentation were screened for cancer occurrence. Descriptive statics were performed where appropriate.

Results: There were 228 patients undergoing a total of 284 prophylactic NSM with a mean and median follow-up of 120.5 ± 15.7 and 119.5 (standard error 1.04) months, respectively. Mean age at the time of NSM was 46.9 ± 8.96 years and mean age at the time of analysis was 57.0 ± 9.0 years. A majority of patients received bilateral NSMs (91.2%), however only the prophylactic mastectomy was included in the analysis. A small proportion of patients had previous breast surgery (6.1%). A minority of patients smoked at the time of mastectomy or had a history of tobacco use (7.9%). Prior history of chemotherapy and radiation was present in 5.7% and 2.6% of patients, respectively. Roughly one-third of patients carried a known genetic susceptibility for breast cancer (33.8%). BRCA1 mutation was present in 21.1% of patients and BRCA2 mutation was present in 12.3% of patients. In this cohort receiving prophylactic nipple-sparing mastectomies, there have been no incidences of locoregional breast cancer occurrence to date (0%). From the prophylactic mastectomy specimens, cancer was identified in 28 pathology specimens (9.9%) with a mean tumor size was 0.67 ± 0.43 cm.

Conclusions: Primary oncologic occurrence rates are very low in high-risk patients undergoing prophylactic NSM at 10-years of median follow-up. In addition to reducing the risk of oncologic occurrence, prophylactic surgery may also be therapeutic in a small proportion of patients. Continued surveillance for these patients remains important to assess for oncologic safety over the entire course of a patient's life.

Oncologic Safety in Autologous Fat Grafting Reconstruction after Breast Conservation Treatment: A Systematic Review and Meta-analysis

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Purpose: Autologous fat grafting (AFG) reconstruction is a widely used method to correct defects after breast conservation treatment (BCT) that has gained popularity within the last decade. Even though it results in aesthetically pleasing outcomes with minimally invasive surgery, the oncological outcomes of the procedure are still being researched. The purpose of this systematic review is to analyze the literature to compare BCT and AFG versus BCT only with cancer recurrence and procedure complications.

Methods: The systematic review was conducted using the PubMed Database with articles from 1970 to 2021. The main search terms used were "mammaplasty", "breast conservation", "breast cancer", "fat grafting", and "neoplasm recurrence." The inclusion criteria were fat grafting only, partial breast reconstruction, and cancer recurrence. The exclusion criteria were all full breast reconstruction procedures. The statistical analysis was done using patients who received AFG versus no AFG in the BCT population in order to compare complications, cancer recurrence, and metastasis.

Results: The PubMed search strategy yielded a total of 146 articles. After applying inclusion and exclusion criteria, a total of 15 articles were used for analysis, with a total of 900 BCT only patients and 1063 BCT AFG patients. Based on the pooled meta-analysis, in the BCT only patients, 4.8% had cancer recurrence and 4.8% had metastasis, and for the BCT and AFG patients, 3% had cancer recurrence and 6.9% had metastasis. The average length of follow up time for BCT only is 58.73 months and for BCT and AFG is 55.24 months. Patients with BCT only versus BCT and AFG showed no statistically significant difference in total cancer recurrence (P=0.99), local cancer recurrence (P=0.84), and metastasis (P=0.36). The fat necrosis and oil cyst rate for BCT only was 21.3 % and for BCT and AFG it was 19.2%. The

complication rates for fat necrosis and oil cysts were not statistically different between BCT versus BCT and AFG (P=0.44).

Conclusions: The results show no significant difference in cancer recurrence or metastasis in the BCT only group versus BCT and AFG, showing that fat grafting is not only an aesthetically pleasing and minimal surgery, but it has safe outcomes with no differences in complications.

Oncoplastic Breast Reduction: A Systematic Review of Post-Operative Complications

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Background: Breast conserving therapy with oncoplastic reduction is a useful strategy for reconstruction of partial mastectomy defects. A systematic review from 2015 of oncoplastic breast reduction outcomes showed a dehiscence rate of 4.3%, fat necrosis in 4.3%, infection in 2.8% and nipple necrosis in 0.9% of patients.1 This study was a systematic review of oncoplastic breast reduction outcomes over the past 7 years to identify trends in complication rates after this increasingly popular procedure.

Methods: Studies describing oncoplastic mammoplasty were identified from PubMed, Google Scholar, and OVID. Studies that reported use of oncoplastic breast reduction and discussion of post-operative complications were included. Data collected included patient demographics and follow-up period; primary outcomes assessed were post-operative complication rate. Papers with the same or over-lapping data, and papers published prior to 2015 were excluded.

Results: Six articles met inclusion criteria from 2015-2022. This resulted in 1275 oncoplastic breast reduction cases. The overall rate of at least 1 post-operative complication was 19% [99% CI: 10% to 34%]. This was further divided into dehiscence, fat necrosis, hematoma/seroma, and nipple-areolar complex necrosis.

Conclusions: Oncoplastic breast reduction is an excellent option for many patients undergoing breast conserving therapy, however post-operative complications can cause delays in adjuvant radiation therapy. We hypothesized a decrease in complication rate after oncoplastic breast reduction with increasing use of this reconstructive procedure, however results of systematic review over the past 8 years showed a slight increase in complication rate. With increased popularity and surgeon familiarity, oncoplastic breast reduction remains a viable option for reconstruction of partial mastectomy defects despite a slight increase in complication rate.

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Outcomes of Implant-based Breast Reconstruction According to Three Different Division Levels of the Pectoralis Major Muscle

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Purpose: Acellular dermal matrix (ADM) has been used in implant-based breast reconstruction (IBR) as a sling to cover the inferior pole of implant. 1 Dual-plane subpectoral IBR has lots of advantages; providing well vascularized tissue coverage to an implant, permitting greater fill of the tissue expander, supporting revision procedures, allowing for better positioning of prosthesis. 2 Nonetheless, subpectoral IBRs have caused unpleasant problems, namely animation deformities, superior fullness for patients having thick pectoralis muscle, and functional impairment of the pectoralis muscle. 3, 4 Moving the implant prepectorally may eliminate these concerns. Therefore, identifying ideal location for breast implants has recently become a popular topic in IBRs.

In this study, we report outcomes according to three different division levels of the pectoralis muscle and suggest algorithm for selection of the division levels.

Patients and Methods: Retrospective chart review was performed for 226 patients who underwent IBRs from October 2017 to December 2020. We excluded follow-up loss cases, IBRs combined with autologous tissue transfer, and patients who underwent radiation therapy. Finally, we completed assessment in 85 cases. According to the division level of the pectoralis muscle, patients were classified into three groups (prepectoral, high-subpectoral, and subpectoral). For prepectoral group, entire anterior aspect of an implant was covered with ADM. For high subpectoral group, upper one quarter of an implant was covered with the pectoralis muscle, and three quarter was covered with ADM. For subpectoral group, the pectoralis muscle covered upper half of an implant and remaining lower part of an implant was covered with ADM.

We assessed aesthetic outcomes in aspects of animation deformity (implant displacement, nipple displacement at contraction of the pectoralis muscle), rippling deformity (at resting and at contraction of the pectoralis muscle), visibility of superior implant border and capsular contracture.

Results: Prepectoral IBRs were 20 cases (23.5%); High-subpectoral IBRs were 25 cases

(29.4%); and 40 cases (47.1%) were subpectoral IBRs. All cases were reviewed at least 6 months follow-up after the final surgery. Animation deformity frequently appeared in the subpectoral group. Nipple displacement during contraction of the pectoralis muscle was most prominent in the subpectoral group (11.1mm). Both nipple displacement of the high-subpectoral group (1.24mm) and prepectoral group (1.2mm) were significantly less than that of the subpectroral group. Subpectoral group frequently showed skin rippling at contraction of the pectoralis muscle, but prepectoral group frequently showed rippling at rest. The degree of rippling was assessed by indentation index of Antera 3D camera. Visibility of superior border of an implant was more prominent in the prepectoral group than other groups.

Conclusion: Based on our result, we suggest the algorithm for selection of the division level of pectoralis muscle. If pectoralis muscle is above 1cm thick, prepectoral plane should be the first choice. In the case of below 1cm, thickness of mastectomy flap needs to be evaluated. If mastectomy flap is thicker than 1cm, prepectoral plane is better option than the subpectoral. If mastectomy flap is thin, high-subpectoral plane is preferable to lessen animation deformity, rippling deformity, and visibility of implant border.

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Outcomes of Negative Pressure Wound Therapy on Immediate Breast Reconstruction after Mastectomy

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Summary: Immediate breast reconstruction after mastectomy has become more popular over the last twenty years, with a 75% increase since 2000. Over 70% of such patients choose tissue-expander or implant-based breast reconstruction. Lack of donor site morbidity, shorter procedure times, and excellent aesthetic outcomes are some of the factors that motivate patients and surgeons to choose these reconstruction techniques. However, they are not without complications.

The most commonly reported complications include seroma, infection, hematoma, mastectomy skin flap necrosis, wound dehiscence, implant exposure, and implant deflation; these factors culminate in an overall complication rate reportedly as high as 45%. Closed incision negative pressure therapy (ciNPT) has shown value in improving wound healing and reducing complications. However, the current literature is inconclusive overall in its role in immediate breast reconstruction. The authors designed a retrospective single-institution study to evaluate the effects of the 3MTM Prevena RestorTM BellaFormTM ciNPT device on tissue-expander or implant-based breast reconstruction patients compared to a control group.

Conclusion: The study was performed between July 1, 2019, and October 30, 2020 with 125 total patients (232 breasts). For our study, 77 patients (142 breasts) did not receive the ciNPT dressing, and 48 patients (90 breasts) received the ciNPT dressing. Primary outcomes were categorized by major or minor complications. Age, body mass index, and final drain removal were summarized using medians and quartiles and were compared (ciNPT versus no ciNPT) with a nonparametric Mann-Whitney test. Categorical variables were compared using Chi-square or Fisher's Exact Test. The statistical significance level was set at $\alpha = 0.05$. The results showed a statistically significant difference with ciNPT having fewer major complications than standard wound dressing ($p=0.0247$). There was no statistical difference between the two groups for minor complications. Interestingly, drain removal time was higher in the ciNPT group. Overall, despite limitations of sample size and lack of racial diversity, our study shows that ciNPT can help reduce major complication rates in implant-based breast reconstruction patients.

Pain Management in Gender Affirming Chest Masculinization Surgery: is PECS Block Effective?

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Purpose: Gender dysphoria is estimated to affect 0.6% of the population in the United States and 0.5% of the population worldwide.1 Non-narcotic post-operative pain control is particularly important in transgender individuals as research demonstrates a higher risk of substance use in

this population.2 While there is current literature supporting the use of pectoral nerve blocks (PECS blocks) for post-operative pain control in breast cancer patients undergoing mastectomy, there is little to no evidence for use in Female-to-Male (FtM) top surgery patients.3 The aim of this study was to evaluate whether PECS blocks were effective in decreasing perioperative pain in FtM top surgery patients.

Methods: An Institutional Review Board approved retrospective review was performed to evaluate FtM transgender patients who underwent top surgery at a single institution from January 2020 to January 2022. Patients receiving PECS block in the preoperative setting were compared to a control group that did not receive PECS block. Patient age, gender, comorbidities, BMI, and psychological conditions were collected, as well as operative details, postoperative pain regimens, and narcotic filling data. Morphine milligram equivalents (MME) were calculated based on the opioid medications received intraoperatively and in the post anesthesia care unit (PACU). Perioperative MME was defined as the sum of total MME. Chi-square and Student's t-tests evaluated comparisons between groups for categorical and numerical variables, respectively. Differences in MME between groups were evaluated using the Mann-Whitney U test. Multivariate analyses evaluated factors associated with PECS block and filled opiate pain medicine prescriptions. A multiple regression evaluated predictor factors associated with perioperative MME.

Results: A total of 84 FtM transgender patients were included in the study. Fifty-one patients (60.7%) underwent PECS block, and 33 (39.3%) patients did not undergo PECS block. A higher proportion of patients who underwent PECS block had underlying anxiety (34.5%) than those who did not get the procedure (15.2%, P=0.004). The multivariate analysis demonstrated that patients who were current smokers (OR=0.04, 95% CI: 0.01-0.59, P=0.019) or had a BMI $\geq$ 35 (OR=0.16, 95% CI: 0.03-0.79, P=0.024) had lower odds to undergo a PECS block compared with non-smokers and patients with BMI $\leq$24.99, respectively. When MME were evaluated, patients who underwent a PECS block had a statistically significant lower total perioperative MME (mean: 62.69, SD: 22.47) than those who did not have PECS block (mean: 73.47, SD: 21.57, P=0.024). Patients who underwent PECS blocks had an 8.61% decrease in total perioperative MME compared with patients who did not get PECS block (P=0.010). Despite the aforementioned reductions in immediate perioperative MME, PECS block did not impact quantity of narcotic fills after discharge (P=0.163).

Conclusions: PECS block in FtM chest masculinization surgery significantly decreased opiate requirements in the immediate perioperative setting. Future studies will utilize a randomized prospective trial to better evaluate postoperative pain control after discharge.

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Partial Mastectomy Versus Oncoplastic Breast Surgery; A Comparison Of Outcomes Using The American College Of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Database

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Purpose: Oncoplastic surgery (OPS) procedures involve the application of principles of volume displacement/replacement to minimize contour deformity following partial mastectomy for breast cancer. To date, OPS has been associated with improved cosmetic outcomes and improved patient satisfaction and has been reported as oncologically safe. Accordingly, OPS techniques are increasingly being adopted by breast cancer and plastic surgeons. We queried a national database to investigate how complication rates from OPS compares to those associated with partial mastectomy alone in the United States.

Methods: The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database was used to extract data on all female patients with breast cancer who partial mastectomy with or without OPS between, 2005-2019. Partial mastectomies were defined as procedures coded using current procedural terminology (CPT) codes (19301, 19160, 19162), with OPS defined as procedures including concomitant codes for soft tissue transfer. Demographics and postoperative outcomes were compared between groups using T- and chi-squared tests. Factors predictive of postoperative morbidity were identified by multivariable logistic analyses. The false discovery rate (FDR) was controlled for at the 5% level to diminish confounding effects and odds ratios were adjusted for comorbidities.

Results: Of total of 346,915 procedures were identified for inclusion, 38% (n=130,270) incorporated OPS. OPS case volume significantly increased from 244 cases in 2005/2006 to 20,410 cases in 2019 (Fig.1). OPS patients were younger, less likely to report tobacco use, less likely to have COPD or diabetes, and more likely to have received neoadjuvant chemotherapy than patients treated without OPS. Radiation therapy did not differ between groups. OPS operations tended to be longer, but hospital stays tended to be shorter; specifically, OPS operations lasted 61 minutes longer than partial mastectomy (95%CI: 60.1-62.2 min, $p<0.001$) and OPS patients were discharged 0.67 days earlier from hospital (95%CI: 0.65-0.69, $p<0.001$). The most significant independent predictor of morbidity probability was OPS (controlling for

diabetes, radiation therapy, chemotherapy, COPD, smoking status); morbidity was 10.7% lower in patients who had OPS (95%CI: 10.3-11.0, $p<0.001$). Despite OPS involving longer procedures with greater tissue manipulation, OPS patients were 52.4% less likely to suffer wound dehiscence ($p<0.001$) and 21% less likely to suffer a wound infection ($p<0.001$). However, while statistically significant, a 10% reduction in the small absolute complication rate (0.67%) decreases the clinical significance of this finding. Rates of re-operation, readmission, sepsis, and wound closure did not significantly differ between patient groups.

Conclusion: OPS is increasingly performed in the US. This analysis demonstrates OPS is not associated with an increased rate of complications compared to partial mastectomy alone. Consequently, OPS represents a safe and effective strategy for eligible women with breast cancer. Applying techniques that utilized pedicled flaps, while still minimizing soft tissue tension and reduce dead-space do not increase operative risk and may improve cosmetic and patient-reported outcomes following breast cancer surgery. The success of OPS highlights how this is one area where plastic surgeons can collaborate with their breast surgeon colleagues to optimize outcomes for breast cancer survivors.

Pathologic Mechanical Signaling Mediated by Rac2 Promotes The Foreign Body Response To Biomedical Implants

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Purpose: An estimated $170 billion is spent annually on biomedical devices including breast implants, pacemakers, neurostimulators and orthopedic prostheses around the world. However, between 10% and 30% of these devices fail prematurely. In most cases, implant failure occurs due to a phenomenon termed the foreign body response (FBR). FBR begins as a wound healing response to the trauma created from the insertion of a foreign object. A continued presence of the implant exacerbates this response, resulting in the formation of a collagenous fibrous capsule around the implanted object. This process eventually leads to device malfunction as well as distortion of the surrounding tissues. Currently, there are no FDA-approved therapies that effectively prevent debilitating fibrotic capsule formation and the resulting functional

complications around biomedical devices.

Methods: We compared human breast implant tissue and a novel murine model of FBR (mechanically stimulating implant or MSI model) to identify the key signaling pathways associated with pathological FBR. Subsequently, we utilized pathway analyses to identify potential molecular targets that are central to the signaling associated with pathological FBR. Finally, we employed small molecule inhibitors of Mechan transduction signaling in our mouse model as a proof of concept for a pharmacological strategy to target FBR and analyzed its effect on FBR capsule formation using immunostaining and histopathology.

Results: We first identified that Rac2, a hematopoietic-specific Rho-GTPase, was differentially upregulated in Baker IV compared to Baker I breast implant capsule tissue. Additionally, single cell sequencing of murine capsule tissue from our MSI model of FBR revealed significant differences in the activation of Rac2 and associated inflammatory markers relative to standard murine implants. Finally, we demonstrated that pharmacologically blocking Rac2 signaling in our MSI model significantly reduced the degree of FBR capsule formation as measured by decreased capsule thickness, total collagen deposition, percent mature collagen, and myofibroblast activation.

Conclusion: Our results highlight the important role of Rac2 as a mediator of pathologic foreign body response in both mice and humans. We demonstrate that pharmacological inhibition of Rac2 may potentially serve as an effective therapy to reduce FBR in patients receiving biomedical implants, thereby increasing patient quality of life and reducing implant failure rates. Further, these findings provide novel insights into the molecular mechanisms underlying fibrotic responses to implanted devices.

Patient and Operative Risk Factors for Complications following Pre-pectoral Implant-based Breast Reconstruction

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Introduction: Implant-based breast reconstruction is the most common reconstructive approach following mastectomy. Pre-pectoral implants offer advantages over sub-pectoral implants, such

as less animation deformity, pain, weakness, and post-radiation distortion. However, pre-pectoral implants are also associated with complications, namely seroma and infection.1 Factors that influence complications in pre-pectoral implant-based breast reconstruction need to be ascertained.

Methods: Patients treated with pre-pectoral implant-based breast reconstruction following mastectomy at our institution from January 2018 – October 2021 were retrospectively reviewed. Both single stage and two-stage reconstructions were included. Patient and operative factors studied were history of smoking, diabetes, obesity, COPD, hypertension, previous breast surgery, and hypercoagulability; genetic mutation for breast cancer; preoperative chemotherapy and radiation; type of mastectomy; stage of reconstruction; use of acellular dermal matrix (ADM); ADM coverage pattern; and postoperative chemotherapy and radiation. Outcomes assessed included: surgical site infection, cellulitis, delayed healing, seroma, hematoma, fat necrosis, mastectomy skin necrosis, nipple areolar necrosis, capsular contracture, expander loss, and implant loss. Univariate analyses were done using Fisher Exact tests. Multivariate analysis was done using logistic regression.

Results: A total of 98 patients (169 breasts) were included. 44 breasts (26.0%) underwent direct-to-implant reconstruction while 125 (74.0%) underwent two-stage reconstruction. The median follow up was 9.9 months (IQR:). In their postoperative course, 26 breasts (15.4%) were diagnosed with surgical site infection, 40 breasts (23.7%) had seroma, and 35 breasts (20.7%) experienced loss of either a tissue expander or permanent implant. On univariate analysis, surgical site infection was associated with history of previous breast surgery (26.2% vs. 11.8%, $p < 0.05$) and with ADM coverage technique (sling: 11.9%, draped: 28.0%, circumferential wrap: 0.0%, $p < 0.05$). Seroma formation was associated with history of previous breast surgery (47.6% vs. 15.6%, $p < 0.05$) and having a two-stage reconstruction (29.6% vs. 6.8%, $p < 0.05$). Postoperative radiation therapy was associated with development of capsular contracture (7.9% vs. 0.8%, $p < 0.05$). In multivariate analysis, surgical site infection was negatively associated with Flex HD ADM vs. Alloderm (OR = -3.86, $p < 0.05$. Expander/implant loss was associated with preoperative chemotherapy (OR = 2.37, $p < 0.05$) and negatively associated with Flex HD ADM (OR = -4.01, $p < 0.05$).

Conclusion: Pre-pectoral implant-based breast reconstruction is associated with high rates of seroma, infection, and implant/expander loss. Various patient and operative factors may affect incidence of complications following this reconstruction. History of breast surgery seems to portend greater risk of surgical site occurrences. ADM also appears to play a role in surgical site occurrences following reconstruction. In the longer-term, these patients also experience capsular contracture and have a higher risk if they have postoperative radiation. Surgeons need to better understand such factors to optimally counsel patients on and plan reconstructive options.

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Patient Reconstruction Factors Associated with a New Breast-Q Scale Measuring Cancer Worry: A Love Research Army Cross-Sectional Study

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Purpose: The BREAST-Q Breast Cancer module is a patient reported outcome measure for women with a breast cancer diagnosis. Our research team developed and validated a novel BREAST-Q Breast Cancer module scale that measures quality of life outcomes specific to Cancer Worry. The aim of this study was to investigate patient breast reconstruction factors that are associated with worse scores on the new BREAST-Q Cancer Worry scale.

Methods: Women with a history of breast cancer treated with mastectomy and reconstruction, aged ≥18, and English-speaking were recruited through the Love Research Army (LRA) between October-November 2019. Participants completed demographic questionnaires alongside the BREAST-Q Cancer Worry scale. Univariable and multivariable regression analyses were used to identify participant characteristics associated with each scale

Results: Of 554 potential respondents, n=538 (97.1%) completed the Cancer Worry scale. The average patient age was 58.4 years (+9.8). Cancer Worry scores were normally distributed with a mean of 46.4 (+17.2). Cancer Worry scores were significantly associated ($p<0.01$) with younger age, history of radiation therapy, complications associated with breast surgery since diagnosis, use of textured breast implants, and shorter duration since surgery.

Conclusion: This exploratory analysis provides evidence of patient characteristics that may be associated with worse cancer worry following post-mastectomy breast reconstruction.

Patient Satisfaction after Abdominally Based Breast Reconstruction in the Class 3 Obese Population

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Background/Objective: Current literature indicates that obese patients undergoing abdominally based autologous breast reconstruction have higher complication rates than patients with normal body mass index (BMI). [1] Despite higher complication rates in the obese population, patient-reported outcomes (PROs) across stratified BMI subgroups of women undergoing autologous breast reconstruction show no statistically significant differences in breast satisfaction. [2] There has been little research conducted on PROs of breast reconstruction in patients with class 3 obesity (BMI > 40 kg/m2). Given the rise of obesity in the United States and its association with increased risk for developing breast cancer, this study sought to investigate PROs in patients with class 3 obesity who underwent abdominally based autologous breast reconstruction.

Methods: A retrospective review of patients who underwent abdominally based breast reconstruction at a single institution was performed between 2010 and 2021. Those patients with a BMI over 40 kg/m2 were included. Eligible participants were contacted to complete the BREAST-Q survey post-operatively.

Results: 26 patients (ages 36-65, BMI range 40.2-45.1) met inclusion criteria with 17 completed BREAST-Q surveys (65% response rate). 11 patients underwent immediate (vs. 6 delayed) reconstruction (4 unilateral, 13 bilateral). 28 DIEP and 6-MS-TRAM flap reconstructions were documented (per breast). Raw scores were scaled following official BREAST-Q guidelines. Mean scaled BREAST-Q scores were 57.53 (psychosocial wellbeing), 26.75 (sexual wellbeing), 55.88 (breast satisfaction), 34.06 (physical wellbeing: chest), 43.33 (physical wellbeing: abdomen), and 59.83 abdomen satisfaction).

Conclusion: Our data indicates lower reported wellness and satisfaction in the class 3 obese population across all 5 tested BREAST-Q categories. Future studies may look to standardize and coordinate follow-up time with survey administration and investigate outcomes for patients with other classes of obesity.

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Patient-Reported Outcomes Following Subpectoral to Prepectoral Implant Conversion

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Background: An increasing number of patients are electing to undergo implant conversion from the subpectoral to prepectoral plane to alleviate chronic pain, animation deformity, and cosmetic concerns.1,2 Multiple studies have detailed this surgical technique and have examined postoperative complications associated with this approach. However, no patient-reported outcome measures have been utilized to examine the patient's postoperative experience. The aim of this study is to utilize the BREAST-Q to examine patient-reported outcomes following implant conversion from the subpectoral to prepectoral plane.

Methods: We retrospectively examined patients who underwent subpectoral to prepectoral implant conversion by two surgeons at two separate centers from 2017-2021. Patient demographics, surgical characteristics, postoperative outcomes, and BREAST-Qs were obtained. The BREAST-Q domains of interest included patient satisfaction with breasts, satisfaction with implants, physical well-being, sexual well-being, and psychosocial well-being. Paired samples t-tests were used to compare preoperative and postoperative BREAST-Q scores for each domain.

Results: Thirty-seven patients with a mean age of 51.8+12.2 years underwent subpectoral to prepectoral implant conversion. Average duration of follow-up was 17.0+10.2 months. Postoperative complications occurred in 23 breasts (35.9%), which included infection (12.5%), seroma (6.3%), hematoma (4.7%), wound dehiscence (9.4%), and capsular contracture (3.1%). Three patients (8.1%) had bilateral implant failure due to wound dehiscence or infection. Indications for implant conversion included chronic pain (43.2%), animation deformity (29.7%), and cosmetic concerns (27.1%). Of these patients, 29 (78.4%) completed preoperative and postoperative BREAST-Qs. Average time between the conversion operation and postoperative BREAST-Q administration was 16.6+13.3 months. Overall, patient satisfaction with breasts and implants improved significantly following the operation (41.0+15.2 vs. 79.6+13.9, $p<0.001$ and 4.6+2.1 vs. 6.2+1.8, $p=0.01$, respectively), as did patient's psychosocial (57.1+15.4 vs. 79.7+17.4), sexual (41.6+16.9 vs. 64.1+17.8), and physical well-being (56.1+21.9 vs. 91.6+8.4, $p<0.001$). In patients with chronic pain, physical well-being scores improved from 41.8+17.2 preoperatively to 91.4+8.4 postoperatively ($p<0.001$). Conversely, for patients with cosmetic concerns, satisfaction with breast appearance increased from 35.0+21.4 to 75.8+17.0 postoperatively ($p=0.02$).

Conclusion: Conversion of subpectoral implants to the prepectoral plane improves patients' chronic pain and satisfaction with cosmetic outcomes. Regardless of the primary indication for this surgery, subpectoral to prepectoral implant conversion significantly increases long-term BREAST-Q outcomes in all domains, including patient satisfaction with breasts and implants, as well as psychosocial, physical, and sexual well-being.

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Payer-Specific Negotiated Prices for Mastectomy and Breast Reconstruction at Top Performing Breast Centers

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Purpose: Mastectomy and breast reconstruction (BR) both play an important role in breast cancer therapy but are associated with significant financial burdens. Given recent federal price transparency regulations, we sought to characterize rates of price disclosure for mastectomy and BR.

Materials and Methods: Cross-sectional analysis of payer-negotiated prices for mastectomy and BR across United States hospitals that satisfied the following criteria: a) met standards set by the American College of Surgeons' National Accreditation Program for Breast Cancer or the National Quality Measures for Breast Centers; b) were designated as Breast Imaging Centers of Excellence by the American College of Radiology and c) received a patient recommendation rating in the top 75% by the Centers for Medicare and Medicaid Services (CMS). This detailed criterion was used so that our sample would be limited to hospitals providing the most comprehensive breast cancer care. Price information were obtained from Turquoise Health, an online price transparency platform. Publicly available financial reports from CMS were used to collect facility-specific data such as bed-size, teaching status, wage index, cost-to-charge ratios, participation in Disproportionate Share Hospital Payments (DSH), and patient revenues. We analyzed hospital characteristics associated with price disclosure using current procedural terminology and diagnosis-related group codes mastectomy (simple and radical) and breast reconstruction (implant, pedicled flap and free flap).

Results: Of the 618 hospitals that comprised our analytical sample, 355 (57.4%) disclosed prices for simple or radical mastectomy; 341 (55.2%) disclosed prices for both mastectomy and some form of BR including implants (n = 217, 61.1%), pedicled flaps (n = 148, 41.7%), and free flaps (n = 81, 22.8%). Hospitals that did not disclose pricing information had higher average charge to cost ratios (or markups) (4.86 vs 4.54, $p < 0.05$), higher total bed days to total employee full time equivalents (58.6 vs. 54.5, $p < 0.05$), were more likely to be non-profits (83.7% vs. 76.9%, p <

0.01), and more likely to not participate in DSH Payments ($p < 0.05$).

Conclusions: More than 40% of eligible hospitals did not disclose prices for mastectomy and BR. Distinct hospital characteristics were associated with price disclosure. Patients face persistent difficulty in accessing costs for breast reconstruction despite the CMS mandate.

Pediatric Reduction Mammaplasty: A retrospective analysis of the Pediatric Health Information System (PHIS) Database

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Background: Breast reduction mammaplasty is performed in the adolescent population for select patients suffering from psychosocial and physical symptoms of macromastia. The existing literature regarding breast reduction the adolescent population remains somewhat limited but does support the overall safety of the procedure in this age group. The purpose of the study is to investigate patient-related and socioeconomic factors affecting cost and operative outcomes using the PHIS database, a large administrative database including over 50 tertiary-care pediatric hospitals in the United States.

Methods: The PHIS database was queried from 2010 to 2020. All female patients ages 10-18 with Current Procedural Terminology (CPT) code 19318, for reduction mammaplasty, were included. Demographic data, including age, race, ethnicity, household income, and payor source, were collected and analyzed. Outcomes evaluated included billed charges, duration of stay, readmission, and complications.

Results: A total of 2,771 patients were identified and evaluated. The mean age was 16.5 (±1.3) years. The number of procedures performed annually increased over the study period from 124 in 2010 to 483 in 2020. Overall, the 30-day readmission rate including returns to emergency department, was 5.6%, and 24 patients (0.8%) required return to surgery for hematoma. Length of stay was one day or less in 97.8% of patients. Hispanic ethnicity was associated with increased chance of length of stay greater than 1 day ($p<0.01$). African American race was associated with higher readmission rates ($p<0.01$) and greater billed hospital charges ($p<0.01$). Medicaid and lower household income were also associated with higher billed charges ($p<0.01$).

Conclusion: In this large retrospective database analysis, adolescent patients undergoing reduction mammaplasty had relatively low early complication rates and short hospital stay. Duration of stay, readmission, and hospital charge discrepancies were associated with race,

ethnicity, income, and insurance payor. These social and economic discrepancies are deserving of further investigation and discussion.

Pedicled Latissimus Dorsi Myocutaneous Flap in Breast Reconstruction: Is There Still a Role for this 'Historic' Flap? Lessons Learned from My First 90 Cases

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Background: Abdominal free tissue transfer (AFTT) has largely superseded the pedicled latissimus dorsi myocutaneous flap (LDMCF) in autologous breast reconstruction. This is partly due to the idea of a 'free tummy tuck', as well as common complaints of the LDMCF. These include: the asymmetric back donor site and scar, need for prosthesis, high seroma rates and long-term functional deficit (REF). Indeed, recently graduated microsurgery fellows may rarely encounter LDMCF during their training. We believe that LDMCF remains an incredibly versatile flap, that is still relevant and has several advantages over AFTT. Low BMI, nulliparous or post-abdominoplasty patients all lack sufficient donor site; high BMI patients and those with hypercoagulable states are poor microsurgery candidates. Furthermore, following failed AFTT, LDMCF may be the only option for salvage breast reconstruction. LDMCF has distinct advantages over AFTT: the flap can be harvested unilaterally or bilaterally, not 'burning any bridges' for future reconstruction, the short and long-term recovery is quicker and no risk of abdominal wall weakness. Microsurgery is not required, leading to shorter operative times and inpatient stay. The purpose of this study was to share our insights and refinements into the versality of the LDMCF in breast reconstruction and report on our outcomes, based on our 90 cases, over a 6-year period.

Methods: Prospective review of all patients undergoing LDMCF reconstruction performed by the senior surgeon (WYL) between 2015 and 2021. We recorded details including demographics, surgical indication, length of stay (LOS), scar placement, esthetic outcome, complication rates and secondary procedures.

Results: 86 female patients with 90 breast reconstructions fulfilled inclusion criteria. Average BMI was 27.6. Ten patients had partial breast defects, and 76 had mastectomies. Immediate reconstruction was performed in 25/90 (28%) and 65/90 (72%) were delayed reconstruction following radiation. 44 patients had LDMCF and silicone implant, 19 patients had LDMCF with tissue expander (TE), and 23 patients had LDMCF alone. Median LOS decreased from 3.6 days in 2016 to 1.6 days in 2021/2022. During this same time period, TE placement decreased from 60% to 5% of prosthesis placed. Complications included 4/90 patients (4.4%) with seroma formation, managed by in-office needle aspiration and use of breast binder, 5/63 (7.9%) with periprosthetic implant infection, requiring operative washout and replacement, 1/90 with partial

flap loss and no patients had complete flap loss.

Conclusions: Pedicled LDMCF remains a highly relevant autologous flap available for breast reconstruction. It may be the only option for autologous breast reconstruction in certain patients. Lessons learned include: 1. many patients do not require an implant, especially in higher BMI patients; 2. TE can be avoided in most cases; 3. donor site esthetics can be improved by approaching flap harvest similar to a 'bra-line back lift' and lengthening the scar to mitigate lateral dog ears; 4. LOS can be reduced to overnight stay using long-acting bupivacaine and Enhanced Recovery After Surgery (ERAS) protocol; 4. seroma rates are low, with use of a topical fibrin glue; and 5. short and long-term recovery are faster than abdominal-based flaps, with minimal long-term deficit.

Physician Perspectives on Breast Implant Illness: A Survey of Members of the American Society of Plastic Surgeons

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Purpose: Breast implant illness (BII), a broad constellation of symptoms in patients with breast implants, is increasingly being reported by patients, providers, and in online communities. Though BII is not a definitive diagnosis, patients are still presenting to their healthcare providers with concerns for unexplained symptoms and requests to remove their breast implants. Current literature seeks to understand patient perspectives of BII, yet few studies examine the other half of the contributors to conversations surrounding BII: physician opinions.[1] This pilot study aims to understand plastic surgeons' perspectives on BII, as well as how physicians are managing the condition in their practices and how patients are being referred to these surgeons.

Methods: An IRB-approved survey was distributed to all members of the American Society of Plastic Surgeons (ASPS). Eligible participants are board-certified plastic surgeons who are active members of ASPS. The survey consisted of questions inquiring about the surgeon's experience with BII as well as their own opinions about the diagnosis. Survey responses were analyzed using qualitative coding and descriptive statistics.

Results: A total of 589 responses were collected. Regarding opinions on whether BII is a distinct clinical entity, 26% (n=153) of respondents believe it is while 36.2% (n=213) feel that the current scientific evidence is insufficient. Of the 492 physicians who reported having previously seen at least one patient who believed they had BII, 88.2% (n=434) answered that these patients had received information about the condition from their own internet searches, 63.8% (n=314) had received this information through social media, and 51.6% (n=254) had received information about the condition through Facebook support groups. The most common reported symptoms that these patients saw their physician for were fatigue (93.1%), joint pain (72.4%), brain fog (71.5%), and muscle pain (63.6%). A subset of survey respondents answered that these patients had been referred to them by another provider (n=201), most commonly by a primary care physician (78.6%) or a medical subspecialty physician (38.8%) such as a rheumatologist or chronic pain specialist. Reported alternative differential diagnoses included endocrine, psychiatric, rheumatologic, and autoimmune disorders. Respondents also answered that their management patterns varied depending on the symptoms that patients present with, but answers included referrals to immunologists or rheumatologists and workup using routine laboratory testing or breast imaging.

Conclusion: While no scientific consensus identifies BII and its characteristics as a distinct disease, plastic surgeons are nonetheless encountering patients seeking relief from its symptoms. Understanding plastic surgeons' opinions on BII at leadership levels can guide future research, efforts for patient counseling, and collaboration with primary care providers and other specialists who may interface with this clinical entity.

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Plastic Surgeons Represent Only a Third of Search Results for Breast Reconstruction on Major Hospital Websites

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Introduction: Online services, including hospital websites, are being used more frequently by potential patients to determine which hospitals and/or physicians to receive care from. Within recent years, there is an increasing number of non-plastic surgeons performing both reconstructive and aesthetic breast surgery. We examined plastic surgeon's representation on major hospital websites in the U.S. for breast reconstruction.

Methods: The top 20 U.S. medical centers according to the U.S. News and World Report's Hospital Rankings from 2020-2021 were identified. Each hospital search engine was used to perform a thorough search for the search items: "breast reconstruction", "implant-based reconstruction", "autologous breast reconstruction", and "mastectomy". Data reviewed for search results included gender, if they were a physician, medical specialty, medical school, and residency attended, and each individual's position within the search results.

Results: Across all searches, a total of 1,145 search results were obtained, averaging 286 (range 197 to 453) results per search term. The majority of suggested physicians were male (64%). The search term "implant-based reconstruction" suggested mostly male physicians (78%) while "mastectomy" suggested slightly more female physicians (52%) (Figure 1). A total of 1,000 physicians allopathic trained (M.D) physicians composed search results who mostly attended medical school in the U.S. (92%) and attended a U.S. based residency training program (98%).

Nearly a third (34%) of all searches produced no results. Plastic surgeons had a collective representation of 39% for the search term "breast reconstruction" and only 16% representation for the term "mastectomy". The majority of physicians identified were non-plastic surgeons (67%). Other surgeons represented approximately half (47%) of search results and obstetricians/gynecologists (OBGYN) accounted for 2%. However, plastic surgeons were more likely to appear earlier on search results with an average search position of 17±28 (range 1-195) compared to non-plastic surgeons' average position of 57±59 (range 1-238) ($p<0.001$).

Conclusions: Plastic surgeons are underrepresented on major hospital websites when searching for common breast reconstruction terms, as they composed only a third of physicians identified and a third of searches produced no results. This inadequate search system on major hospital websites likely is indicative of similar issues across most U.S. hospitals. This creates inefficiencies for the entire healthcare systems and may negatively impact hospital and physician patient referrals and income.

Patients interested in breast reconstruction may encounter difficulty finding an appropriate plastic surgeon given that non-plastic surgeons such as general surgeons, oncologic breast surgeons, trauma surgeons, orthopaedic surgeons, neurosurgeons, urologists, and OBGYN represented approximately half of all search results. Partnership with administrative and information technology personnel is critical to enhance search engine function. Doing so will benefit patients and plastic surgeons. Advocacy efforts focused on enhancing the presence of plastic surgeons in such searches is crucial to maintaining the scope of practice of plastic surgery and ensuring patients have access to the appropriate reconstructive care.

Post Mastectomy Tissue Expander Placement followed by Radiation Therapy: A Cost-Effectiveness Analysis of Staged Autologous vs. Implant-Based Reconstruction

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Purpose: There is no clearly preferred approach to breast reconstruction in patients with locally advanced breast cancer who require post-mastectomy radiation therapy (PMRT). Staged implant and deep inferior epigastric perforator (DIEP) flap reconstruction each have unique risks and benefits. No previous study compares the cost-effectiveness of these approaches with validated utility scores.

Methods: A literature review looking at prospective trials determined the probabilities and outcomes for mastectomy and staged implant reconstruction or staged DIEP flap reconstruction. Utility scores were used to calculate the quality adjusted life years (QALYs) associated with a successful procedure and post-operative complications. Medicare current procedure terminology and diagnosis-related group codes were used to assess the costs for a successful surgery and associated complications. A decision analysis tree was constructed with rollback analysis to highlight the more cost-effective strategy. An incremental cost-effectiveness ratio (ICER) analysis was performed with a willingness to pay at $50,000. Deterministic and probabilistic sensitivity analyses were performed to validate the robustness of the results, and to account for uncertainty in the data.

Results: Mastectomy with staged DIEP flap reconstruction is costlier ($14,104.80 versus $3,216.93), but more effective (29.96 versus 24.87) compared to staged implant reconstruction. This resulted in an ICER of 2141.00, which favored DIEP flap reconstruction, indicating a dominant strategy. In one-way sensitivity analysis, DIEP flap reconstruction was the more cost-effective strategy if the cost was less than $257,444.13. Monte Carlo analysis showed a confidence of 99.99% that DIEP flap reconstruction is more cost-effective.

Conclusions: For patients with locally advanced breast cancer who require PMRT, mastectomy followed by staged DIEP flap reconstruction is significantly more cost-effective when compared with staged implant reconstruction. Despite the decreased morbidity, staged implant reconstruction has much greater rates of complication in irradiated fields including capsular contracture and infection.

Post-Mastectomy Breast Reconstruction: How Much Do Patients Understand?

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Purpose: Health Literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic medical information needed to make health decisions. Patients undergoing post-mastectomy breast reconstruction are faced with complex medical and surgical decisions that may be influenced by their degree of health literacy. Several studies have evaluated the quality of education materials covering breast reconstruction. However, there is a paucity of data measuring the level of knowledge surrounding post-mastectomy reconstruction in patients. The aim of our study is to compile and present the data assessing health literacy in breast cancer patients contemplating post-mastectomy reconstruction.

Methods and Materials: Our scoping review retrieved publications from the following databases: Cochrane Database of Systematic Reviews, Cumulative Index to Nursing and Allied Health Literature, MEDLINE/PubMed and Scopus. Based on the initial exploratory research, the following eligibility criteria were selected: original research, systematic reviews, meta-analyses, scoping reviews, rapid reviews, literature reviews from 2000 and on, English text language, patients aged 18 and older, and surgical intervention that includes autologous or prosthetic breast reconstruction. The following keywords were used: breast reconstruction, mammaplasty, health literacy, health numeracy, patient education, and decision-making aids. An academic librarian advised the Medical Subject Headings terms for each database. The articles were retrieved and analyzed by two independent screeners following the PRISMA-Scr guidelines.

Results: Of the 33 articles that were included for full review, three articles directly assessed degree of knowledge surrounding post-mastectomy reconstruction. All publications were prospective, cross-sectional studies that assessed a total of 2522 women, aged $18 < x < 79$, diagnosed with ductal carcinoma in situ and/or invasive ductal carcinoma. The most common assessment tool was a set of brief screening questions that covered the following domains: knowledge about specifics of breast reconstruction, involvement in decision making and degree of general medical knowledge. One study showed 25% of patients demonstrated limited health literacy and were significantly less likely to undergo breast reconstruction.(1) The second study showed a mean knowledge score of 58.5% out of 100% about the specifics of breast reconstruction.(2) In the final study, only 11.2% of patients were able to correctly answer all reconstruction specific questions in the knowledge assessment.(3)

Conclusions: There is a paucity of studies that directly measure the fund of knowledge about post-mastectomy breast reconstruction in patients with breast cancer. The current data suggests that there is a significant proportion of patients that demonstrate moderate to low degrees of knowledge which may correlate to suboptimal rates of post-mastectomy reconstruction.

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Post-Mastectomy Lymphedema in Breast Reconstruction: A Multicenter 10-Year Temporal Stratification

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Purpose: Lymphedema is one of the most feared side effects following mastectomy. Within the years following a mastectomy, over 20% of women may be affected by lymphedema. 1 Current literature suggests that breast reconstruction may offer a protective effect against post-mastectomy lymphedema. 2 As the largest study of its kind, this study aims to analyze the risk of post-mastectomy lymphedema in patients without reconstruction versus those undergoing autologous or implant based reconstruction (IBR) using a federated electronic medical record network (TriNetX Inc,Cambridge,MA).

Methods: The de-identified records of 85,776,922 patients were retrospectively screened from 2006 to 2021. 24,136 post-mastectomy patients aged 18-99 meeting criteria were allocated into cohorts using common procedural terminology codes. Cohorts were compared to assess lymphedema outcomes relative to timing of reconstruction (immediate vs. delayed) and type of reconstruction (no reconstruction vs. IBR vs. autologous). Outcomes were assessed following rigorous balancing including age, race, radiation, smoking, diabetes, obesity, chemotherapy, hormone therapy, and axillary lymph node dissection. Rates of post-operative lymphedema within 1,2,3,5, and 10-years of mastectomy were analyzed to account for the development of lymphedema over time.

Results: Within 10-years, both IBR and autologous breast reconstruction yielded significantly decreased risk of lymphedema when compared to no reconstruction (Risk Ratio (RR): 0.44-0.528, 95%CI:0.401-0.569, $p<0.0001$). Delayed IBR is significantly associated with lower rates

of lymphedema when compared to autologous breast reconstruction (RR:1.687-1.847, 95%CI:1.261-2.48, p<0.001). No significant within-groups differences for autologous breast reconstruction or IBR were detected when delaying reconstruction 6 months or 12 months.

Conclusion: Our analysis examines the potential mediated risk of post-operative lymphedema in breast reconstruction. Our results suggest that patients with breast reconstruction have lower risks of lymphedema and delayed IBR may be associated with the lowest risk of post-operative lymphedema. Limitations include this study's retrospective nature and reliance on the accuracy of medical coding. Future prospective studies are warranted to characterize these findings.

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Postsurgical Outcomes with Acellular Dermal Matrices for Two-Stage Prosthetic Breast Reconstruction in 20,817 Patients

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Purpose: The use of acellular dermal matrices (ADM) for tissue expander breast reconstruction remains controversial with uncertain safety and efficacy profile. This study analyzes the rates and factors for reoperation and postoperative infection in patients who underwent tissue expander breast reconstruction with and without ADM.

Methods: Patients who underwent breast reconstruction with and without ADM were identified from the NSQIP database utilizing CPT codes. Covariates included patient demographics, preoperative comorbidities, and operative characteristics, while outcomes of interest were postoperative infection and reoperation. A univariate and multivariate analysis were performed to identify predictors of adverse outcomes.

Results: There were 8,334 patients in the ADM cohort and 12,451 patients who underwent tissue expander breast reconstruction without ADM. There were significantly fewer reoperations in the non-ADM cohort (5.4%) compared to the ADM cohort (7.7%) (p<0.0001), with infection and hematoma as the most common etiologies in both cohorts. Surgical infections were also more prevalent in the ADM cohort (4.7%) compared to the non-ADM cohort (3.6%) (p<0.0001).

Univariate and multivariate analysis of the tissue expander breast reconstruction cohort revealed race, obesity, hypertension, smoking status, albumin, and operative time as predictive for infection risk, while race, obesity, hypertension, smoking, albumin, operative time, and age were significant for reoperation.

Conclusion: Our study of 20,817 patients revealed significantly higher risk of infection and reoperation in patients who underwent breast reconstruction utilizing ADM compared to those without ADM. Patients considering ADM for breast reconstruction should engage in discussion with their provider about complications, aesthetics, and cost.

Predicting Final Implant Volume in Two-Stage Pre-Pectoral Breast Reconstruction

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Purpose: Two-stage implant based breast reconstruction remains the most commonly performed reconstruction surgery following mastectomy.(1) Although prior studies have explored the relationship between tissue expander (TE) features and permanent implant (PI) size in subpectoral reconstruction(2), recent trends have demonstrated a shift towards prepectoral implant placement with acellular dermal matrix (ADM).(3) This study aims to identify pertinent TE characteristics and evaluate their correlations with PI size for prepectoral implant-based reconstructions.

Methods: This study analyzed patients who underwent two-stage pre-pectoral tissue expansion for breast reconstruction followed by implant placement. Exclusion criteria were delayed, autologous and direct to implant breast reconstruction patients. Patient demographics and oncologic characteristics were recorded, including age, body mass index, overall stage, chemoradiation history, and patient-reported pre-operative cup size. TE and PI features were evaluated, including TE size, final fill volume, mastectomy weight, ADM usage, expansion duration, TE and PI manufacturers, PI size, and PI projection. Significant predictors for PI volume were identified using linear and multivariate regression analyses.

Results: We identified 177 patients and 296 breast reconstructions that met our inclusion criteria. The expansions were all performed in the prepectoral plane with the majority using ADM (93.8%) and primarily silicone implants placed (94.3%). The study showed a mean TE

size of 485.4 cc with mean initial fill of 245.8 cc and mean final fill of 454.4 cc. Mean PI size was 502.9 cc with a differential fill volume (PI - TE) of 11.7 cc. Multivariate analysis identified significant features for PI size prediction, including TE size ($R2=0.60$; $p<0.0001$), TE final fill ($R2=0.57$; $p<0.0001$), and mastectomy weight ($R2=0.42$; $p<0.0001$). The prediction expression for TE final fill and implant size was calculated as $26.6 + 0.38*(\text{TE final fill}) + 0.61*(\text{TE size})$.

Conclusion: Tissue expander size, final expansion volume, and mastectomy weight were significant variables for implant size prediction. The calculated formula yielded significant regression coefficient values for TE size and final fill. With pre-pectoral implant placement gaining popularity, this formula may enable more optimized preoperative planning and decision-making for pre-pectoral reconstructions.

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Predictors Of Postoperative Complications In Deep Inferior Epigastric Perforator Flap Breast Reconstruction

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Background: Deep inferior epigastric perforator (DIEP) flaps are the gold-standard for autologous breast reconstruction following mastectomy given its positive effects on body image, self-esteem, and quality of life. However, complications occur in up to 20% of patients, and risk

factors are not well characterized. This study aimed to explore risk factors for complications in a large, contemporary cohort of patients undergoing DIEP breast reconstruction.

Methods: This retrospective study included patients who underwent unilateral or bilateral DIEP flaps for breast reconstruction between 2016 and 2020 at an academic institution. Demographic and treatment characteristics were evaluated in univariable and multivariable regression models for outcomes of interest: overall complications, reoperation, total and partial flap necrosis, venous congestion, arterial thrombosis, flap salvage, and infection.

Results: In total, 802 DIEP flaps were performed in 524 patients (mean age 51.2±9.6, BMI 29.3±4.5). There were 453 (86.5%) patients with breast cancer, and 79 (15.1%) patients had a BRCA mutation. There were 282 (53.1%) delayed and 242 (46.2%) immediate reconstructions, and 278 (53.1%) bilateral and 246 (46.9%) unilateral reconstructions. Median follow-up was 15.1 months (IQR, 8.7-22.7). Overall complications occurred in 81 (15.5%) patients, including abdominal site issues (3.8%), venous congestion (3.4%), breast hematoma (3.6%), infection (3.6%), partial flap loss (3.2%), total flap loss (2.3%), and arterial thrombosis (1.3%). The complications cohort had higher BMI (30.5 vs 28.9, p=0.016). Prolonged surgical time (OR=1.003 per additional minute, p=0.001) and immediate vs delayed reconstruction (OR=1.92, p=0.013) predicted overall complications. Reoperation was required in 75 (14.3%) patients. Reoperation was associated with higher BMI (p=0.007), immediate reconstruction (p=0.024), and longer operating time (p<0.001). The flap salvage rate was 54.2%. Total flap loss occurred in 12 (2.3%) patients, occurring a median of 5 days following DIEP surgery. There were no individual risk factors that were significantly associated with total flap failure. In contrast, partial flap loss was more likely to occur in patients with higher BMI (31.4 vs. 29.0, p=0.014), current smokers (17.6% vs. 3.4%, p=0.044), immediate reconstructions (82.4% vs. 45.0%, p=0.003), and longer operating time (11.6 vs. 9.5 hours, p=0.004). On multivariable analysis, age (p=0.131), BMI (p=0.056), and operating time (p=0.138) were not significantly associated with partial flap loss, but immediate reconstructions increased risk by 5-fold compared to delayed reconstructions (OR 5.12, p=0.014).

Conclusions: This analysis of 802 DIEP flaps among 524 patients identified an overall complication rate of 15.5%, reoperation rate of 14.3%, and flap salvage rate of 54.2%. Prolonged operating time and immediate reconstruction were significant risk factors for developing complications after DIEP breast reconstruction. For each additional hour of surgical time, the risk of developing any complication increased by 18%. Immediate reconstructions were at higher risk of overall complications, reoperation, and partial flap failure. Age, smoking, tamoxifen or aromatase inhibitor use, and laterality were not significantly associated with adverse outcomes. Our findings contribute to the evidence base to inform shared decision-making for patients seeking breast reconstruction.

Prevention and Repair Techniques of Abdominal Wall Fascial Defects following Autologous Abdominal Based Breast Reconstruction: A Meta-Analysis and Systematic Review

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Purpose: Primary workhorse flaps for autologous breast reconstruction include those harvested from the abdomen, however devastating side effects of this technique include the creation of iatrogenic fascial defects. Use of mesh over primary closure in abdominal wall reconstruction of ventral or inguinal hernias has been proven effective, however inconsistency remains regarding donor site closure techniques for abdominal wall-based breast reconstruction. We review the efficacy of reported operative techniques most commonly used to prevent or repair donor site fascial defects in abdominally based autologous breast reconstruction.

Methods: A meta-analysis was performed in accordance with PRISMA guidelines. Ovid MEDLINE was queried for records pertaining to the study question using appropriate Medical Subject Heading (MeSH) terms. Study characteristics and patient demographics were collected. Abdominal weakness was determined to be any report of bulge, hernia, or fascial weakness. Univariate Fisher's exact and chi-square tests were used to analyze data.

Results: Of 516 citations identified, 65 underwent full-text review with 40 unique citations included in this study across 31 (77.5%) retrospective reviews, 6 (15%) prospective studies and 3 (7.5%) case series. Thirty studies described preventative abdominal wall weakness techniques while 10 reported fascial defect repair following autologous reconstruction. Mean patient age was 49.7+7.5 years with a mean follow-up 23.4+17 months. Donor site closure techniques included primary closure (57.4%), primary closure with mesh (17.8%), or mesh alone (22.9%). Synthetic mesh was most commonly used for closure (n=1609/2056, 78.3%), most frequently with an inlay placement (n=1075/2335, 46.0%). Occurrence rate of abdominal wall weakness was 4.6% (n=147) following primary closure, 5.6% (n=55) following primary closure with mesh, and 6.1% (n=78) following mesh alone for donor site closure (p=0.095). Following this, incidence of abdominal wall weakness was highest with biologic mesh (n=30, 18.5%) compared to synthetic (n=86, 5.3%) or biosynthetic (n=13, 4.6%) meshes (p<0.00001). There was no difference in occurrence of abdominal wall weakness based on primary location of mesh placement (p=0.147). There was no difference in reoperation rates by primary closure or mesh techniques (p=0.204). When isolating for mesh type or location used for repair, there were significantly higher reoperation rates for synthetic mesh (3.6%, p=0.041) and mesh placed in onlay positions (4.3%, p=0.010). Of repair techniques used, there were no significant differences in prevention of abdominal weakness for closure techniques, mesh types, or mesh placement.

Conclusion: Our results indicate donor site closure with mesh trended towards higher rates of abdominal fascial defects than primary closure, with the highest incidence associated with biologic mesh. Following abdominally based breast reconstruction, no difference was found in donor site closure techniques, but synthetic mesh and an onlay placement resulted in higher reoperation rates than other mesh types or placements. For primary prevention or repair of abdominal wall defects following autologous breast reconstruction, care should be taken when choosing mesh materials and techniques.

Primary and Salvage Reconstruction with the Latissimus Dorsi Musculocutaneous Flap

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Background: The latissimus dorsi musculocutaneous flap (LDF) is a versatile option for breast reconstruction after total or partial mastectomy. The LDF is often used in the setting of prior reconstructive failure, but its low complication rates and reliable vascular pedicle make it a strong primary option for certain patients. Staged breast reconstruction with the LDF and prosthetic devices allow for a well-vascularized tissue bed that helps facilitate successful reconstruction.

Methods: A retrospective chart review was performed for patients that underwent LDF breast reconstruction from 2017-2021. Patients were categorized based on if they underwent primary reconstruction with an LDF or a salvage LDF operation following failed reconstruction. Demographics, comorbidities, and complications were recorded for each patient. Additionally, patients were split into four pathways based on the nature of their staged reconstruction: 1- LDF with implant (1-stage), 2- LDF alone (1-stage), 3- LDF with tissue expander and delayed implant (2-stage), 4- Latissimus with delayed tissue expander and subsequent implant exchange (3-stage). Patients were delegated into these pathways irrespective of their classification of a primary or salvage LDF reconstruction.

Results: There were a total of 98 patients, with 30 receiving primary LDF reconstruction and 68 undergoing salvage LDF reconstruction. 11 of these patients were in pathway 1, 16 in pathway 2, 64 in pathway 3, and 7 in pathway 4. There was a significant difference in surgical revision rates between the primary cohort (73.3%) and salvage cohort (51.5%) ($p=0.043$). Furthermore, surgical revisions rates were dependent on reconstructive pathway as well ($p=0.022$). Overall complication rates after the LDF surgery for primary and salvage groups were 36.6% and 42.6% respectively, but there was no statistical difference ($p=0.579$). When the four LDF reconstructive

pathways were compared, there was no association between complication rates and reconstructive pathway (p=0.817). Comparing individual complication rates between the four pathways, rupture was significantly elevated in pathway 4 (p=0.004) and donor site seroma was also dependent on pathway (p=0.039) with pathway 1 and pathway 2 having elevated rates, 9.09% and 12.50% respectively. There was no significant difference between the four pathways for capsular contracture (p=0.117), flap necrosis (p=0.335), wound dehiscence (p=0.892), implant exposure (p=0.281), implant malposition (p=0.567), breast seroma (p=0.963), hematoma (p=0.911), or infection (p=0.510).

Conclusion: These data suggest that the LDF is a safe option for breast reconstruction. Selection of reconstructive pathway in staged LDF reconstruction should depend on patient preference and account for variable complication rates.

Prospective Study of Complications Following 500 Explantations with Simultaneous Breast Lift

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Background: Breast Implant Illness remains a poorly understood disease. Given this poor understanding, the best treatment for BII is uncertain, although all studies seem to agree that removal of implants leads to improvement of BII symptoms. For numerous reasons, BII patients are universally asking for removal of their implants with its capsule as a single specimen, which they are referring to as "capsulectomy-en-bloc".

Given our lack of understanding regarding BII, the senior author (SN) has taken a pragmatic approach to treatment, whereby he fully informs patients of all the facts in order for them to make an informed decision themselves. With that in mind, he has prospectively followed his patients in order to obtain accurate complication rates for capsulectomy with simultaneous lifting.

Methods: This study examined the complication rates of the first 500 bilateral capsulectomies performed by a single Plastic Surgeon between January 2019 and February 2022. All capsulectomies were done in conjunction with breast lifts. The inclusion criteria were patients implanted with either saline or silicone implants, above or below the muscle, bilateral or unilateral, intact, or ruptured. Exclusion criteria were patients with breast reconstruction following cancer resection. The main outcome was the incident risk of laceration, hematoma, pleural effusion, seroma, nipple compromise, pneumothorax, phlebitis and/or pulmonary embolus.

Results: Out of the 500 patients who underwent bilateral capsulectomies with breast lifts, 25

patients had complications post-operatively (total of 5%). The age of patients with complications ranged from twenty-seven to seventy-six years old, and the duration of the implants ranged from less than a year to forty-six years. Two patients had a skin laceration in the upper breast pole, representing an incident risk of 0.2% in 3 years. There was a total of nine hematomas (incident risk of 0.9% in 3 years). One patient who had a hematoma also developed a pleural effusion. There was a total of three seromas (incident risk of 0.3% in 3 years) which required drainage under ultrasound. Three cases out of 500 led to concern for nipple compromise but only one of these developed partial nipple loss on one side. There were 8 cases of unilateral pneumothorax (incident risk of 0.8% in 3 years), none of which developed any consequences. There were three cases of phlebitis (incident risk of 0.3% in 3 years), one of which led to a non-life-threatening pulmonary embolus.

Conclusion: In conclusion, the goal of this prospective study was to determine the complication rates of capsulectomies with simultaneous breast lift. Out of the 500 bilateral capsulectomies that were performed by a single Plastic Surgeon, 5% of patients had complications. Given our poor understanding of BII and its treatment, Plastic Surgeons are better off giving patients all the FACTS known in order for the patients to make an informed decision themselves, rather than tell patients what they THINK is best for the patient.

Psychological Impact of the Covid-19 Pandemic on Breast Reconstruction Patients

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Purpose: A population that has been interestingly impacted by the Covid-19 pandemic is the breast cancer patient population. The moratorium on elective surgeries cancelled all elective cases yet allowed high priority cases to continue. This placed breast cancer patients in an unusual position, where mastectomy procedures were deemed necessary, yet all immediate reconstructive procedures were halted. The positive psychosocial benefits of immediate breast reconstruction within this patient population have been well established. The purpose of our study was to examine the effect of the Covid-19 pandemic on rates of immediate breast reconstruction and on patients' wellbeing.

Methods: A retrospective chart review was conducted and included all patients who underwent mastectomy at a large safety-net hospital from December 2019 to September 2021. Demographic and surgical data were extracted via chart review. Patients meeting our inclusion criteria were contacted by a member of our research team and asked to voluntarily participate in a Covid-19

specific survey and to complete the Hospital Anxiety and Depression Scale (HADS).

Results: Two hundred and fifty-nine patients were included in our study. Of these patients, the majority (62.2%, n=161) were referred to plastic surgery prior to mastectomy, yet 57.1% (n=148) did not undergo breast reconstruction at any time. From December 2019 through the year of 2020, 37.9% of patients underwent breast reconstruction, with an overall immediate breast reconstruction rate of 28.2%. Throughout 2021, 48.0% of patients underwent breast reconstruction, with 46.5% of all patients undergoing immediate tissue expander placement at time of mastectomy. During 2019, 51.5% of patients underwent immediate breast reconstruction.

Of the 259 patients that met inclusion criteria, 76 patients consented to participate in the covid-19 specific survey, for a participation rate of 29.3%. Many patients stated that their breast reconstruction was disrupted due to covid-19 restrictions, with 17.1% stating that their breast cancer care was affected "extremely much." Twenty-four patients were diagnosed with Covid-19 during this time, but only 33.3% stated that being infected with Covid-19 impacted their breast cancer care. At time of diagnosis, 57.3% of patients stated that breast reconstruction was "extremely" important to them, with 28.9% of patients having concerns about breast reconstruction cross their mind "constantly."

Seventy-three patients completed the HADS survey, for a response rate of 28.2%. Most patients were classified within the normal range for both the anxiety and depression scales, yet large numbers of patients fell into the mild and moderate categories, with 5.5% of patients being classified within the severe anxiety range, and 2.7%. within the severe depression range.

Conclusions: Throughout the Covid-19 pandemic, breast cancer patients have faced increased difficulties with regards to access to breast reconstruction. Our institution showed decreased rates of immediate breast reconstruction during this period compared to mastectomy patients from 2019. Many of our patients stated their breast cancer care was affected due to covid-19 restrictions and reported increased levels of anxiety and depression.

Public Perceptions of Breast Implant Complications and the 2021 FDA Boxed Warning for Implants

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Background: Implant-based breast reconstruction and breast augmentation using implants comprise some of the most common procedures performed by plastic surgeons. The United

States Food and Drug Administration (FDA) released a boxed warning for implants in October 2021, requiring surgeons to disclose certain risks of implants to patients. This study aimed to assess public perceptions of breast implant complications and the risks that are now required to be communicated with patients.

Methods: Amazon Mechanical Turk was used to administer a cross-sectional survey to women in the United States in December 2021 to assess public perceptions of breast implant complications and items included in the October 2021 breast implant checklist issued by the FDA. Incomplete survey responses were excluded. "Experienced" respondents were those who knew someone who/personally worked in healthcare or had any surgery. Remaining respondents were "naïve." A multivariable logistic regression model was used to identify predictors of responses.

Results: There were 494 complete responses. Respondents had a median age of 35 years and were 86% White, 17% Hispanic, 90% insured, and 80% with an associate degree or higher (ADH). Most respondents were "experienced" (92%). At baseline, most respondents would consider receiving implants for cosmetic or reconstructive reasons (65%).

At baseline, most respondents indicated that breast pain (42%) and anaplastic large cell lymphoma (ALCL) (25%) were the most and least common complications, respectively. Respondents indicated that damage to surrounding structures (39%) and breast pain (22%) were the most and least concerning complications, respectively. At baseline, 47% of respondents indicated that implants affect breast milk quality and 42% were unsure or indicated that it is not possible to undergo mammograms after receiving implants. The majority of respondents strongly agreed/agreed that patients should know the materials that are used in implants (91%).

Respondents were then provided information contained in the FDA checklist. With regard to implants not being lifetime devices, 68% strongly agreed/agreed that they were less likely to receive implants, with greater odds among Hispanic respondents (OR 2.35, $p<0.01$). With regard to risk of ALCL, 75% strongly agreed/agreed that they were less likely to receive implants, with greater odds among Hispanic respondents (OR 2.04, $p<0.05$). With regard to developing breast implant illness, 68% strongly agreed/agreed that they were less likely to receive implants, with lower odds among higher income respondents (OR 0.52, $p<0.01$). With regard to implants containing chemicals and heavy metals, 74% strongly agreed/agreed that they were less likely to receive implants. Notably, "experienced" was not a significant predictor for any response.

Conclusion: There are misconceptions with regard to risks associated with breast implants. Despite most laywomen indicating that they would consider receiving implants for cosmetic or reconstructive purposes at baseline, the risks communicated in the new FDA boxed warning may make patients less likely to receive implants, with variability among different ethnic and socioeconomic populations.

Quality of Life in Patients without Breast Reconstruction: Early Data using BREAST-Q in Breast Cancer Reconstruction Outcome SurvEy (ROSE) Study, Part-I

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Background: Breast cancer is the most diagnosed cancer in women worldwide and has a critical impact on their quality of life (QOL).1 Improved QOL is associated with breast reconstruction (BR) after ablative surgery.2 It is critical to understand how QOL varies with surgical approach to inform patient decision-making. The purpose of the ROSE Study is to create a Canadian, database of breast cancer patients, measuring their QOL at routine intervals pre and post treatment, based on their surgical management with or without reconstruction.3

Methods: We used a patient-reported outcome measurement (PROM), the BREAST-Q to quantify QOL in four domains (physical wellbeing, psychosocial wellbeing, sexual wellbeing, and satisfaction with breasts) into Q-scores out of 100.4 Part I of the ROSE study follows the patients receiving ablative surgery without reconstruction prospectively. These patients are receiving lumpectomy or mastectomy without reconstruction and were asked to complete the corresponding BREAST-Q modules pre- and post-operatively at 6 months, 12 months, 2 and 5 years. Patients were asked to complete a survey outlining their reasons for no reconstruction (NR) if relevant. QOL scores from our cohort were compared against our delayed reconstruction patient cohort, and normative individuals from a separate comprehensive study with no history of breast cancer or breast surgery, using t-tests.

Results: Pre-operative NR patients on average scored significantly lower ($p<.0001$) in their physical wellbeing (N=28, 79+/-16.09), than normative individuals without BC or breast surgery (N=1201, 93+/-11), demonstrating the impact of a breast cancer diagnosis.5 Pre-operative NR patients also exhibited higher psychosocial wellbeing (70.96 +/-21.39, $p=0.054$) and satisfaction with breasts (62.93+/-26.26, $p=0.053$) than pre-operative delayed reconstruction patients (N=19) (57+/-24.84) (47.4 +/-26.2) respectively, highlighting the burden of ablative surgery. Reasons for NR showed that 52% of patients do not consider BR essential for their wellbeing and are willing to accept their appearance after ablative surgery. 22% of patients were concerned about risks and complications with BR and 19% believed it would be painful. Only 23% of patients reported they were offered a consultation with a plastic surgeon and only 15% attended a consult, suggesting possible barriers to access to reconstruction.

Conclusions: As the intent of BR is to improve QOL, our accruing prospective data will provide important information on how QOL changes over time in patients without reconstruction following ablative surgery, and how to remove barriers to QOL-improving treatments. Although our sample is small important differences in QOL by treatment were identified. As there is

paucity of prospective non-reconstruction studies, and our cohort accrual and data collection continue, extrapolation of our long-term database results aims to improve a shared-decision making model regarding BR and provide evidence-based patient-centered care.

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Racial Disparities in Postoperative Breast Reconstruction Outcomes: A National Analysis

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Background: Previous, single-institution studies demonstrate that African American patients are more likely to experience complications following breast reconstruction relative to other racial groups. Most of these studies have been conducted in patient populations undergoing either autologous or implant-based reconstruction. To the best of our knowledge, this is the first study examining racially stratified postoperative outcomes in both autologous and implant-based reconstruction at a national level.

Methods: Patients in the Optum Clinformatics Data Mart that underwent all billable forms of breast reconstruction were identified via CPT codes. Demographics, medical history, and post-

operative outcome data was collected by querying relevant reports of CPT, ICD-9 and ICD-10 codes. Patients with other invasive procedures unrelated to their mastectomy-reconstruction pairing within 90 days of reconstruction were excluded. Outcomes analysis was limited to the 90-day postoperative period. A multivariable logistic-regression analysis was performed to ascertain the effects of age, race, coexisting conditions, and reconstruction type (autologous or implant-based) on the likelihood of any common postoperative complication occurring. Linearity of the continuous variables with respect to the logit of the dependent variable was confirmed. Odds ratios and corresponding 95% confidence intervals were calculated.

Results: From over 86 million longitudinal patient records, our study population included 104,714 records for 57,468 patients who had undergone breast reconstruction between January 2003 and June 2019. African American, White, and Hispanic race (relative to Asian race), autologous reconstruction, hypertension, type II diabetes mellitus, and tobacco use were independent predictors of increased complication likelihood. Specifically, the odds ratios for complication occurrence for African American, White, and Hispanic race (relative to Asian race) were 1.54, 1.46, and 1.37 respectively. African American individuals had an overall breast reconstruction complication rate of 13.3% while the corresponding rate for White individuals was 11.2%. Hispanic individuals had a postoperative complication rate of 10.9%, whereas the rate for Asian individuals was 7.7%.

Conclusion: On a national level, African American patients undergoing implant-based and autologous breast reconstruction have increased risk of complications, a finding that mirrors previous, smaller studies. Additional work is required to address the underlying structural inequities that may propagate these trends through time.

Racial Variability in Breast Reconstruction Outcomes During and Pre-COVID-19 Pandemic

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Purpose: The COVID-19 pandemic posed unique challenges to healthcare systems as surgical protocols were majorly altered and hospital systems were overwhelmed. Additionally, the pandemic exposed various racial and health disparities. By utilizing a continuously updated federated EMR network (TriNetX Inc, Cambridge, MA), this study investigates breast reconstruction rates before and during the pandemic, specifically examining socioeconomic status (SES) and postoperative complications among different racial cohorts.

Methods: The de-identified records of patients who underwent breast reconstruction between January 2018 to January 2020 were identified and classified as 'pre-pandemic', while procedures performed after January 2020 to December 2022 were identified as 'during-pandemic'. 15,165 breast reconstruction patients met the criteria and were allocated into one of 18 cohorts based on race (White, Black, or other minorities (Hispanic, Asian, Native Hawaiian or Pacific Islander, American Indian or Alaska Native), time frame (pre, or during), and breast reconstruction type (autologous, implant-based, or combined (both autologous and implant-based reconstruction (IBR)). Patients experiencing problems related to housing and economic circumstances were identified as low socioeconomic status (SES) using medical coding. Pre-pandemic versus during pandemic 90-day postoperative outcomes were compared in patients of the same race and reconstruction type.

Results: In the combined cohort, in the pre-pandemic period, White patients experienced more post-operative infections (p=0.0018) and more patients were of low SES (p=0.0016) compared to during the pandemic. In the pre-pandemic period, other minority patients experienced more postoperative infections (p=0.0385), more pulmonary embolisms (PE) (p=0.0015), less incisional/ventral hernias (p=0.0015) and were of low SES (p=0.0015) compared to during pandemic. Similarly, the Black combined cohort experienced more post-operative infections (p=0.0239) and incisional/ventral hernias (p=0.0015). The other minority autologous cohort experienced less PE (p=0.0012) and more incisional/ventral hernias (p=0.0014) during the pandemic. There were no significant differences for Black autologous patients. However, White patients that underwent autologous reconstruction experienced more hematomas (p=0.0300) and more patients were of low SES (p=0.0015) pre-pandemic. Although there were no significant postoperative differences for white IBR patients, other minority IBR patients experienced more sepsis (p=0.0015), hematoma (p=0.0014), gangrene (p=0.0015), deep vein thrombosis (DVT) (p=0.0015), incisional/ventral hernia (p=0.0015), and were of low SES (p=.0015) pre-pandemic. Conversely, Black IBR patients experienced more deep vein thrombosis (p=0.0014), PE (p=.0014), and more were of low SES (p= 0.0014) during the pandemic.

Conclusion: Overall, all races experienced poorer surgical outcomes pre-pandemic as compared to during. The decrease in surgical outcomes during the pandemic may reflect the increase in preventative infection measures and heightened awareness of PE and DVT. Interestingly, Black patients undergoing IBR experienced worse surgical outcomes during the pandemic, whereas the other racial cohorts experienced fewer poor outcomes. Additionally, fewer White and other minority patients with low SES were seen during the pandemic. Limitations include this study's retrospective nature, its reliance on the accuracy of medical coding, and limited insurance information. Future investigations should analyze potential factors that influence racial differences in surgical outcomes, particularly IBR as well as address the factors that lead to patients with low SES having lower rates of breast reconstruction during a pandemic.

Radiated Prepectoral Immediate Direct to Implant Reconstruction: A Retrospective Cohort Study

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Background: Increasing use of the prepectoral plane in post mastectomy implant-based reconstruction has made immediate direct to implant (DTI) reconstruction more achievable. There has also been an increased incidence of post mastectomy radiation therapy making it important to understand the feasibility of immediate DTI reconstruction in patients who may require adjuvant radiation therapy.

Methods: A retrospective cohort study of consecutive patients undergoing DTI prepectoral reconstruction with and without postmastectomy radiation was performed. Patient and treatment level factors, operative and post-operative outcomes were extracted on both the patient and breast level. The presence of at least one minor complication (superficial or full-thickness necrosis, cellulitis requiring oral antibiotics, hematoma, or seroma) or major complication (cellulitis requiring intravenous antibiotics, hospital re-admission, explanation, or unplanned return to the operating room) was compared. Univariate analyses were performed to evaluate differences in outcomes between groups.

Results: From January 2018 to December 2021, 148 patients (240 breasts) underwent prepectoral direct to implant reconstruction. In this group, 125 patients (217 breasts) did not undergo post mastectomy radiation therapy, whereas 23 patients (23 breasts) were exposed to post mastectomy radiation therapy. Mean follow up time was 218 days (+/- 196.8). There were no significant differences in demographics, operative time, implant type or size, mastectomy type, or mean operative time. Patients who underwent adjuvant radiation had higher rates of neoadjuvant chemotherapy ($p<0.001$) and axillary lymph node dissection ($p<0.001$). Univariate analysis did not demonstrate any significant differences in minor or major complications between the radiated and non-radiated breasts.

Conclusion: While limited by a small number of patients who underwent radiation, post mastectomy immediate DTI reconstruction is a feasible and safe surgical option for patients to have a completed breast mound prior to radiation therapy.

Readability Analysis of FDA-Mandated Breast Implant Patient Literature: A Call to Increase Equitable Healthcare Access within Plastic Surgery

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Introduction: Health literacy directly impacts health outcomes, as it dictates how a patient can participate in their own care. In the modern, and increasingly digital era of healthcare, text readability plays a significant role in promoting health equity. As the average American adult reads at an eighth-grade level, the US Department of Health and Human Services recommends that patient education materials be written at, or below, a sixth grade reading level.

In October of 2021 the US Food and Drug Administration (FDA) mandated new labeling for breast implants and patient decision checklists, with the goal of improving the informed decision-making process for patients considering breast implantation. Given growing concerns over breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) and breast implant illness (BII), patients should be able to easily review these resources in order to make a fully informed decision when considering surgery.

This study seeks to review the readability of newly mandated breast implant patient checklists and patient education documents with the final goal of improved patient comprehension and health literacy.

Methods: Breast implant patient education materials, including patient decision checklists and the breast implant boxed warning, were obtained from the three most popular breast implant manufacturers in the US–Allergan, Mentor, and Sientra. Readability analysis was performed with the validated Flesch Reading-Ease Score (FRES) and Flesch-Kincaid Grade Level (FKGL).

Results: The overall readability of all patient materials for Allergan (FRES 39.9, FKGL11.2), Mentor (FRES 41.7, FKGL 11.6), and Sientra (FRES 42.5, FKGL 11.1) correlates with a college reading level. Reading materials from Sientra were only slightly easier to read than materials from Allergan or Mentor.

Average FRES and FKGL scores across all patient checklists were 38.8 (range 40.3-38) and 13.01 (range 12.2-13.8), which is considered "difficult to read" and correlates with a college reading level. Of all of the checklists, Allergan patient checklists for saline (FRE 40.3, FKGL 12.2) and silicone (FRE 39, FKGL 12.5) were easiest to read, but were still considered college reading level. The Mentor patient checklist for saline implants was the most difficult to read (FRE 38, FKGL 13.5). Average FRES and FKGL scores across all boxed warnings were 42.1 (range 46.5-39) and 10.75 (range 9.7-12.9), which is also considered "difficult to read" and correlates with a college reading level.

Conclusion: New FDA mandated breast implant patient decision guides are written at a college

reading level, well above the average patient reading level. Education materials should be simplified for the average patient in order to combat disparities in health literacy and achieve the goal of increased patient involvement and understanding in this complex decision.

Reducing donor-site complications in DIEP Flap Breast Reconstruction with Closed Incisional Negative Pressure Therapy

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Introduction: Deep inferior epigastric perforator (DIEP) flaps are considered the gold standard for autologous breast reconstruction but create large abdominal incisions that risk donor site morbidity during harvest. Closed incision negative pressure therapy (ciNPT) is emerging as an effective alternative to standard postoperative dressings, but there is a paucity of data in DIEP flap donor sites.

Methods: We conducted a retrospective case-control study investigating the use of ciNPT in DIEP flap donor sites at a single institution between March 2017 and September 2021. Patients who underwent microsurgical autologous breast reconstruction with DIEP flaps were included. Patients were divided into those with donor incision sites managed with ciNPT (n=24) and those with conventional postoperative wound dressings (n=20). We compared patient demographics, wound drainage volumes and postoperative outcomes between the two groups.

Results: There was no statistically significant difference in age, BMI, comorbidity burden or smoking status between the two groups. Both groups had similar lengths of stay and wound drainage volumes with no readmissions or reoperations in either group. There was a statistically significant reduction in donor-site complications (p=0.018), surgical site infections (p=0.014) and seroma formation (p=0.016) in those with ciNPT.

Conclusion: ciNPT appears to be an effective alternative incision management system with the potential to improve complication rates and postoperative morbidity in DIEP flap donor sites. We recommend a multicentre prospective trial with formal cost-utility analysis to strengthen these findings.

Results of Modified Goldilocks Procedure as Total Autologous Breast Reconstruction: A Single Surgeon Experience of 275 Consecutive Cases

Abstract Presenting Author:
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Background: Goldilocks procedure is a total autologous breast reconstructive technique which involves breast mound creation utilizing de-epithelialized residual mastectomy flaps. We modified this technique by augmenting the volume of the reconstructed breast mound with thoraco-epigastric fasciocutaneous flaps and preserving the nipple areolar complex in suitable cases.

Purpose: The purpose of this study was to analyze results of 275 modified Goldilocks procedures.

Methods: Retrospective review of the patients who underwent modified Goldilocks procedure between June 2015 and October 2021 was performed. Relevant medical comorbidities, previous breast surgery, adjuvant therapy and complications were analyzed. Aesthetic results were assessed on clinical photographs. Patient satisfaction was recorded.

All patients were marked preoperatively with Wise reduction pattern. Type 4 subcutaneous mastectomy was performed by the breast surgeon using the lateral limb of Wise pattern as access incision. Intraoperative pathology was performed in all cases to ascertain that tumor was removed with a 10 mm margin. Nipple biopsy was performed routinely in both affected and contralateral breast. If nipple areola complex (NAC) was found to be cancer free it was preserved and based on either superior or bipedicle de-epithelialized dermal flap. Fasciocutaneous thoraco-epigastric flap was designed below the inframammary fold (IMF). Flap was raised by incising through the skin and subcutaneous adipose tissue in the lower thoraco-epigastric region and dissecting proximally in the plane over the abdominal musculature to the level of the IMF. Flap blood supply was based on intercostal perforators at the level of the IMF, which was preserved. Flap was de-epithelialized and folded over the IMF into the mastectomy pocket. Abdominal skin inferior to the flap donor site was undermined and advanced to the level of the IMF, similar to reverse tummy-tuck. NAC was lifted into the preoperatively marked position and breast skin flaps were draped over the created breast mound.

Results: A total 275 patients (540 breasts) were included in this study. 96% cases were bilateral. Mean age at the time of reconstruction was 54.5 years (range 27-75). Mean BMI at the time of reconstruction was 33.2 (range 19.5-45.2). 36 patients had previous breast surgery (reduction or therapeutic mammaplasty, implant breast reconstruction). Mean surgical time was 178 min and average hospital stay was 2 nights.

The overall complications rate was 7.3 % (hematoma 1, infection 4, nipple necrosis 2, wound dehiscence 2, fat necrosis 11). Back to theatre rate was 1.4% (4 cases). Mean follow-up was 39 months (range 5-77). There was no cancer recurrence.

To improve aesthetic results 68 patients underwent fat transfer and 2 patients implant placement. Good aesthetic results were seen in 88% of patients. Patient satisfaction was 92%.

Conclusion: Modified Goldilocks procedure is a reliable method of total autologous breast reconstruction post mastectomy. NAC preservation is possible and does not increase the risk of cancer recurrence. Auto-augmentation with thoraco-epigatric flap provides excellent volume in the lower breast pole and allows offering this reconstructive technique to thinner patients. Theatre time and hospital stay compares favorably to other methods of autologous post mastectomy reconstruction. Second stage fat transfer further improves aesthetic results.

Reverse Expansion In Breast Reconstruction After Skin Sparing (SSM) And Nipple Sparing Mastectomy (NSM) - Our First 100 Cases

Abstract Presenting Author:
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Background: The majority of surgeons choose an implant-based breast reconstruction after mastectomy (1). Nevertheless, lipofilling is a constantly growing technique allowing a complete breast reconstruction without prosthesis. We are introducing our experience using reverse expansion for breast reconstruction following a SSM and NSM with a breast expander in one hundred patients.

Methods: In 2010, we began to perform fat grafting for breast reconstruction using the "Reverse Expansion" technique (2). In the period January 2010 - September 2018, 253 breast reconstruction procedures were performed on 100 patients. The technique consists of autologous fat tissue transplantation requiring the combined use of a skin expander and of multiple lipofilling sessions. We harvested an amount of fat tissue using a 2.5 mm liposuction cannula, we centrifuged it 3 minutes at 4000 rpm and injected in the recipient site using 3 ml syringes and a Coleman cannula. At the beginning of every session the breast expander was deflated of a saline volume similar to the one of the fats to be injected. Skin expander deflation is used to achieve a good breast volume without significative pressure during fat grafting.

Results: We have carried out 56 breast reconstructions after SSM and 44 after NSM. We harvested an average of 661,5 ccs of fat per session and injected an average of 305,3 ccs. Overall, the mean number of sessions to achieve breast reconstruction has been 2,53. In NSM the mean number of sessions has been 2,34 and in SSM has been 2,67. There were complications in four out of the 253 procedures (1,5%), one has been a hemorrhage of the donor site because of genetic lack of coagulation factors. The residual three patients have suffered a surgical site infection.

Discussion: Lipofilling has proven to be a safe and effective technique for complete breast reconstruction. Our procedure considers the use of a breast expander as a device to prepare the recipient site. Reverse expansion after a NSM and SSM allows a like-to-like reconstruction and it might be the first reconstructive choice in a selected group of patients.

Conclusion: Considering the large number of positive factors such as a fast post-operative recovery, an easy learning curve, a lack of need of a specialized surgical team, a natural look of the breast shape and the soft consistency of the grafted tissue, we believe this breast reconstruction method with autologous tissue could be considered as a new autologous reconstruction possibility after SSM and NSM.

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Revisiting the Vascular Patterns of the Deep Inferior Epigastric Perforator System Using Machine-Learning

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Background: Knowledge of a patient's vascular anatomy is among the most important components for a successful free flap procedure. Within breast reconstruction, the deep inferior epigastric perforator (DIEP) flap is a widely performed procedure, with its branching patterns famously characterized by Moon and Taylor (1988).[1] While DIEP branching patterns, perforator locations, variations, and course around the rectus abdominis muscle have been individually documented within literature, there still remains the question on how these characteristics relate to one another in a clinical setting. Previously, our group developed a standardized, preoperative planning system for microvascular free tissue transfer called 'FlapMap' that condenses a patient's vascular anatomy from MRA/CTA scans into a single image. Within our institution alone, over 60 FlapMaps have been created, detailing the DIEP branching patterns, course, and variations. The aim of this study is to use this unique library of vascular patterns and generate a corollary, clinically applicable classification system to increase the collective understanding of the DIEP system.

Methods: This study received Institutional Review Board approval (STUDY 21-01836). Using

standard distance measuring tools readily available on image-viewing software, three separate readers (MC, NR, IS) divided the FlapMaps equally and recorded 43 variables including the DIEP lateral trunk, bifurcation, and trifurcation branch course (submuscular, intramuscular, and/or subfascial) and locations (distance from the midline, distance from the umbilicus) from each FlapMap. Pearson and Spearman Correlation Coefficient tests were performed to analyze associations between the variables, with significance set at $p<0.05$. Ordinary Least Squares (OLS) linear regression was performed to describe relationships between variables with significance for parameter variables and the overall regression set at $p<0.05$ and evaluated using their respective p-values and F-statistics. Their respective adjusted R-squared values were also a factor in evaluation.

Results: A total of 61 FlapMaps and 106 hemiabdomens were analyzed in this study. When comparing DIEP course between the lateral trunk and the first bifurcation (if any) of FlapMaps, a submuscular course constituted the majority of courses (100% lateral trunk, 66% first bifurcation primary branch, 71% first bifurcation secondary branch). Among FlapMaps with more than one bifurcation, the second bifurcation showed a slight plurality of branches on a submuscular route (24/51 = 47% and 29/51 = 57%). For FlapMaps with a third bifurcation, the majority showed an intramuscular route (10/15 = 66% and 8/15 = 53%). Next, among FlapMaps with an intramuscular lateral trunk, all of their bifurcations and trifurcations at least in part followed a submuscular route. Using OLS regression, lateral trunk length accurately described the distances of bifurcations from the midline (Adjusted R-squared=0.827, F=285.0 for df=104) and from the middle of the umbilical cord (Adjusted R-squared=0.848, F=460.8 for df=104). Notably, although both distances of the first bifurcation and the first trifurcation described lateral trunk length, both distances of the second and third bifurcations were not helpful descriptors.

Conclusion: Since its conception, the deep inferior epigastric perforator (DIEP) flap has become among the most widely performed procedures in breast reconstruction. Yet, to our knowledge, a classification system based on clinically applicable characteristics has not yet been introduced. Here, our group incorporates novel parameters to the existing classification system, validated with statistical analyses and linear regressions. Our results demonstrate that bifurcation and trifurcation branches from the DIEP lateral trunk have a higher likelihood of being submuscular, even with an intramuscular lateral trunk, and its locations can be validated and predicted using machine-learning. Future studies should evaluate how these findings relate to postoperative outcomes following DIEP flap breast reconstruction.

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Risk Factors for Complications in Gender-Affirming Feminizing Chest Surgery: A NSQIP Analysis of 842 Patients

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Purpose: For some transgender and non-binary individuals, feminizing chest surgery is a crucial step that helps them to reach identity actualization and improved quality of life.[1,2] To date, one study, comprising only 137 transgender women, used the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) database to show that while transgender patients are at higher complication risk versus cisgender patients undergoing breast augmentation, perioperative safety profiles are the same for both populations.[3] The present study aimed to identify risk factors for complications in a much larger transgender and non-binary population undergoing feminizing chest surgery.

Methods: The NSQIP database was used to perform a retrospective review on all patients who underwent feminizing chest surgery from 2013-2019. CPT codes were used to exclude patients who did not undergo feminizing chest surgery. Using univariate and multivariate logistic regression, demographics, comorbidities, outcomes, and complications were examined to determine complication risk factors.

Results: A total of 842 patients met inclusion criteria. The mean age was 36.3±12.3 and the mean BMI was 27.2±5.8. Of the patients included, 69.8% identified as female, 29.5% identified as male, and 0.7% identified as non-binary. Most patients were white (44.1%), followed by unknown/not reported (30.4%), Black/African American (20.2%), and Hispanic (17.1%). A greater majority of patients were non-smokers (79.1%).

The primary CPT code was 19325 "breast augmentation, with implant". Other CPT codes included "Breast implant on same day as mastectomy", "Revision of reconstructed breast", "Breast implant on separate day as mastectomy", "Tissue expander placement" Breast augmentation, w/o implant (defunct)", "Mastopexy", "Breast reconstruction w/other technique (defunct)".

Forty patients experienced complications. The most common were readmission (1.3%) and reoperation (1.8%). The strongest predictor for all-cause complications was the use of steroids (OR=17.73, p=0.02). Positive smoking status was also predictive for all-cause complications (OR=2.34, p=0.05). For surgical site complications, positive steroid use was, again, predictive (OR=59.43, p=0.001). Steroid use was the lone predictor of complication severity ($p<0.001$). Age and BMI were not a predictive factor for any outcome measure.

Conclusion: The gender identity of patients undergoing feminizing chest surgery is

inconsistently recorded in NSQIP. Steroid use and smoking status were key risk factors, while total comorbidities and ASA Class were not. It is necessary to do further analysis that stratifies patients by the type of chest feminizing surgery they undergo in order to further the strength of this analysis.

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Risk Factors for Unplanned Reoperation During The Expansion Phase In Two-Stage Postmastectomy Breast Reconstruction: Nationwide Results From The Dutch Breast Implant Registry

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Background: The majority of postmastectomy breast reconstructions (PMBRs) are currently performed in two stages using a tissue expander (TE). However, complications during the expansion phase occur regularly, leading to unplanned reoperation and reconstruction failure in severe cases. This study identified risk factors for unplanned reoperation, compared the time until revision between unplanned reoperation and planned reoperation, and evaluated the indications reported during unplanned reoperation.

Methods: Patient and surgery characteristics of patients who underwent two-stage PMBR between 2017 and 2021 were collected from the Dutch Breast Implant Registry (DBIR). Every

TE had a follow-up of at least six months. Unplanned reoperation was defined as TE explantation followed by either no replacement or replacement with the same or a different TE. After controlling for confounding variables, risk factors for unplanned reoperation were determined using regression analyses.

Results: In total, 1926 patients were included with a mean age of 50.3 years. Unplanned reoperation occurred in 16.7% of all inserted TEs (n=2210). Independent factors associated with unplanned reoperation were BMI≥25, no pocket irrigation, no drains, 'axillary/other' incision site, and subcutaneous placement or partial pectoralis major muscle coverage. Age<40 years, bilateral surgery, delayed PMBR, and maximum TE volume<350cc reduced the risk of unplanned reoperation. Median time until revision was 87 days for unplanned and 211 days for planned reoperation. Deep wound infections most often resulted in unplanned reoperation (35.0%).

Conclusion: This study identified several risk and protective factors which may be used to reduce complications in expander based PMBR.

Risk Profile for Gender Affirming Mastectomy Resembles Gynecomastia Correction more than Risk Reduction Mastectomy

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Purpose: Gender affirming mastectomy is the most common type of top surgery, but analysis of national outcomes has been limited by low annual case volumes. To benchmark these outcomes, previous work has compared top surgery to analogous procedures such as cancer risk reduction mastectomy (CRRM) in cisgender females and gynecomastia correction in cisgender males. Given that top surgery has become more common in recent years, we designed a study to report updated outcomes data and evaluate the validity of these benchmarks.

Methods: Patients with diagnosis codes for gender identity disorder, elevated breast cancer risk, or gynecomastia and a procedure code for mastectomy or reduction mammaplasty were extracted from the National Surgical Quality Improvement Program (NSQIP) database between 2016-2020. After excluding patients who underwent concurrent procedures unrelated to the mastectomy, patients were stratified into three groups: top surgery, CRRM, and gynecomastia correction. Annual case volumes for each procedure type were evaluated over the study window, and baseline characteristics were compared between groups. The primary outcome was surgical site complications, and secondary outcomes included related reoperation and unplanned

readmission within 30 days. Unadjusted adverse event rates were compared between groups using Chi-square tests, and classification tree analysis was used to independently identify partitions most associated with each outcome.

Results: A total of 7626 patients were included in the analysis, and of these, 27% (n=2029) had top surgery, 23% (n=1732) had CRRM, and 51% (n=3865) had gynecomastia correction. The annual representation of top surgery within NSQIP increased from 21 to 61 per 100,000 cases in 2016 vs 2020 (P<0.001). Over the same time period, rates of CRRM decreased from 39 to 31 per 100,000(P=0.004) and gynecomastia correction from 84 to 58 per 100,000 (P<0.001). Compared to the CRRM and gynecomastia correction groups, top surgery patients were younger (age 27 vs 47 and 32 respectively, P<0.001) and had higher rates of smoking (16% vs 9% and 12%, P<0.001). Other medical comorbidities such as hypertension and diabetes were higher in the CRRM group. Unadjusted surgical site complication (5.1% vs 1.3% and 1.5%, P<0.001), reoperation (5.9% vs 2.3% and 2.5%, P<0.001), and unplanned readmission (3.8% vs 0.9% and 1.4%, P<0.001) rates were significantly higher for CRRM compared to both top surgery and gynecomastia correction respectively. Classification tree analysis independently identified CRRM, BMI>36, and insulin dependent diabetes as partitions associated with higher surgical site complications. The partitions most associated with readmission were CRRM, operative time >169 minutes, and BMI>35. CRRM was not identified as a partition associated with higher reoperation.

Conclusions: Top surgery volumes have nearly tripled in the past five years. Despite the more extensive dissection and longer incisions commonly used for top surgery, the risk profile for gender affirming mastectomy more closely resembled that of gynecomastia correction rather than CRRM. Further work that incorporates information about hormonal therapy, specimen weights, and mental health comorbidities is necessary, but surgeons performing top surgery should consider using gynecomastia correction as a more appropriate benchmark when counseling patients about surgical risks.

Robotic versus standard harvest of deep inferior epigastric artery perforator flaps: Early outcomes

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Introduction: Traditional deep inferior epigastric artery perforator (DIEP) flap harvest for breast reconstruction splits the anterior sheath of the rectus fascia from the perforating vessels to the

deep inferior epigastric (DIE) vessel origin, weakening the primary strength layer of the abdominal wall, predisposing the patient to a bulge or hernia. Minimally invasive techniques are being developed to decrease abdominal wall morbidity.1,2 Previously published studies are limited to small case series and focus on technical descriptions of primarily unilateral flap harvest.3-5 We refined a transabdominal approach to robotic harvest of bilateral DIEP flaps with the da Vinci Xi Surgical System®. This study describes our technique and examines early outcomes of robotic (rDIEP) compared with standard (sDIEP) harvest.

Methods: A retrospective cohort study was performed for patients who underwent bilateral rDIEP or sDIEP flap harvest at our institution between July 2021 and February 2022. Outcomes studied include abdominal wall morbidity, dissection time, total OR time, and length of stay (LOS).

Technique Description: Target perforating vessels are selected on preoperative imaging for their intramuscular course as this determines the fascial incision length.5 Following perforator dissection and suprafascial flap mobilization, robotic harvest of the DIE vessels is completed with the da Vinci Xi, utilizing its Firefly fluorescence imaging technology along with 2-3 doses of indocyanine green dye to provide a roadmap for safe and efficient intraabdominal dissection of the vascular bundles and their branches. After the DIE vessels are completely freed and all side-branches clipped, they are divided at their origins and exteriorized through the fascial incisions. While the microvascular anastomoses of the first flap are being performed, the superior extension of the DIE vessels on the 2nd flap is preserved to maintain circulation.

Results: Twenty-five patients were included (15 sDIEP (30 flaps), 10 rDIEP (20 flaps)) with no significant difference in patient age, BMI, or abdominal surgical history between cohorts. A greater number of perforators were included in the flap design for sDIEP compared to rDIEP (mean 2.65 vs 1.9, $p=0.015$). Mean fascial incision length in the rDIEP group was 4.55 cm while the mean pedicle length was 12.47 cm. This provided a mean "benefit" as described by Selber et al. of an average 8.78 cm of spared fascial incision length.1,5 Mesh reinforcement of the abdominal wall was not required for any rDIEP; however, mesh was used in 12/15 sDIEP patients ($p<0.001$). Average robotic time was 173 minutes in the rDIEP group, without significant increase in overall case length (759 min vs 710 min, $p=0.255$). No pedicle or bowel injuries occurred during intraabdominal dissection. LOS was shorter with rDIEP (3.7 days vs 4.7 days, $p=0.038$).

Conclusion: This is the largest reported cohort of bilateral rDIEP flap harvest and the first to compare outcomes to sDIEP. Our technique for rDIEP harvest is associated with decreased fascial incision length, elimination of the need for abdominal wall reinforcement and a reduction in LOS without significantly increasing operative time.

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Safety of Same-Day Discharge after Mastectomy with Implant-Based Breast Reconstruction

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Introduction: Implant-based breast reconstruction accounts for approximately 80% of breast reconstruction cases in the United States, making it the most common choice for patients undergoing mastectomy. Of women undergoing mastectomy for breast cancer, approximately 50% will undergo breast reconstruction within 24 months of oncologic surgery. Traditionally, patients undergoing mastectomy and immediate breast reconstruction are candidates for inpatient admission for postoperative pain management, nausea and vomiting associated with extensive resection and reconstruction, or immediate postoperative complications.1 In March 2020 near the beginning of the COVID-19 pandemic, most medical facilities in the United States were recommended to halt all elective medical care. This was in an attempt to conserve resources and staff availability for patients requiring urgent medical or surgical interventions.

The COVID-19 pandemic as well as recent improvements in reconstructive and anesthetic techniques have paved the way for same-day surgery and discharge for patients undergoing mastectomy with prosthetic-based reconstruction.1 However, it is unclear whether same-day discharge after surgery is safe for patients. Our study examines the safety of same-day discharge for post-mastectomy patients undergoing immediate implant-based breast reconstruction.

Methods: Patients who underwent mastectomy and immediate breast reconstruction from March 2020 to December 2020 at the Cleveland Clinic were reviewed. There were a total of 249 patients and nine staff plastic surgeons. All 249 patients underwent same-day surgery with immediate implant-based breast reconstruction. The age of the patient, date of surgery, type and laterality of surgery, and same-day discharge vs. inpatient stay were collected. Complications

and readmissions at one day and 30 days post-breast reconstruction were compared amongst same-day discharge vs. inpatient stay cohorts.

Results: The results showed that there was no significant difference in surgical, medical, or wound complications for patients who were discharged after same-day surgery compared to those admitted for inpatient stay at one and 30 days after immediate implant-based breast reconstruction. Furthermore, there was no significant difference in readmission or return rates to the OR for patients undergoing same-day surgery and discharge compared to those admitted for inpatient stay at one- and 30-days post-breast reconstruction.

Conclusions: Overall, there was no difference in safety for patients admitted for inpatient stay compared to those who were discharged after same-day surgery. Inpatient stay did not reduce complications, readmission, or return rates to the OR at our institution.

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Same Day Discharge after Mastectomy and Implant-Based Breast Reconstruction: A Retrospective Cohort Comparison using NSQIP data

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Introduction: The rates of mastectomy and implant-based breast reconstruction using implants or tissue expanders has experienced an increasing trend over the last decade. The standard of care after immediate Implant-based Breast Reconstruction (IBR) is an overnight stay following surgery. Due to limited hospital resources and increasing healthcare costs, same day discharge has been a recently described post-operative protocol for these patients. The purpose of our study is to analyze safety, feasibility, and outcomes of outpatient surgery for patients undergoing immediate implant-based breast reconstruction.

Methods: A Review of NSQIP database from 2015 – 2019 was performed to identify all mastectomy cases (CPT 19303-19307) which underwent immediate implant-based breast reconstruction (CPT 19340, 19357). Primary ICD 9-10 codes were reviewed, and all non-breast

cancer related cases were excluded. Cases were then separated into the Treatment group if patients were discharged same day as the index operation and Control group if patients were admitted the day of index surgery. Patient Demographics, comorbidities, implant type (tissue expander versus implant), total wound complications, readmission and reoperation rates were collected and analyzed. Chi squared analysis was performed between groups to identify if a statistical difference existed between groups, defined as $p < 0.05$.

Results: 18,741 cases were identified that underwent mastectomy with immediate placement of tissue expander or implant; Of these, 667 patients were discharged the day of mastectomy and reconstruction (treatment group). The average age in the treatment group was 52 years and average Body Mass Index (BMI) was 27 kg/m2. Total wound complications occurred in 4%, reoperation in 7%, and readmission in 2.7%. Conversely, 18074 patients were admitted at least overnight (control group) with an average Length of Stay (LOS) of 1.5 days (range 1-86 days). The average age for this group was 51 years and average BMI was 28 kg/m2. Total wound complications occurred in 4.2%, reoperation in 7.3%, and readmission in 4.4%. There was no significant difference between groups in regards to wound complications or reoperation rates ($p = 0.89$ and 0.82, respectively), however, there was a significant difference in readmission rates between groups ($p=0.032$).

Conclusion: Thousands of women undergo mastectomy and immediate implant-based reconstruction every year, each with a minimum of one-night hospital stay as current standard of care. In recent months the postoperative admission standard has begun to be questioned with several institutions managing these procedures as outpatient. NSQIP data analysis over a 4 year period shows that while wound complications and reoperation between outpatient and admission groups remain equivalent, readmission rates were statistically significant with rates being higher in the admission groups. A limitation of the study is lack of specific data such as mastectomy type/incision, wound size/depth, follow up, and specific indications of reoperation.

Secondary Breast Reconstruction with PAP Flaps Following Failed Microvascular Abdominal Free Flaps

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Background: Secondary breast reconstruction with autologous tissue is challenging. Prior failed microsurgery leaves difficulty obtaining tissue and limiting inflow options.

Methods: We performed a retrospective chart review of patients who underwent secondary autologous tissue breast reconstruction between January 2015 and February 2022. Criteria included failed microvascular free flap primary breast reconstructions. We assessed the initial procedures, indications for secondary reconstructions and revisionary surgeries, as well as outcomes.

Results: Ten consecutive patients sought secondary breast reconstruction with autologous tissue.

None of the primary reconstructions were performed by the senior surgeon. Mean age was 51. All patients underwent mastectomies due to cancer. Primary breast reconstruction flaps included DIEP (nine cases) and TRAM flaps (one case), all bilateral. The delay between removal, partial or total, of the primary flap and secondary breast reconstruction was 4-8 weeks. Eight cases required complete removal of the primary flap, seven unilateral and one bilateral, while two required partial removal, one unilateral and one bilateral. The profunda artery perforator (PAP) flap was chosen in all cases. Stacked configurations of the flap were used in all seven unilateral cases, by means of sequential anastomosis between the flaps. A single PAP flap was used for one unilateral case and bilateral cases (one per side). One patient was taken back to the operating room two hours postoperatively, due to venous congestion of the stacked flaps, fully resolved after rerouting one of the veins. The initial three patients remained in the hospital for two days (before March 2018), while the remaining were discharged home within 23 hours. No partial or total flap losses were documented and secondary surgery, including fat grafting and mastopexies, was required in seven patients.

Conclusion: Secondary breast reconstruction with autologous flaps can be successfully achieved following failure of the primary free flaps. The challenge arises during the dissection of the inflow vessels; chief concerns include paucity of tissue available for reconstruction, scar tissue and adhesions which may hinder the recreation of the breast mound and create difficulty obtaining an aesthetic shape. We consider the PAP flap an excellent choice due to its ready accessibility and malleability.

Single-Stage Pre-Pectoral Implant Placement and Fat Grafting after Tissue Expansion: Aesthetic and Safety Considerations

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Background: Pre-pectoral implant-based breast reconstruction is often accompanied by autologous fat grafting to optimize aesthetic outcomes. Large-volume lipofilling can elevate local pressures and result in poor graft-to-recipient interface. Necrosis results in palpable nodules, skin retraction, lymphadenopathy, and infection. Therefore, when reconstructive surgeons require both implant placement and fat transfer for optimal outcomes, reconstruction usually entails several rounds of modest fat transfer to minimize risk of necrosis. However, the limits of single-stage fat grafting at time of implant are not known. In this study, single-stage pre-pectoral implant placement and fat grafting after tissue expansion are compared to multiple-stage fat grafting.

Methods: A retrospective study was performed from July 2016 to February 2022 for pre-pectoral tissue expander-to-implant breast reconstruction patients that also received fat grafting. Inclusion criteria consisted of patients that underwent (1) mastectomy, (2) pre-pectoral tissue expander placement, (3) pre-pectoral permanent silicone or saline implant placement, and (4) at least one round of autologous fat transfer. Breasts were excluded in cases of flap reconstruction, sub-pectoral reconstruction, sub-pectoral-to-pre-pectoral transformation, and implant removal without replacement prior to fat transfer. Breasts with a follow-up time less than 30 days after most recent fat transfer were excluded. Primary outcome variables included fat grafting frequency, volume of fat transfer, fat necrosis, and surgical complications following fat transfer (e.g., infection, dehiscence, hematoma, seroma). Secondary outcomes included patient demographics and comorbidities. Student t-test and chi square test were used (alpha 0.05).

Results: Of the 932 relevant patients reviewed, 95 patients with 157 breasts met inclusion criteria. Of these, 82 breasts underwent a single round of fat grafting at the time of implant placement (single-stage group). The remaining 75 breasts underwent multiple rounds of fat transfer, beginning either during or after the implant placement procedure (multi-stage group). Groups were comparable with regards to patient demographics, cancer vs. prophylactic mastectomy, and radiation therapy.

Single-stage and multi-stage breasts underwent comparable tissue expander fill (385.9cc vs. 421.4cc, $p=0.1$), although single-stage breasts received smaller implants (441.5cc vs. 508.7cc, $p<0.005$). Single-stage breasts underwent fewer planned implant and fat graft-inclusive operative procedures compared with multi-stage breasts (1.0 vs. 2.2, $p<0.0001$). Single-stage breasts received more fat at the time of implant placement (100cc, IQR 55-140cc, $p<0.0001$). However, total fat volume in the multi-stage breasts did not significantly exceed that of single-stage breasts until after two additional rounds of fat transfer (128.5cc, IQR 90-130cc, $p<0.01$). Within the multi-stage group, 17 breasts underwent 3 to 5 rounds of fat grafting. There was no significant difference in the rate of fat necrosis between single-stage and multi-stage breasts after the first round (15.9% vs. 6.7%, $p=0.07$) and last round (15.9% vs. 8.0%, $p=0.1$) of fat grafting. Single-stage breasts also demonstrated similar complication rates compared with multi-stage breasts (3.7% vs. 8.0%, $p=0.2$).

Conclusion: A single-stage approach of pre-pectoral implant placement with one-time fat grafting reduces overall number of operative procedures without increased risk of fat necrosis or other post-operative complications.

Stopping Traffic: An Analysis of Number of Scrubbed Personnel and Infection in Implant Based Breast Reconstruction

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Purpose: Postoperative surgical site infection (SSI) is a devastating complication of implant-based breast reconstruction following mastectomy. Its occurrence may require additional hospitalization, cause fibrosis of the tissue envelope, and ultimately require explant. Contamination of the prosthesis during placement is a potential source of biofilm formation, capsular contracture, and infection.1 Whereas operative modifications have been described to mitigate this, including use of antimicrobial irrigation and "no touch" technique, the effect of foot traffic in the operating room has not been investigated within our specialty.2 This study analyzed the influence of number of scrubbed and unscrubbed personnel on postoperative SSI in the setting of post-mastectomy implant-based breast reconstruction.

Methods and Materials: This was a retrospective review of 223 patients who underwent post-mastectomy implant-based reconstruction from 2015 to 2021 at our institution. Patients included underwent either first stage or direct to implant reconstruction. Patient demographics, comorbidities, smoking status, laterality (unilateral/bilateral), number of scrubbed and unscrubbed personnel, use of drains, and length of surgery were collected. Primary outcome assessed was surgical site infection with secondary outcomes of wound healing complications, skin necrosis, hematoma, seroma, and reoperation.

Summary of Results: Our study population of 223 patients had a mean age of 50 (23 – 79). Comorbidities included hypertension in 35% (79) of patients, type one or two diabetes in 13.9% (31), and 16% (35) active smokers at time of surgery. Eighty one percent (181) underwent tissue expander placement and 19% (42) underwent direct to implant reconstruction. SSI was associated with higher incidence of skin necrosis (31% versus 4%, $p < 0.05$), wound healing complications (28% versus 16%, $p < 0.05$) and reoperation (31% versus 7.3%, $p < 0.05$). Univariate analysis demonstrated number of scrubbed individuals was predictive of SSI (OR: 1.239, CI: 1.064-1.444, $p < 0.05$) whereas number of unscrubbed individuals was not (OR: 1.129, CI: 0.913-1.395, $p = 0.262$). A multivariate logistic regression was performed to ascertain the effects of BMI, skin flap necrosis, wound healing complications, scrubbed individuals, and unscrubbed individuals on postoperative infection. The model was statistically significant ($X2(6) = 47.978$, $p < 0.001$) and demonstrated increased likelihood of SSI with increased number of individuals scrubbed (OR: 1.232, CI: 1.027-1.478, $p < 0.05$).

Conclusion: This study demonstrates increased risk of SSI following mastectomy and implant-based reconstruction with increased number of personnel in the operative field. Presence of multiple surgical and scrub teams may contribute to variation in the number of personnel in these cases. While the efficiency of additional hands and surgical education should not be de-emphasized, this must be weighed against increased risk of contamination with increased individuals scrubbed. Our findings highlight the importance of reducing foot traffic in the operating room when feasible to reduce risk of postoperative SSI and its associated morbidity.

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Structured Saline Breast Implants: Core Study Results through 10 Years

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Background: The Structured Saline Breast Implant utilizes different technology than unstructured saline or silicone gel implants, making it a third type of implant. FDA and Health Canada granted approval in November 2014. This saline-filled implant has an internal structure consisting of a series of nested shells that support the upper pole when upright and control movement of the saline to provide a natural feel. Because women can look in the mirror to know their implants are intact, they have peace of mind. In contrast, most women are concerned about silicone gel implant ruptures, which are silent and require FDA-recommended MRI or ultrasound scans for detection.

Methods: This US trial enrolled 502 women: 399 for primary and 103 for revision augmentation. Investigators were 45 ABPS certified plastic surgeons at 35 sites. Of the 502 women enrolled, 426 (84.9%) completed 10-year follow-up visits, a higher percentage than all other FDA breast implant trials.

Results: Through 10 years of follow-up, surgeon satisfaction was 94.8% for primary and 87.4% for revision augmentation; patient satisfaction was 92.7% for primary and 82.3% for revision augmentation. Cumulative Kaplan-Meier risk rates for two major adverse events were lower than in the silicone gel implant trials: Baker Class III & IV capsular contracture was 6.6% for primary, 11.5% for revision augmentation; rupture/deflation was 3.7% for primary, 4.7% for revision augmentation.

Conclusion: 10-year results from 426 women show the Structured Saline Implant has high patient and surgeon satisfaction, a low rate of capsular contracture and a low rate of rupture/deflation.

Success of Autologous Breast Reconstruction in Hypercoagulable Patients

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Purpose: Hypercoagulable disorders have been shown to have adverse consequences on microsurgical outcomes, including increased flap failure and complication rates. Outcomes specific to autologous breast reconstruction patients are not well described. Thrombophilic states may frequently be encountered in this population, as 8% of cancer patients have had a previous thrombotic event.

Materials and Methods: A retrospective review was performed of patients who underwent autologous breast reconstruction by five microsurgeons at an academic institution from 2009 to 2020. Hypercoagulable patients were defined as having a thrombophilic diagnosis (i.e., Factor V Leiden, protein C/S deficiency) or previous thrombotic event (i.e., pulmonary embolism, deep venous thrombosis). Analysis compared perioperative complications and flap success rates between hypercoagulable and non-hypercoagulable patients. Statistical analysis was performed using Fisher's Exact Test for discrete variables and Student's T-tests for continuous variables.

Results: A total of 916 patients underwent autologous breast reconstruction during the study period. Preoperative hypercoagulable conditions were identified in 101 patients who underwent 165 free flaps and were compared to 815 control patients who underwent 1300 flaps. A preoperative thromboembolic event had occurred in 90 patients (89.1%) and a thrombophilic disorder had been diagnosed preoperatively in 23 patients (22.8%). Twelve patients had both a thrombophilic disorder and previous thrombotic event (11.9%). There were no increases in intraoperative arterial (p=.14) or venous (p=.67) anastomosis revisions or thrombotic events (p=.16) for hypercoagulable patients compared to controls. Postoperatively, 68 hypercoagulable patients (67.3%) were treated with twice-daily prophylactic subcutaneous enoxaparin injections and 32.7% were managed with continuous dosing heparin infusions in addition to daily aspirin. There were trends towards an increased length of stay (4.7 ± 1.7 days vs 4.4 ± 1.6 days, p=.07) and increased blood transfusion rates (16/101, 15.8% vs 80/815, 9.8%, p=.09) in hypercoagulable patients. There was a statistically increased rate of unplanned acute return to the operating room in hypercoagulable patients (14/101, 13.9% vs 76/815, 9.3%, p=.005). Four arterial compromises resulted in one flap loss (75% salvage rate) and seven venous compromises resulted in three flap losses (57.1% salvage rate). There were statistically more early flap losses in hypercoagulable patients (4/165, 2.4% vs 7/1300, 0.5%, p=.03). The rate of delayed flap losses was similar (1/165, 0.6% vs 9/1300, 0.7%, p=.01). However, delayed partial flap losses were more common in hypercoagulable patients (8/165, 4.8% vs 18/1300, 1.4%, p=.006). The overall flap success rate was 97.0% in the hypercoagulable group and 98.8% in the control group (p=.08).

Conclusions: Autologous breast reconstruction may be viewed as a non-urgent microsurgical indication, and thus, hypercoagulable patients may not be offered reconstruction. This study

reports the largest series of hypercoagulable patients to date and found higher flap success rates and salvage rates than previously reported. Although early total flap losses and delayed partial flap losses were more common in hypercoagulable patients, overall flap success rate remains at 97% in this group. Microsurgical breast reconstruction can be successfully offered to hypercoagulable patients.

Sustaining Breast Reconstruction During a Pandemic: Institutional Review from the United States COVID-19 Epicenter

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Introduction: Screening, detection, and treatment for cancer faced numerous challenges and delays across the United States and world during the coronavirus disease-19 (COVID-19) pandemic. The effects of this are presumed to extend far beyond the initial peaks of the pandemic, as predictive modeling has suggested that delays in breast cancer screening, diagnosis, and treatment will lead to increases in subsequent breast cancer mortality over the ensuing decade. In our state, there was a strict month-long moratorium on elective consultations, imaging, procedures, and surgeries to preserve healthcare resources and divert personnel and attention to caring for patients with COVID-19 in April 2020. It is important to understand how screening delays created by the COVID-19 pandemic may affect both short-term and long-term oncologic outcomes for patients with breast cancer. Furthermore, it is important to characterize how these delays affected breast reconstruction in these patients. The objective of this study was to quantify the effect of the COVID-19 pandemic on breast cancer screening, primary oncologic breast operations, and subsequent breast reconstruction practices at a single institution situated within the epicenter of the pandemic.

Methods: A retrospective review of a single academic institution was performed to identify all mammograms, lumpectomies, mastectomies, and breast reconstruction operations performed from January 2019 through June 2021. Data was extracted from a combination of institutional databases in conjunction with direct electronic health record review. Only index breast reconstructions were included, and by such, revisions or secondary procedures were not included. Wilcoxon signed-rank tests were used to compare the number of total number of

mammograms, oncologic, and reconstruction cases between calendar quarters using SPSS Version 25 (IBM Corp., Armonk, N.Y.). Predetermined level of significance was $p<0.05$.

Results: Mammography volume declined by 11% in March-May of 2020. Oncologic breast surgeries and reconstructive surgeries similarly declined by 6.8% and 11%, respectively, in 2020 compared to 2019, reaching their lowest levels in April 2020. The volume of all procedures increased during the summer of 2020. Mammography volume in June and July 2020 were found to be at pre-COVID-19 levels, and in October-December 2020 were 15% higher than in 2019. Oncologic breast surgeries saw a similar rebound in May 2020, with 24.6% more cases performed compared to May 2019. Breast reconstruction volumes increased, though changes in the types of reconstruction were noted. Oncoplastic closures were more common during the pandemic, while two-stage implant reconstruction and immediate autologous reconstruction decreased by 27% and 43%, respectively. Volume in 2021 will supersede 2020 levels in all categories.

Conclusion: The COVID-19 pandemic acutely reduced the volume of breast cancer surveillance, surgical treatment, and reconstruction procedures. Despite mask mandates and required COVID-19 preoperative testing, diligent efforts were made to mitigate the decline in volume related to the COVID-19 pandemic. Volume increased beyond baseline levels to make up for the backlog created by the COVID-19 pandemic. The plastic surgery community can learn from these experiences in order to mitigate the impact of future disrupting events.

Systematic Review and Meta-Analysis of Epidemiologic Data on Breast Cancer Rates in Women With and Without Cosmetic Breast Implants

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Background: There has been recent interest in the immune response to breast implants. We endeavored to review epidemiologic evidence of the relationship between breast implants and breast cancer.

Methods: PubMed and EMBASE were queried (February 15th, 2022) for cohort-based studies that included women with cosmetic breast implants as a cohort and had an outcome criterion was breast cancer occurrence. Single cohort studies and studies that assessed women with

reconstruction and non-cosmetic implants were not included. Only the most recent study was used when several studies used the same population of subjects. Statistics were collected from the studies which included the data for relative risk (RR, the increased or decreased risk of breast cancer compared to another cohort) and the standardized incidence ratio (SIR, the number of breast cancer cases in women with cosmetic implants compared to the expected number of breast cancer cases). Statistical tests were performed with Stata Statistical Software, Release 15 (StataCorp., College Station, TX).

Results: 9 studies from the systematic review were included in the meta-analysis. Studies were published from the United States, Canada, Denmark, Sweden, Norway, and Finland during the years 1995 to 2020. Using forest plots, cumulative statistics were calculated for SIR and RR, which were based on 7 and 5 studies, respectively. Study populations ranged from 680 patients to 785,706 patients in the largest study. The summary SIR estimate was 0.59 (95% CI: 0.55-0.63) and the summary RR was 0.51 (95% CI: 0.46-0.56).

Conclusion: These results suggest that women who have cosmetic breast implants have a two-fold reduced risk of breast cancer. Future studies will elucidate a better understanding of the underlying mechanism that results in this reduced risk.

Systematic Review and Meta-analysis of Immediate Versus Delayed Autologous Breast Reconstruction in the Setting of Post-Mastectomy Adjuvant Radiation Therapy

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Background: Immediate post-mastectomy autologous breast reconstruction in breast cancer patients requiring post-mastectomy radiation therapy (PMRT) minimizes the number of operations patients must undergo and alleviates the psychological impact of living without a breast. However, the safety and impact of radiation on the reconstructed breast remains to be established. This study aimed to compare immediate versus delayed autologous reconstruction in the setting of PMRT to determine optimal sequencing of reconstruction and adjuvant radiation.

Methods: A systematic review of the literature identified 292 studies meeting criteria for full-text review, 44 of which underwent meta-analysis. This represented data on 1,927 immediate reconstruction patients and 1,546 delayed reconstruction patients (3,473 total patients). Early complications included flap loss, fat necrosis, thrombosis, seroma, hematoma, infection, and skin dehiscence. Late complications included fibrosis or contracture, severe asymmetry, hyperpigmentation, and decreased flap volume.

Results: Immediate breast reconstruction did not demonstrate significantly increased complication rates. Reported mean complication rates in immediate versus delayed reconstruction groups respectively were fat necrosis 14.91% and 8.12% (p=0.076), flap loss 0.99% and 1.80% (p=0.295), hematoma 1.91% and 1.14% (p=0.247), infection 11.66% and 4.68% (p=0.155), and thrombosis 1.51% and 3.36% (p=0.150). Seroma rates were significantly lower in the immediate cohort at 2.69% versus 10.57% in the delayed cohort (p=0.042).

Conclusion: Complication rates are comparable between immediate and delayed breast reconstruction in the setting of PMRT. Given the patient benefits incurred by an immediate reconstruction algorithm, immediate autologous breast reconstruction should be considered as a viable treatment option in patients requiring PMRT.

Systematic Review of Risk Factors for Hematoma in Gender-Affirming Mastectomy

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Background: Hematomas are reported to be the most common immediate complication in patients undergoing gender-affirming mastectomy, with rates substantially higher than those associated with other types of breast surgery.(1,2) This study sought to examine the breadth of current literature and provide evidence-based explanations regarding the development of hematomas in chest masculinizing surgery and technical considerations for reducing their incidence.

Methods: A systematic review was conducted to identify all articles related to gender-affirming mastectomy published through September 2021. The comprehensive literature search yielded 3,525 studies. From these, 864 duplicates were removed leaving 2,661 articles for screening. Exclusion criteria included articles for which the full text was not available, non-English language articles, lack of complications reporting, or those in which data presentation prohibited analysis of hematoma rate separately from other complications. After review, 20 studies met inclusion criteria. Themes from the selected articles were compiled to generate consensus statements qualified by associated level of evidence.

Results: The rate of hematoma following gender-affirming mastectomy reported in the literature ranges from 0% to 31.2%. Review revealed that nipple-sparing (periareolar, circumareolar, etc.) incisions are associated with a higher hematoma rate than mastectomy with free nipple grafting (Level of Evidence, III). There is insufficient evidence to support an association between higher

body mass index (BMI) and hematoma rate (Level of Evidence, III). Likewise, there is not sufficient data to support an association between mastectomy weight and hematoma rate (Level of Evidence, III). No evidence supports a relationship between use of testosterone and hematoma rate (Level of Evidence, IV), though nicotine use is associated with an increased risk of hematoma (Level of Evidence, IV). Prior breast reduction is an inconclusive risk factor for hematoma in patients undergoing gender-affirming mastectomy (Level of Evidence, IV). There is inconclusive evidence to determine if progressive tension sutures reduce the risk of hematoma and allow gender-affirming mastectomy to be safely performed without the use of drains (Level of Evidence, III). There is inadequate evidence to determine if perioperative administration of tranexamic acid (TXA), intra-operative blood pressure elevation to at least 120 mm Hg prior to closure, and use of post-operative compression bandages may reduce hematoma rate (Level of Evidence, III).

Conclusions: Hematoma is a known complication following gender-affirming mastectomy. Limited incision approaches have the strongest association with increased risk of hematoma. There is no evidence indicating an association between hormone use (i.e., testosterone) and hematoma incidence. Future studies are needed to better define factors, interventions, and protocols to reduce the rate of hematoma.

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Techniques in Nipple-Areolar Reconstruction: A retrospective Analysis of Surgical Interventions and Patient-Reported Satisfaction Scores

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Background: Nipple areolar complex (NAC) reconstruction is an important step in completing the breast reconstruction process for some patients and has been shown to improve both psychosocial and sexual well-being. Several techniques for NAC reconstruction have been

described, however, there currently exists little evidence in the literature describing outcomes or patient satisfaction following these procedures.

Methods: A retrospective analysis of patients who have undergone NAC reconstruction over the last decade were queried for patient demographics, operative technique, and post-operative outcomes. Patients were additionally queried using a standardized survey with informed consent that evaluated overall satisfaction, with a focus on aesthetic outcome, shape, color, and projection. Each response was graded from 1 to 5, with 1 being very dissatisfied and 5 being very satisfied. As appropriate, the independent-samples t-test, Mann-Whitney U Test, Fischer's exact, and Chi-squared were used to determine the association between groups and the clinical variable of interest. Demographic factors, surgical outcomes, and patient satisfaction scores were analyzed by Chi-square (categorical variables) or independent T-tests (categorical and continuous) with significance set at $P < 0.05$. Multivariate regression was applied for all subsequent analyses to adjust for possible confounders of survey time to follow-up. All statistical analysis was conducted using the IBM® SPSS® Statistics 27.0 (IBM Corp., Armonk, N.Y).

Results: 83 patients were identified from the retrospective analysis, with 49 patients (59.0%) willing to participate in the survey. The modalities used for reconstruction include the C-V flap (45.7%), the modified skate flap technique (42.2%), and free nipple grafting (FNG) (12.0%). The most utilized donor site for skate flap reconstruction was the supra-pubic area (37.1%). There were no significant differences in age, BMI, or medical comorbidities between the three types of reconstruction. There were also no significant differences in complication rate (CV 10.5%, FNG 10%, skate 5.7%, p=0.630) or revision surgeries (CV 2.6%, FNG 0%, skate 5.7%, p=0.732). The most common complication(s) after NAC reconstruction was nipple necrosis.

Because of evolution in our choice of technique, follow-up time was longer for the CV flap than for skate flap (CV 413.4 weeks compared to 322 weeks FNG, 229 weeks skate flap, p=0.012). Adjusting for time to follow-up using multivariate analysis, there was a significant difference in overall patient satisfaction when compared across all three techniques, with the modified skate flap having the highest mean overall satisfaction scores (4.48/5), and FNG with the lowest (3.75/5; CV 4.23/5; p=0.05). Patients who underwent reconstruction using the modified skate flap reported the highest scores across all categories, including aesthetic outcome (4.48, CV 4.23, FNG 3.75), shape (4.48, CV 4.05, FNG 3.75), color (4.26, CV 3.95, FNG 3.5), and projection (4.04, CV 3.55, FNG 3.5). 91% of patients who underwent modified skate flap reconstruction would recommend the procedure to a friend, compared with 82% of those who had CV flap reconstruction, and 50% who underwent FNG.

Conclusion: NAC reconstruction can be completed safely and effectively with a variety of techniques. Though potentially confounded by shorter time between surgery and patient-reported outcome, the modified skate flap technique was associated with high levels of patient satisfaction and a low complication rate.

Ten-Year Trends in Post-Mastectomy Radiation at a Single Institution: Implications for Breast Reconstruction

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Background: Guidelines for optimal breast cancer treatment are updated frequently in response to the latest evidence from clinical trials. Radiation therapy is a cornerstone of multimodal breast cancer treatment after lumpectomy and also plays a role in treatment for select patients after total mastectomy. Radiation therapy is known to impact skin quality, therefore special consideration should be taken when caring for patients with post-mastectomy radiation therapy (PMRT) seeking breast reconstruction. The aim of this study was to analyze annual trends in PMRT at our institution over the past decade to better elucidate its implications for patients seeking subsequent breast reconstruction.

Methods: All patients who underwent total mastectomies between 2011 and 2021 were identified through our institutional Clinical Data Repository utilizing Current Procedural Terminology codes. A retrospective chart review was carried out for each patient identified. Demographic information, comorbidities, breast cancer diagnosis and treatment, breast reconstruction method, and complications were compared between patients with and without PMRT. Additionally, radiation dose and timing were evaluated for patients who had radiation. Chi-square and Mann-Whitney U tests were utilized to compare differences between categorical and continuous variables, respectively.

Results: Of 452 patients who underwent mastectomy between 2011 and 2021, 133 (29.4%) had PMRT. The proportion of patients undergoing PMRT varied yearly, with no clear trend over time ($p = 0.016$). However, a higher proportion of patients received PMRT in more recent years (40.2% in 2020, 35.7% in 2021). Most patients (126/133) received adjuvant radiation. Mean Radiation dose to the chest wall and lymph nodes were 4867 cGy and 4133 cGy, respectively. A greater proportion of patients who underwent PMRT had T-stage T2 or greater (63.2% vs. 23.1%, $p <0.001$), N-stage N1 or greater (73.7% vs. 14.9%, $p<0.001$), and axillary lymph node dissection (59.4% vs. 16.8%, $p <0.001$). A greater proportion of patients with PMRT underwent breast reconstruction (49.6% vs. 39.9%, $p = 0.044$). Of those patients who had breast reconstruction, the most common method was tissue expander to implant reconstruction (no radiation: 67.5%, PMRT: 51.5%), followed by staged tissue expander to autologous reconstruction (no radiation: 11.9%, PMRT: 28.8%), $p = 0.001$. A greater proportion of patients with PMRT experienced postoperative complications (40.6% vs. 26.9%, $p = 0.004$); specifically, reoperation within 30 days of mastectomy (8.3% vs. 4.1%, $p = 0.07$), reoperation after 30 days of mastectomy (13.5% vs. 5.4%, $p = 0.003$), skin necrosis (3.8% vs. 0.6%, $p = 0.014$), and poor

cosmetic outcome (3.8% vs. 1.3%, p - 0.082).

Conclusions: Differences exist in the disease extent, classification, and outcomes for patients with and without radiation. Surprisingly, a greater proportion of patients with PMRT chose to undergo breast reconstruction. In this cohort of patients, we observed increased rates of complications including reoperation, skin necrosis, and poor cosmetic outcomes for patients with PMRT. An individualized approach and careful planning are essential for optimizing outcomes for this patient population.

The Comparative Study of the DIEP Flap and PAP Flap in Breast Reconstruction; Reconstructive Outcomes and Fat Necrosis

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Background: The diversity of patients prompts plastic surgeons to find secondary options for autologous breast reconstruction from various regions of the body. The PAP flap then quickly got popularity as a second option for autologous breast reconstruction. (1-4) However, due to a short history of the PAP flap, there is a lack of studies about long-term outcomes. However, due to a short history of the PAP flap, there is a lack of studies about long-term outcomes. This study aims to compare the outcomes of the profunda artery perforator (PAP) flap to the deep inferior epigastric artery perforator (DIEP) flap.

Methods: We review our data from the DIEP flap and PAP flap breast reconstructions performed from 2018-2021. The PAP flap breast reconstructions were compared with the DIEP flap breast reconstructions. The primary outcome of this study is the reconstructive outcome of the flap, Total flap loss, secondary procedure, mastectomy flap complications. The secondary outcome of this study is fat necrosis. Ultrasonographic evaluation of reconstructed breast was performed by a specialized radiologist after 6 months postoperatively for a follow-up study. The fat necrosis shows ill-defined complex cystic lesion surrounded by edematous fat in the subacute phase (days to months) and spiculated mass with the calcified wall in the late phase (1.5 years or more)

Results: 43 PAP flaps were performed to reconstruct 31 breasts, and 99 DIEP flaps were performed to reconstruct 99 breasts. The average age of the PAP flap patients (39.1 ± 7.3 years) was lower than DIEP flap patients (47.4 ± 7.7 years), and the body mass index (BMI) of the PAP flap patients (22.7 ± 2.8 kg/m²) were lower than the DIEP flap patients (24.3 ± 3.4 kg/m²). There was no total loss of both flaps. Donor site morbidity was higher in PAP flap (11.1%) than the DIEP flap (1.0%). The rate of fat necrosis was higher in the PAP flaps (40.7%) compared to the DIEP flaps (17.8%) in ultrasound.

Conclusions: The PAP flap was performed in young and slim patient compared to the DIEP flap. The PAP flap breast reconstruction showed similar reconstructive outcome compared to the

DIEP flap breast reconstruction. Donor site morbidity was higher in the PAP flap. Perfusion related complication (fat necrosis) in ultrasonographic evaluation was higher in PAP flap breast reconstruction than the DIEP flap breast reconstruction.

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The Effect of Postoperative Infection after Implant Breast Reconstruction on Additional Revision Procedures

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Introduction: Infection after implant-based breast reconstruction (IBR) adversely affects surgical outcomes and significantly increases healthcare utilization. The most taxing complications will result in revision procedures, such as autologous salvage or implant removal.

Purpose: This study aims to quantify how post-IBR infections impact additional surgical revision procedures.

Methods: We conducted a retrospective cohort study, using Optum's De-Identified Clinformatics Data Mart, to analyze 6,102 women who underwent IBR from 2003 to 2020. Patients with continuous enrollment greater than 6 months before and after the index procedure were excluded. Subsequent visits to the operating room for revision procedures were identified using CPT codes and included autologous reconstructions, removals of ruptured implants, removals of intact implants, and revisions of a reconstructed breast. The relationship between

postoperative infection and additional revision procedures was analyzed via linear regression with poisson distribution to determine statistical significance at $p < 0.05$.

Results: Infections post-IBR were recorded for 7.4% of patients. When patients developed a postoperative infection, 18.3% of patients had no revision procedures, 26.3% had one revision procedure, 29.8% had two revisions, 21.4% had three revisions, and 4.2% had four revisions. Patients with a postoperative infection were associated with an 87.35% increase in revision trips to the operating room compared to those without postoperative infections ($p<0.001$). Of patients with postoperative infections, 75.5% had an autologous salvage procedure, 48.1% patients had an implant placed again, and 43.3% had their breast implant removed.

Conclusions: Surgical revision procedures after IBR infection present hidden costs to both the patient and the hospital. This national, claims-level study shows that an infection after IBR was associated with an 87.35% increase in surgical revision procedures. These revision procedures represent an opportunity cost to the patient which could manifest in delayed recovery, lost wages, and increased discomfort. This increase in trips to the operating room overloads the hospital system and over utilizes resources. These unplanned operations could also increase the wait time for other patients' procedures.

The Effects of Connecticut's Prescription Monitoring Program on Narcotic Prescribing Patterns in Breast Reduction Surgery

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Purpose: Over prescription of opioids has become a nationwide epidemic. Plastic surgeon prescription practices may be part of the problem with some physicians prescribing double the number of narcotics needed by patients. [1] In recent years, there has been greater awareness of the potential for abuse of narcotics. [2] One of the results of this awareness has been the development of prescription monitoring programs (PMP) by many state boards of health. The Connecticut PMP was started in July 2008. The goal of this study was to evaluate the impact of this greater awareness and monitoring program on prescribing patterns following breast reduction surgery.

Methods: A retrospective chart review of 21 consecutive patients undergoing breast reduction surgery prior to the PMP program was compared to 21 consecutive patients who underwent the same procedure following establishment of the program. All subjects were patients from a single institution. Patient demographics, average grams of resected tissue and number of narcotic pills prescribed were compared. Statistical significance was determined using student t-test.

Results: Prior to the prescription monitoring program, the average number of narcotic pills prescribed to each patient was 41.9 (range, 30 – 100 pills). Following establishment of the PMP

program, the average number of pills prescribed per patient was 19.2 (range, 0 – 30 pills). There was a statistically significant decrease in the number of narcotics being prescribed by physicians. In addition, there was no correlation between size of reduction and number of pills prescribed in either group.

Conclusions: This study demonstrates that there was a significant reduction in the amount of narcotics prescribed for patients undergoing breast reduction surgery following establishment of the prescription monitoring program in Connecticut.

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The Fate of 2-Stage Implant-Based Breast Reconstruction in Patients with First Stage Complications: Predictors for Failure

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Purpose: Due to different protocols on how to proceed once a complication occurs and due to the different definitions of tissue expander (TE) or implant loss and implant-based reconstruction (IBR) failure, there is conflicting data regarding the natural history of a definitive implant following exchange in a reconstructed breast that has previously presented with surgical site occurrence (SSO) during the expansion process. Herein, we present a 10-year experience of a single center with TE complications and subsequent definitive implant placement. The main outcome of this study was to determine the risk factors associated with TE loss and failure of IBR once a complication develops and to determine the incidence of complications after definitive implant placement in patients with previous complications during tissue expansion.

Methods: We retrospective reviewed the medical charts of patients who underwent two-stage IBR from December 2010 to December 2020. We only included patients undergoing IBR who presented with SSO during the first stage of reconstruction (tissue expansion). SSO was defined by the presence of fat necrosis, capsular contracture, TE rupture, seroma, hematoma, infection, and wound-associated complications (dehiscence and mastectomy flap necrosis). We identified independent predictors for failure of TEs using multivariate logistic regression analysis. We

noticed there was a significant proportion of patients who underwent simultaneous fat grafting during TE-to-implant exchange (SFG-TtE). Therefore, we stratified patients to determine the effects of SFG-TtE.

Results: After reviewing 504 medical records, 208 reconstructive procedures in 167 patients who underwent mastectomy and presented with SSO during the first stage of IBR were included. The mean age and BMI were 53.1 years and 27.8 kg/m2 respectively. The average follow-up was 40.6 months. Sixty-one reconstructions required TE removal (29.3%), while thirty-two TEs (15.4%) were permanently explanted due to complications (IBR failure). Smoking (OR 17.5, p=0.01) and infection by Staphylococcus aureus (OR 11.9, p=0.002) were independent predictors for IBR failure in patients with TE infection. Smoking (OR 22.7, p=0.001), and infection (OR 7.6, p=0.03) were independent predictors for failure of IBR in reconstruction with wound-associated complications during tissue expansion.

Of 208 reconstructive procedures presenting with SSO during tissue expansion, 176 reconstructive cases (84.61%) were able to undergo TE-to-implant exchange. The overall rate of complications after exchange was 30.1% (n=53) and the rate of IBR failure was 5.7% (n=10) on the second stage. Despite the overall complication rate after definitive implant placement was not significantly different between patients who had SFG-TtE versus those who did not. The rate of wound dehiscence was significantly higher in patients who received SFG-TtE (8.7% versus 1.9%, p=0.034). Nonetheless, the rates of debridement/excision and closure (p=0.152) and IBR failure (p=0.958) were not significantly different between groups.

Conclusion: Definitive implant placement in patients with previous SSO during tissue expansion is safe. Once patients undergo TE-to-implant exchange, the IBR failure rate is less than 6%. Fat grafting during TE-to-implant can be securely performed in patients with previous tissue expander complications. A more conservative or measured approach for SFG-TtE should be contemplated in patients with surgical site occurrence during tissue expansion.

The Impact of Intraoperative Radiotherapy (IORT) on Surgical and Cosmetic Outcomes of Breast Reconstruction

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Background: Intraoperative radiotherapy (IORT) is increasingly used worldwide in combination with breast conserving surgery due to decreased non-cancer morbidity and mortality and skin complications compared to external beam radiation therapy (EBRT).

Purpose: Retrospective analysis of complications, reoperations and cosmesis in patients treated with IORT.

Methods: 121 patients underwent breast conserving therapy with IORT between November

2017 and November 2021. 58 patients (48%) received IORT as a boost to the tumor bed followed by adjuvant EBRT. 63 (52%) patients had only IORT. Wide local excision of the tumor was followed intraoperative pathology. Once the margins were confirmed to be clear of tumor, the cavity was measured and IORT applicator size selected. IORT was delivered with Zeiss Intrabeam (50kV) machine at a dose of 20 Gy at 1 cm depth. Therapeutic mammaplasty reconstruction was performed in 111 (92%) patients, 10 patients had reconstruction with a local parenchymal flap. Patients were followed up weekly for 6 weeks, thereafter at 3 months, 6 months, one year and two years.

Results: Mean patient age was 58 years (range 32-86). Mean follow up was 26,5 months (range 5-48). Tumor histology was ductal in 101 (83%), lobular in 11 (9%), DCIS in 8 (6%), other in 4 (3%) patients. In three patients radiologically occult second tumor was discovered on histological assessment, ipsilateral in 2 patients and contralateral in one. 8 (7%) tumors were Tis, 60 (50%) tumors were T1, 42 (35%) tumors were T2, 2 (1.5%) tumors were T3 and 3 (2.5%) tumors were T4. Five patients had complete pathological response post neoadjuvant chemotherapy. Surgical margins were 10 mm or greater in 93% of patients. In 8 patients, margins were 4-6 mm from DCIS, which was deemed acceptable at the multidisciplinary unit discussion. Early complications were seen in 29 (24%) patients: hematoma 3, seroma 2, breast edema 1, infection 2, delayed wound healing 5, skin burn 9 and fat necrosis 7. One patient required reoperation for evacuation of hematoma.

Late complications (> 3 months) were seen in 24 (20%) of patients, 19 of which were fat necrosis. IORT related changes (skin burn and fat necrosis) were the most common early and late complication, however they significantly improved with time. Skin changes completely resolved within 6 months. Favorable cosmesis was achieved in 81% of patients. Loss of volume due to fibrosis from EBRT was the most common factor detrimental to final cosmesis. 88% of patients were satisfied with their aesthetic results.

Three patients required completion mastectomy. One had local recurrence of DCIS at 9 months postoperatively. One patient, initially treated with neoadjuvant chemotherapy for a large T2 tumor, followed by surgery with IORT and adjuvant EBRT, developed DCIS at 22 months postoperatively. Another patient initially treated with surgery and IORT for a T1 lobular cancer developed an ipsilateral new primary at 48 months post treatment. All three patients had histologically clear margins at initial tumor extirpation.

Conclusion: IORT related complications resolve over time resulting in favorable cosmesis. Reoperation and recurrence rate is comparable to conventional breast conservation.

The Nipple-Preserving Inferior Ellipse Mastectomy: A New Technique for Masculinizing Top Surgery

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Background: The two most common techniques for gender affirming mastectomy are the double incision with free nipple graft (DFNG) and the periareolar. However, there are patients that are not well suited for either technique. When a patient's nipples are high and on the pectoralis muscle yet there is marked breast tissue and skin redundancy, a DFNG would land the incision above the pec shadow, but a peri-areolar approach would not adequately remove the excess skin. In these patients, a nipple-preserving inferior ellipse incision allows for appropriate chest contouring while leaving the nipple unchanged and placing the incision in the pectoralis muscle shadow.

Purpose: To describe the authors' novel technique for nipple-preserving inferior ellipse gender affirming mastectomy and to review the early surgical outcomes of this technique.

Materials & Methods: Retrospective chart review identified patients undergoing nipple-preserving inferior ellipse mastectomy with the senior author between June 2020 and September 2021. Indications were patients with moderate glandular tissue, skin excess and a high nipple areolar complex (NAC) above the inferior border of the pectoralis major.

Results: Sixteen patients underwent inferior ellipse mastectomy and were included in this study. Mean follow-up was 203 days. Two patients (14%) had undergone previous reduction mammaplasty. Two patients (14%) required revision of the NAC. There was no partial or complete NAC loss. One patient (7%) developed postoperative seroma which resolved with aspiration.

Conclusions: For patients with moderate glandular tissue, excess skin in the inferior pole and NAC position above the inferior border of the pectoralis major, the nipple-preserving inferior ellipse mastectomy technique allows favorable aesthetic outcomes without requiring a free nipple graft.

The Relationship Between Neuropsychiatric Diagnoses and Revision Surgery Following Breast Reconstruction

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Introduction: Alloplastic and autologous breast reconstruction frequently involve additional revision operations to enhance the breast's aesthetic outcome. The number of revision operations is variable among patients and largely driven by patient satisfaction. A neuropsychiatric diagnosis (ND) can negatively influence patient satisfaction regarding reconstructive outcomes and may impact the rate of revisions following reconstruction. In this study, we aim to determine if NDs result in increased revision operations and healthcare utilization of plastic surgery resources following alloplastic and autologous breast reconstruction.

Methods: We retrospectively reviewed 200 patients from 2010-2019 who underwent post-mastectomy alloplastic or autologous breast reconstruction by a single surgeon at our institution. We evaluated for the presence of NDs, type of NDs, number of revisions, and number of post-reconstruction plastic surgery appointments. Continuous variables were compared using independent samples t-tests, and categorical variables were compared using chi-square tests.

Results: Of the 196 patients who met inclusion criteria, the majority had at least one revision surgery (65.3%). Overall, 100 patients had a ND (51.0%), and 79 patients (40.3%) were diagnosed preoperatively to their index reconstruction while 21 patients (10.7%) were diagnosed postoperatively. Preoperative and postoperative NDs were not significantly associated with the number of revision operations (p=0.156). Patients who had a ND at any point during the reconstructive process had a significantly higher number of plastic surgery appointments on average over a longer duration of time compared to patients without any NDs (p=0.009 and p=0.040, respectively).

Conclusions: Neuropsychiatric diagnoses do not significantly influence the number of revision operations following breast reconstruction. However, NDs result in increased healthcare utilization of plastic surgery resources that may lead to increased longterm healthcare costs. Plastic surgeons should place emphasis on early identification of patients with NDs to provide resources and counseling, as well as better manage patient expectations regarding surgical outcomes.

The Return of the Flap; the Empire State Mandate: New York State Legislature's Impact on Post-Mastectomy Immediate Breast Reconstruction

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Purpose: Despite the psycho-social benefits of immediate post-mastectomy breast reconstruction, national trends show that only 16-40% of patients undergo immediate breast reconstruction after total mastectomy.1-4 In 2010 New York State passed the Breast Cancer Provider Discussion Law with the aim of increasing awareness of post-mastectomy reconstructive options through provider-driven patient education. Given that analysis of immediate years following implementation suggested that the law increased access to care, we aimed to study the long-term effects of the bill at our institution.5

Materials and Methods: A retrospective review identified demographic, socioeconomic, and clinical data for patients undergoing mastectomy with immediate reconstruction at Weill Cornell Medicine from 2002 to 2019. Primary outcome was the reconstruction type. Subgroup analysis was based on sociodemographic factors. Interrupted time series (ITS) modeling analyzed differences in reconstructive trends for sociodemographic factors before and after the 2011 implementation of the NYS law.

Results: 1,852 patients were included in our cohort. 1507 (81.4%) and 345 (18.6%) patients underwent implant and flap-based reconstruction, respectively. ITS showed that with each year leading up to implementation of the 2010 law, patients were 22% less likely to receive flap-based reconstruction ($p < 0.05$). For each year that passes post-implementation, the odds that a patient received flap-based reconstruction increased by 37% ($p < 0.05$). With each passing pre-implementation year, the highest income quartile was 29% less likely to receive flap-based reconstruction compared to the lowest income quartile ($p < 0.05$). Following implementation, there was no difference between groups. Pre- and post-implementation, there was no difference between groups based on race, ethnicity, age at diagnosis, distance from hospital, or insurance status (all $p > 0.05$). However, when comparing White and AAPI patients, the odds that AAPI patients were 27% less likely ($p = 0.07$) and 46% more likely ($p = 0.08$) to get flap-based reconstruction pre- and post-2011, respectively, approached significance.

Conclusions: Our data suggests the long-term efficacy of the NYS Breast Cancer Provider Discussion Law. The increase in rate of flap-based reconstruction across sociodemographic groups underscores the importance of this bill and encourages its adoption in other states.

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The Role of ACE-Inhibitors and ARBs in Reducing Hypertrophic Scarring Following Bilateral Breast Reduction

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Background: The angiotensin-renin system (ARS) has been shown to play a role in the promotion of tissue fibrosis through angiotensin II activation of the angiotensin-receptor 1 and subsequently TGF- β1. Breast reduction surgery is known to have a potential complication of hypertrophic scarring. The primary objective of this study is to assess whether the use of ACEi or ARBs by patients undergoing bilateral reduction mammoplasty is correlated with a reduction in hypertrophic scarring complications post-operatively.

Methods: A retrospective chart review of all patients who received bilateral breast reduction surgery in our province over a 10-year period was performed. Patient charts were reviewed for post-operative hypertrophic scarring as well as medications being used around the time of surgery. The rate of hypertrophic scarring within patients treated with an ACEi or ARB for existing hypertension were compared with the rest of the population.

Results: A total of 981 patients met the inclusion criteria of the study. The overall incidence of hypertrophic scarring was 6.2%. Within the population, 132 (13.5%) of patients had a clinical diagnosis of hypertension. Of the patients who were managed with an ACEi or ARB, one (1.5%) patient developed hypertrophic scarring post-operatively. This was significantly less than the total population and the remainder of the population with hypertension treated with a medication other than an ACEi or ARB.

Conclusions: This study investigated the impact of routine ACEi or ARB use by patients undergoing bilateral reduction mammoplasty and demonstrated a statistically significant reduction in the incidence of hypertrophic scarring. This study is one of the first to investigate ACEi or ARB use in humans to reduce rates of unsightly scarring.

The Safety of Same-Day Discharge After Immediate Alloplastic Reconstruction: A Systematic Review and Comparison of Patient Factors and Complication Rates

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Background: Implant based breast reconstruction can be performed in a variety of ways and can result in vastly different experiences for patients. The pandemic and recent trends have resulted in more outpatient management of these patients.

Purpose: The main objective of this review was to identify the safety of same day discharge after immediate post-mastectomy alloplastic breast reconstruction.

Methods: A systematic review of PubMed and Embase databases was conducted with respect to same-day discharge after post-mastectomy immediate alloplastic breast reconstruction. A total of 1,328 articles were identified on initial search, with four meeting inclusion and exclusion criteria. Manuscripts were included if post-mastectomy alloplastic breast reconstruction was performed, and there was documentation of same-day discharge. This cohort of patients was compared to traditional, planned overnight admission cohorts found in the literature. Objective data included comparison of patient factors and patient complication rates.

Results: A total of 574 patients were included in our comparison of patient factors and complication rates. Among the four studies included in our comparison between same-day and overnight admission groups, 289 were planned same-day discharge and 285 were planned overnight admission. BMI, radiation, and smoking rates were comparable. The pooled rate of bilateral procedures for same-day discharge and overnight admission were 82% and 74%, respectively. Tissue-expanders were used more frequently in both cohorts, with lower rates in the same-day discharge cohort (52%) than the overnight admission cohort (66%). Among same-day discharge patients, the rate of overall complications was 33%. Among overnight admission patients, the rate of overall complications was 34%. Rates of major and minor complications among same-day discharge patients were 12% and 26%, respectively. Rates of major and minor complications among overnight admission patients were 16% and 21%, respectively. Among same-day discharge patient, rates of infection, seroma, and hematoma were 7%, 4%, and 4% respectively. Among overnight admission patient, rates of infection, seroma, and hematoma were 13%, 6%, and 1% respectively. There were no reported increases in re-admissions or re-operations between groups.

Conclusions: Same day discharge after mastectomy with immediate, alloplastic reconstruction is a safe approach to treatment in both the ambulatory and hospital setting. There is no reported increase in complication rates or re-admissions among patients with same-day discharge.

The Sensory Assessment after FTM gender affirming mastectomy (SAFTY) Study

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Background: Gender-affirming mastectomy (GAM) is the most common procedure performed to alleviate gender dysphoria. There is paucity of data regarding extent of sensation loss and return of sensation after "double-incision mastectomy" with free-nipple graft (DM-FNG). Therefore, this study aims to quantify the degree and timing of sensation return to the chest and nipple areolar complex (NAC) to improve counseling and expectations for patients undergoing DM-FNG.

Methods: Participants are enrolled at surgical consultations and post-GAM follow-up appointments. Light touch and pressure are assessed via Semmes-Weinstein Monofilaments, ranging from 1.65-6.50 mm, at standardized locations. Sizes up to 2.83, 3.61, 4.3, and 6.65 represent normal sensation, diminished light touch, diminished protective sensation, and deep pressure sensation respectively. Temperature sensibility is assessed with warm and cool test tubes on the chest. Patients also completed Qualtrics surveys that evaluated perceptions of chest sensation and sexual health.

Results: The sensory filament tests were performed on 27 preoperative and 39 postoperative patients. Significantly more postoperative patients had a history of binding than preoperative patients ($p<0.05$). 100% and 94.9% of all preoperative and postoperative patients were able to identify hot and cool stimuli on their chests, respectively ($p=0.23$).

There is normal sensation in the upper chest (G2-H3) as early as one month postoperatively. Patients have significantly decreased bilateral sensation inferior to the nipple on the inframammary scar (IMF) (B) and along the midaxillary line at multiple time points postoperatively ($p<0.05$).

All preoperative patients had intact nipple sensation. Postoperative patients had significantly reduced nipple sensation at all times ($p<0.05$). 41% had absent nipple sensation and 48.7% had decreased sensation. For those with decreased nipple sensation, a thicker monofilament size was required (6.0- 6.7, $p<0.01$). Notably, 19.3% had normal bilateral nipple sensation even as early as four months.

64.3% of patients preoperatively reported that nipple and chest stimulation is slightly or not at all important to their sexual activities. 60.7% were not concerned about potential nipple sensation loss after the surgery, with 25% unsure.

82% of surveyed postoperative patients had unchanged or improved satisfaction with their sexual health after the surgery. 100% agreed that top surgery changed their lives for the better.

Conclusion: Our findings suggest chest sensation is normal after DM-FNG except on the NAC and along the IMF and midaxillary line. The diminished sensation along the IMF corresponds to the native NAC location within the dermatomal distribution of the 4th intercostal nerve that is resected in DM-FNG. The extent of lateral dissection, flap elevation, and axillary dissection may contribute to the decreased sensation at the midaxillary line.

For patients with significant decreases in NAC sensation, they had protective and deep pressure sensation on their NACs. Notably, one out of five patients had normal NAC sensation as early as four months, which may be due to sensation of the underlying dermis. However, the majority of patients were not concerned about their sensation loss and had improved sexual health and overall satisfaction postoperatively. These results further improve preoperative patient counseling and better align patient expectations with outcomes.

The Superficial Low Abdominal Mini (SLAM) Flap for Oncoplastic Breast Reconstruction

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Purpose: The majority of described volume replacement techniques for oncoplastic breast reconstruction utilize chest wall-based pedicled flaps. In patients with small breasts who desire to preserve breast volume and have a paucity of regional chest wall tissue, free tissue transfer may be better suited for reconstruction. However, reports of free flaps for oncoplastic reconstruction have been limited and typically include delayed reconstructions1 or abdominal/thigh-based flaps that sacrifice the donor sites for future reconstruction.2 The purpose of this study was to review our experience using a low abdominal flap based on the superficial perfusion for immediate volume replacement in partial breast reconstruction without sacrifice of future autologous donor sites.

Materials and Methods: A retrospective review was performed of all patients that underwent immediate oncoplastic breast reconstruction with a free superficial low abdominal mini (SLAM) flap. Data on patient demographics, tumor location and size, flap type, recipient vessel and reconstructive outcomes were collected and analyzed.

The SLAM flap utilizes a 2-3cm-wide strip of hemi-abdominal tissue at the caudal aspect of an abdominoplasty incision based on dominant superficial perfusion in the region. After dissection

of the pedicle to the femoral vessels, the flap is designed eccentrically on the pedicle to maximize length. Anastomosis is performed to chest wall perforator vessels based on defect location to restore volume and contour.

Results: A total of 5 patients underwent reconstruction with SLAM flaps. Mean patient age was 49.8 and body mass index was 23.5. Tumor location was in the lower outer quadrant in 40% of patients, upper outer in 20%, upper medial in 20% and lower medial in 20%. Average lumpectomy size was 30 grams. All five flaps were based on the superficial circumflex iliac artery and vein. Recipient vessels included internal mammary perforators (40%), serratus branch (20%), lateral thoracic vessel branch (20%) and lateral intercostal perforators (20%).
All patients underwent scheduled adjuvant radiation therapy without delay and had maintenance of volume, symmetry, and good contour at an average of 11 months after surgery. There were no cases of total or partial flap loss, clinically palpable fat necrosis, or delayed wound healing at the recipient or donor site.

Conclusions: The free SLAM flap allows for immediate autologous oncoplastic breast reconstruction in thin, small-breasted patients after partial mastectomy. In a small series, the SLAM flap provided good contour and maintenance of volume after radiation without importantly sacrificing future potential donor sites for autologous breast reconstruction.

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The Superomedial Pedicle: A Case for Superiority in Reduction Mammoplasty Outcomes

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Background: The superomedial pedicle for reduction mammoplasty remains less commonly performed than the inferior pedicle. This study seeks to delineate the complication profiles and outcomes for reduction mammoplasty using a superomedial pedicle technique in a large series.
Methods: A retrospective review was conducted of all consecutively performed reduction mammoplasty cases at a single institution by two plastic surgeons over a two-year period. All consecutive superomedial pedicle reduction mammoplasty cases for benign symptomatic macromastia were included.

Results: Four hundred sixty-two breasts were analyzed. Mean age was 38.31±3.38 years, mean BMI 28.5±4.95, and mean reduction weight 644.4±299.16 grams. Nineteen percent of patients were either current or former tobacco users. Regarding surgical technique, a superomedial pedicle was used in all cases, and Wise pattern incision in 81.4 percent and short-scar incision in 18.6 percent. The mean sternal notch-to-nipple measurement was 31.2±4.54 cm. Overall, there was a 19.7 percent rate of any complication in any breast. The majority of the surgical complications in superomedial pedicle breast reductions were very minor in nature, including 7.5 percent rate of any wound healing complications treated with local wound care and healed by secondary intention and 8.6 percent rate of scarring meriting office-based intervention. Utilizing the superomedial pedicle resulted in extremely low rates of nipple necrosis, specifically 0.4 percent of partial nipple necrosis and 0.2 percent of full nipple necrosis. Furthermore, rates of seromas (2.8 percent), hematomas (0.9 percent), and fat necrosis necessitating office-based intervention (0.9 percent) were all similarly very low. The rate of returning to the OR for revision surgeries was extremely low at 1.1 percent. For the five breasts requiring OR for revision surgeries, the indications were as follows: one hematoma, one fat necrosis excision, and three scar revisions. There was no statistically significant difference in breast reduction complications and outcomes using the superomedial pedicle, regardless of sternal notch-to-nipple distance ($p=0.123$). Surgical complications using superomedial pedicles for reduction mammoplasty were stratified by sternal notch-to-nipple measurement (distance in centimeters) in categories of less than 30 centimeters, 30 to less than 35 centimeters, 35 to less than 40 centimeters, and greater than 40 centimeters, and there was no statistically significant difference. BMI ($p=0.029$) and breast reduction specimen operative weight ($p=0.004$) were the only significant risk factors for a surgical complication, and with each additional gram of reduction weight, the odds of a surgical complication increased by 1.001. The type of incision pattern used, namely Wise pattern or short-scar incision, was not a statistically significant factor for having a surgical complication. Mean follow up time was 40.5±7.1 months.

Conclusion: The superomedial pedicle is an excellent option for reduction mammoplasty, portending a favorable complication profile and long-term outcomes. With the superomedial pedicle, there is no statistically significant difference in using a Wise pattern versus a short-scar pattern in terms of surgical complication profile. Furthermore, there is no statistically significant difference in breast reduction complications and outcomes using the superomedial pedicle, regardless of sternal notch-to-nipple distance.

To ADM or not to ADM? Outcomes of Pre-pectoral Prosthetic Reconstruction after Nipple-Sparing Mastectomy with and without Acellular Dermal Matrix

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Introduction: Nipple-sparring mastectomy (NSM) is psychologically advantageous and cosmetically superior to skin-sparing mastectomy. Pre-pectoral reconstruction avoids animation and deformity and is associated with less morbidity. Traditionally, NSM poses an increased risk of nipple ischemia and potential implant contamination through the remaining nipple ducts. Therefore, it appears of importance that a "barrier" between the prosthesis and the outside world be preserved. In sub glandular prosthetic reconstruction, acellular dermal matrix (ADM) has been used with success. However, ADM application has been linked with higher likelihood of seroma, infection, and implant loss. This study aims to compare surgical outcomes of implant-based pre-pectoral reconstruction after NSM with and without ADM.

Methods: All patients who underwent immediate breast reconstruction with prepectoral tissue expander (TE) or direct-to-implant (DTI) after NSM by the senior author between April 2013 to January 2021, were included in this study. Cohorts were stratified into breasts with ADM or No-ADM. DTI and TE groups were also analyzed irrespective of ADM use. Complications that occurred within 30 days were analyzed individually and as minor and major groups. Minor complications included erythema, seroma, flap necrosis, nipple necrosis, and prescription of extra antibiotics. Major complications included hematoma, dehiscence, infection, hospitalization, necrosis requiring surgery, any surgical intervention, capsular contracture, and implant loss. Capsular contracture was assessed at the latest follow-up. Ecchymosis was individually measured as it is not a complication but an expected outcome.

Results: A total of 115 pre-pectoral reconstructions were performed in 66 patients, including 80 of TE and 35 of DTI placements. The mean patient age was 48 ± 11 years and BMI 27 ± 5.3. Groups appeared uniform with regards to age, BMI, breast weight, diabetes, hypertension, smoking status, initial and final fill volumes if they received a TE, and permanent implant volumes. Smokers experienced 3.1 times more major complications than non-smokers ($p<0.012$) and required 4.5 times more post-operative antibiotics ($p<0.01$), irrespective of ADM use or implant type. There were 75 breasts with ADM and 40 breasts with no ADM. The rate of ecchymoses was statistically higher with ADM compared to No-ADM (70.7% vs 30%, $p<0.001$) as was nipple necrosis with ADM than without ADM (28% vs 10%, $p=0.026$). ADM use was also associated with less rates of capsular contracture (16% vs 37.5%, $p<0.01$) at latest follow-up 577 ± 453 days. When groups were stratified into DTI and TE irrespective of ADM use, DTI was associated with lower rates of major complications (37.14% vs 65%, $p<0.005$), necrosis requiring excision (33.33% vs 91.3%, $p<0.001$), loss of implant (5.7% vs 38.75%, $p<0.001$), and any complication necessitating surgery (14.3% vs 27.5%, $p=0.024$).

Conclusion: ADM use in pre-pectoral implant-based breast reconstruction after NSM increases the likelihood of ecchymoses, mastectomy flap necrosis and nipple necrosis, but appears protective against capsular contracture, which could be due to its properties as through-duct contamination barrier. As compared to DTI, TE placement led to greater complication rates likely due to flap ischemia. In smokers, prosthetic reconstruction after NSM leads to exceptionally high complication rates and should be offered with caution.

Trend Reversal in U.S. Lumpectomy Rates: An Analysis From 2005-2017 Using Three Nationwide Datasets

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Background: Despite equivalent oncologic outcomes and survivorship, U.S. lumpectomy rates previously declined in favor of more aggressive surgical options such as mastectomy, often performed in conjunction with a contralateral prophylactic mastectomy (CPM). Using three national datasets (the National Surgical Quality Improvement Program [NSQIP], Surveillance, Epidemiology, and End Results program [SEER], and the National Cancer Database [NCDB]), this study aims to evaluate longitudinal trends in lumpectomy, mastectomy, and CPM rates and to determine characteristics associated with current surgical practice.

Methods: An examination of the NSQIP, SEER, and NCDB databases was performed to evaluate trends in lumpectomy and mastectomy rates from 2005-2017. Longitudinal trends were analyzed using Cochran-Armitage Trend tests. We further examined mastectomy rates by assessing annual rates of unilateral mastectomy and CPM per 1000 mastectomies using Poisson regression. Upon determining a notable reversal in lumpectomy rates in 2013, we compared NCDB lumpectomy patients before (2011) and after (2017) this change. Multivariable logistic regression models were performed on the NCDB dataset to identify predictors of lumpectomy and contralateral prophylactic mastectomy.

Results: We analyzed a study sample of 3,467,152 female surgical breast cancer patients (1,912,771 lumpectomy patients; 1,554,381 mastectomy patients). Surgical trends were found to be similar in all three databases. Lumpectomy rates reached a nadir between 2010-2013, with a significant increase thereafter (all $p<0.001$). Conversely, mastectomy rates declined significantly beginning in 2013. Unilateral and contralateral prophylactic (bilateral) mastectomy rates increased significantly from 2005-2013 (all $p<0.001$) and subsequently stabilized after 2013, with unilateral mastectomy rates remaining higher than CPM throughout the entire time period. Age distribution of lumpectomy patients from 2011 to 2017 demonstrated an increase in patients 60-79 years of age (2011: 35.3%, 2017: 55.9%, $p < 0.001$) with a concurrent increase in the proportion of patients with Medicare (2011: 39.6%, 2017: 44.7%, $p < 0.001$). On multivariable logistic regression analysis, the strongest predictors of lumpectomy were older age, black race, treatment at a community center, and clinical N0 disease. The strongest predictors of CPM were younger age, white race, treatment at an integrated network cancer program, and residence in a

zip code with a higher median income.

Conclusions: This is the first study to document a reversal of trend in lumpectomy rates since 2013 with an associated decline in mastectomies. The steady increase in rates of CPM from 2005-2013 has since stabilized. While the databases differ in size and population, the trends are consistent among all three databases. The etiology of the recent reversal in trends is likely multifactorial; however, an increase in age of the breast cancer population is likely related to this change in the trends. Further qualitative and quantitative research is required to understand factors driving these recent practice changes and associated impact on patient reported outcomes.

Trends in Breast Oncologic and Reconstructive Procedures During the COVID-19 Pandemic

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Background: The Center for Medicare and Medicaid Services (CMS) proposed guidelines at the beginning of the COVID-19 pandemic that non-urgent surgeries should be undertaken on a case-by-case basis. While oncologic procedures carry a sense of urgency, breast reconstruction poses a unique dilemma as an elective component integral to the overall treatment plan. Using the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database, we aimed to assess the effect of the CMS guidelines on national trends of breast oncologic and reconstructive procedures.

Methods: The 2019-2020 ACS-NSQIP databases were used to examine breast surgery and reconstruction trends before (BC) and during (DC) COVID-19. Patients (n=59360, aged 60.3±13.0 years, 99.1% female) undergoing surgery for breast cancer or carcinoma-in-situ were identified using CPT and ICD-10 codes. DC patients were defined from the second quarter (Q2) of 2020 onward. Descriptive statistics were performed on demographic information, hospital length-of-stay, reoperation, and readmission within 30 days. Multinomial logistic regressions controlling for age, BMI, diabetes and smoking status, ASA class, and systemic disease were used to determine the effect of COVID-19 on procedure choice.

Results: Breast oncologic and reconstruction case numbers in 2020 Q2 remained similar to those in 2019 (96.6% and 95.4%, respectively) but fell in Q3 (80.7% and 82.9%) and Q4 (70.7% and 70.7%). The rate of breast-conserving surgery (BCS) and complete mastectomy (CM) did not change, nor did the rate of reconstruction (implant-based reconstruction (IBR), autologous reconstruction (AR), or mixed reconstruction) or complete mastectomy without reconstruction (CMO). There was no change in reoperation or readmission rate for any procedure.

Patients undergoing mastectomy were younger (BCS BC:63.1±11.9 years, DC:62.6±12.0 years; CM BC:57.5±13.5 years, DC:57.0±13.6 years; $p<0.01$) during COVID-19. All patients were less physically fit (ASA class 3 vs. ASA Class 2, $p<0.001$). Black or African American patients ($p<0.001$) and Hispanic/Latino patients ($p<0.01$) were more likely to have a breast oncologic or reconstructive procedure during the pandemic. While there was no change in hospital length-of-stay for BCS or CM, CMO patients (BC:1.18±3.1 days, DC:0.94±2.5 days) and patients undergoing reconstruction (BC:1.43±3.4 days, DC:1.17±1.3 days) had shorter length-of-stay ($p<0.001$).

COVID-19 was not an independent predictor of BCS vs. CM but predicted MO over AR (OR=1.133 (95% CI 1.009-1.271)) and IBR over AR (OR=1.139 (95% CI 1.015-1.279)).

Conclusion: Nationwide, the number of mastectomies and breast reconstructions related to breast cancer decreased over the COVID-19 pandemic's first year. While surgical practice remained similar, patient demographics changed: patients were younger, more likely to be Black or Hispanic/Latino, and more likely to have a higher ASA class. Patients undergoing CMO or CM with reconstruction had a shorter hospital length-of-stay with no change in reoperation or readmission rates. When controlling for demographic factors, COVID predicted CMO and IBR over AR. Overall, the data suggest that physicians are not abandoning conventional standards of care and are considering minimizing in-hospital stay during the pandemic to decrease the risk of COVID exposure to patients and health care staff.

Trends in Insurance Coverage for Adolescent Reduction Mammaplasty

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Background: Reduction mammaplasty has been shown to be an effective intervention for the physical and psychological symptoms of macromastia. Studies of insurance policy criteria for adult patients have demonstrated nonuniformity and ambiguity. The authors sought to study trends in insurance preauthorization for reduction mammaplasty in the adolescent population. Methods: This is a retrospective cohort study of patients aged 18 years and under seen at a pediatric breast clinic between January 1, 2010 and December 31, 2020. Demographic information and clinical variables submitted to insurers were analyzed, as well as third-party payer company, provider network type, and preauthorization criteria.

Results: Two-hundred forty-nine preauthorization requests were studied, with an approval rate of 79.5%. Submissions increased from 6 in 2010 to 59 in 2020. Chi-square analysis of variables deemed significantly associated with preauthorization denial included submission before 2015 (OR 2.04, 95% CI 1.04-3.95, p=.038), billing zip code median income under $60,000 (OR 2.11, 95% CI 1.12-3.98 p=.02), predicted resection mass submitted below Schnur Sliding Scale threshold (OR 1.97, 95% CI 1.01-3.83 p=.047), and insurance company. Age was not found to significantly influence preauthorization. On multivariate ordinal regression, median income under $60K (p=.041) and insurance company (p=.040) were independently associated with successful preauthorization. Most cited unmet criteria by third-party payers for denial were lack of conservative treatment (52.3%), age under 18 (34.1%), and insufficient clinical documentation of symptomology (29.5%).

Conclusions: Insurance criteria for preauthorization of reduction mammaplasty in adolescents differ from adults, are not supported by clinical studies, and may exclude low-income patients from receiving care.

Trends of Autologous Free Flap Breast Reconstruction and Safety During the COVID-19 Pandemic

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Background: Autologous free flap breast reconstruction (ABR) is a valuable surgical option for many patients following mastectomy. The COVID-19 pandemic has led to a myriad of factors that have affected access to care, hospital logistics, and post-operative outcomes. This study aims to identify differences in patient selection, hospital course and severity, and early post-operative outcomes for patients who underwent ABR in the period prior to the COVID-19 pandemic, compared to those who underwent reconstruction during the pandemic.

Methods: Patients undergoing ABR from the ACS-NSQIP 2019-2020 database were analyzed to compare baseline demographics, information regarding the hospital course, and early post-operative outcomes over the first post-operative month. Multivariable logistic regression was used to identify complication predictors based on operative year.

Results: 3,770 breast free flaps were stratified into two groups based on the timing of reconstruction (historical pre-pandemic and pandemic groups). Patients with a diagnosis of disseminated cancer and those lower ASA classification with were significantly less likely to undergo ABR during the COVID-19 pandemic ($P<0.05$). When comparing the operative time and hospital length of stay between the COVID-19 and historical groups, the COVID-19 group had significantly shorter operative times and hospital length of stay ($P < 0.01$). There were no significant differences in post-operative complications through the first post-operative month between the COVID-19 and historical group. This finding also held true on subgroup analysis of those who underwent breast free flap reconstruction during the second quarter of the year (April-June). On univariate analysis, there were no significant differences in post-operative complications between the two groups. When controlling for potentially confounding demographic and clinical risk factors, the COVID-19 group was significantly more likely to undergo unplanned reoperation compared to the historical group ($P < 0.05$). Patients with hypertension and those whose operative time or hospital length of stay was in top 25% were significantly more likely to undergo reoperation when compared to the historical group ($P <0.05$). The mean post-operative day of reoperation was 6.5 days in the COVID-19 group and 7.1 days in the historical group, which was not significantly different.

Conclusion: When comparing pre-operative patient selection, differences hospital course and severity, and post-operative outcomes between patient who underwent ABR prior to and during the COVID-19 pandemic, we found a significant increase in the odds of unplanned reoperation for those who had ABR during the pandemic. Additionally, we found that the racial and demographic inequities previously observed in ABR were not exacerbated by the pandemic, though they may still exist. Further research correlating the effects of the aforementioned changes imposed by the pandemic is necessary to elucidate any underlying factors responsible for this finding.

Understanding Disparities in Breast Reconstruction

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Introduction: Post-mastectomy breast reconstruction has been shown to improve quality of life for many breast cancer patients and is an essential component of comprehensive breast cancer care. However, despite identifying this disparity more than twenty years ago, rates of reconstruction still vary significantly between women of different racial, ethnic, and socioeconomic backgrounds. In this study, we aim to better understand breast reconstruction among patients at a single-institution by studying the [1] breast cancer to reconstruction pathway and [2] utilization of reconstruction by race/ethnicity.

Methods: A retrospective review was performed of all women who underwent mastectomy with or without reconstruction at a single National Cancer Institute designated institution during a 2-year period from 2017-2018 (n=356). Inclusion criteria included ≥3 years of follow-up and breast cancer treated with mastectomy. Patients with prophylactic mastectomies were excluded. Demographic/clinical variables and referral details were collected via medical record review. A total of 218 patients were included. Mean age was 56.1 years (range: 26-90 years). The study population was 56% White (n=122), 28% Black (n=62), 1% American Indian/Native Alaskan (n=2), and 4% Asian (n=9). Hispanic/Latino ethnicity was reported in 4% (n=8).

Results: The overall rate of breast reconstruction after mastectomy was 48%. In White patients, the rate of reconstruction was 58%, whereas it was 34% in Black patients ($p<0.001$). Type of breast reconstruction did not differ significantly between White and Black patients. Plastic surgery was discussed by the breast surgeon with 68% of patients (n=147), with lower rates of plastic surgery discussion associated with older age ($p<0.001$), need for an interpreter ($p<0.05$), and non-private insurance (Medicare $p<0.001$, Medicaid $p<0.05$). Referral to plastic surgery was made in 62% of patients (n=132), with lower rates of referral associated with older age ($p<0.001$) and non-private insurance (Medicare $p<0.001$, Medicaid $p<0.05$). Black race was not associated with lower rates of plastic surgery discussion or referral, in comparison to White race. A multivariate analysis evaluating factors associated with receipt of breast reconstruction found lower rates of reconstruction associated with Black race (OR 0.33, 95% CI 0.13, 0.79) and BMI≥35 (OR 0.14, 95% CI 0.05, 0.37). Elevated BMI did not disproportionately lower rates of breast reconstruction in Black women versus White women ($p=0.27$).

Conclusion: Plastic surgery discussion and referral to a plastic surgeon were negatively related to age, interpreter use and insurance status. Despite equal distribution of plastic surgery discussion and referral, Black women had half the breast reconstruction rates when compared to White women. While Black patients had a higher mean BMI, Black and White patients statistically were equally affected by the BMI≥35 cutoff safety parameter. Although our study did not reveal a negative BMI relationship with race, the prevalence of barriers to care are known to disproportionality affect minority populations. Our results suggest lower rates of breast reconstruction in Black women likely represents an amalgamation of barriers to care and warrants qualitative exploration within our community to better understand the racial disparity observed.

Use of Thromboprophylaxis after Autologous Breast Reconstruction: A Cost-Effective Break-Even Analysis

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Purpose: Post-operative venous thromboembolism (VTE) is a major source of morbidity and mortality for patients. However, the use of thromboprophylaxis amongst surgeons can vary greatly and have not been well-studied in autologous breast reconstruction.[1] The purpose of this study was to determine the rate of VTE in breast cancer patients undergoing autologous breast reconstruction and to perform a break-even analysis to compare the cost-effectiveness of heparin and enoxaparin for VTE prophylaxis.

Methods: The TriNetX LLC. National Health Research Network database was used to identify patients with breast cancer who underwent autologous breast reconstruction surgery between 2002-2022. The incidence of VTE within the first 30 days of surgery was then calculated. This value was utilized as the baseline VTE incidence in the break-even analysis.

A break-even analysis was performed using a modified equation developed by Hatch et al. to determine the break-even rate of VTE at which the use of heparin and enoxaparin would be cost-effective.[2] The absolute risk reduction (ARR) of heparin and enoxaparin was calculated by subtracting their respective break-even VTE rates found from the equation from the baseline incidence. A lower ARR indicated a smaller decrease that was needed from the baseline incidence rate, and thus a more cost-effective thromboprophylaxis agent.

Results: A cohort of 8,003 patients was analyzed in this study, with a mean age of 57.6 years. 55.1% did not receive thromboprophylaxis, while 28.9% received heparin, 12.4% enoxaparin, and 3.6% other anticoagulants. Total of 236 cases of VTE were observed (2.90%). The rate of VTE was significantly higher in those without anticoagulation (3.4%) compared to those who received anticoagulation (2.3%) ($p=0.0078$). Among those prophylactically anticoagulated, there was no significant difference ($p=0.91$) in VTE rates between heparin (2.4%) and enoxaparin (2.3%).

The cost of VTE treatment was estimated to be $15,000 from existing literature.[3] The costs of heparin and enoxaparin were determined from GoodRx to be $42.07 and $164.38, respectively. The presumed length of prophylactic treatment was 30 days.[1] The break-even analysis for heparin and enoxaparin's cost-effectiveness yielded ARRs of 0.28% and 1.10%, respectively.

Conclusion: The use of thromboprophylaxis significantly lowered the risk of VTE within 30

days after autologous breast reconstruction. Although both heparin and enoxaparin appear to have cost-effective potentials, heparin was more cost-effective at preventing VTE compared to enoxaparin as the VTE rate only needed to decrease by an ARR of 0.28% in comparison to 1.10% for enoxaparin. The model presented holds potential for other institution-specific variables that can be easily applied by plastic surgeons to determine the cost-effectiveness of any therapy of their choice.

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Validation Of the Caprini Risk Assessment Model for Venous Thromboembolism In Patients Undergoing Deep Inferior Epigastric Flap Breast Reconstruction

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Background: Deep inferior epigastric perforator (DIEP) flaps are commonly used for autologous breast reconstruction but reported rates of venous thromboembolism (VTE) remain high at up to 6.8%. The Caprini risk assessment model (RAM) was established as a VTE risk assessment tool that ascribed low, moderate, high, and very high risk of VTE based on patient-level and surgical factors. However, this model has not been examined for predictive value in patients undergoing autologous free flap breast reconstruction. This study aimed to test the predictive accuracy of the Caprini model for VTE events in DIEP breast reconstruction.

Methods: This retrospective study included patients who underwent unilateral or bilateral DIEP flaps for breast reconstruction between 2016 and 2020 at a tertiary-care, academic institution. Demographic and operative characteristics were recorded. Components of the Caprini score were obtained through electronic medical record review. Caprini risk categories was defined as follows: very low-low, 0-2; moderate, 3-4; high, 5-8; very high, >8. A receiver operating curve

(ROC) analysis was performed to test Caprini score against the outcome VTE. Univariate analysis tested patient-level factors for associations with VTE.

Results: In total, 524 patients underwent DIEP breast reconstruction and were included. Mean age was 51.2±9.6 years (range, 23.0-72.5), and 440 (84%) patients had BMI≥25. Median Caprini score was 5.0 (range, 2-11), with 122 (23.3%) moderate risk, 393 (75.0%) high risk, and 8 (1.5%) very high risk. DIEP surgery was bilateral in 278 (53.1%) and unilateral in 246 (46.9%) cases and was delayed in 282 (53.8%) and immediate in 242 (46.2%) cases. Mean operating time was 9.9±2.9 hours. Preoperative VTE prophylaxis comprised 207 (39.5%) subcutaneous heparin, 42 (8.0%) subcutaneous heparin and heparin infusion, 37 (7.1%) low-dose heparin drip (continuous infusion), and 15 (2.9%) enoxaparin; 223 (42.6%) patients had no preoperative VTE prophylaxis. Overall, the incidence of postoperative VTE was 2.1%. When stratified by risk categories, 1 (0.82%) of patients in the "moderate" risk category developed VTE, 7 (1.8%) of 393 patients in the "high" risk category developed VTE, and 3 (37.5%) of 8 patients in the "very high" risk category developed VTE. On univariable analysis, there were no independent variables significantly associated with VTE: age (p=0.21), BMI (p=0.84), smoking (p=0.74), aromatase inhibitor use (p=0.30), tamoxifen use (p=0.99), surgical time (p=0.35), and immediate vs. delayed reconstruction (p=0.074). Caprini score achieved an area under the curve (AUC) of 0.724 demonstrating its predictive value.

Conclusions: This is the first study to validate the Caprini RAM in DIEP flap breast reconstruction patients. The Caprini model demonstrated predictive value for VTE events, despite no independent variable being significantly associated with VTE. Although the Caprini RAM lacked discriminatory power, as the vast majority of patients within the high-risk and very-high risk categories did not result in a VTE event (99.2% and 98.2%, respectively), these results show that the Caprini score does provide a tool for personalized risk stratification prior to DIEP breast reconstruction, with potential implications for intensification of chemoprophylaxis in higher-risk patients.

Craniomaxillofacial Abstracts

Cleft Surgery Workforce in Bolivia

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Introduction: The significant contribution of orofacial clefts to DALYs can be averted with timely interventions by cleft surgeons. Cleft lip and/or palate (CLP) prevalence varies between 1-in-1000 live births in high-income countries and 1-in-730 in LMICs. The highest prevalence of cleft disease is reported in Bolivia, of up to 1-in-373 in certain regions1. The burden of cleft disease is amplified by the fact that there are only 120 plastic surgeons and 10 cleft specialists in Bolivia, all internationally trained due to the lack of a Bolivian program.

Aim: To elucidate the current cleft surgeon workforce in Bolivia and identify future candidates for cleft surgery training.

Methods: An electronic survey was distributed to plastic surgeons that are part of the Bolivian Society of Plastic Surgeons (BSPS). Investigated variables included: ability to perform cleft surgery, training program, cleft surgical volume, and interest in additional cleft surgery training. Data were quantified and analyzed.

Results: The survey was sent to 83 BSPS-accredited plastic surgeons. 36 responded and 61% responded having more than 10 years of practice. Surgeons were trained in Mexico (12), Argentina (11), Brazil (10), Colombia (2) and Italy (1). 75% achieved cleft surgery competency during residency, but only 35% is practicing it currently. Between the ones that do practice, 36% do it in a private setting, 50% at public facilities, and 54% additionally operate at non-profit surgical missions. The NGO with the most affiliated surgeons is Operation Smile Bolivia. 28 surgeons showed interest in pursuing additional cleft training.

Conclusions: A significant burden of unmet care for CLP currently exists in Bolivia due to a disproportionately high prevalence and deficit in cleft-trained surgical providers. Strategic solutions addressing the lack of Bolivian training programs, high training costs, and insufficient surgical mentors will significantly help overcome this deficit in care.

The Prevalence, Risk of Premature Births, Mortality and Causes of Death of Cleft Lip With or Without Palate in South Korea: a Nationwide Population-Based Cohort Study

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Background: Very few recent nationwide studies have assessed the epidemiology of cleft lip with or without palate (CL/P). The purpose of this study was to identify the prevalence, risk of premature births, mortality, and cause of death of CL/P.

Methods: This nationwide population-based cohort study evaluated all 5,747,830 live births in South Korea, including CL/P infants, from 2006 to 2018. The prevalence with trend analysis

with Poisson regression, risk of premature births with logistic regression, mortality with Cox hazards model and standard mortality ratios, and cause of death of CL/P with or without associated syndromes (non-syndromic, syndromic CL/P) and subgroups (cleft lip only, cleft palate only, cleft lip with palate) were evaluated.

Results: Among 5,747,830 live births, 11,284 children were identified as having CL/P during the study period. The annual prevalence was 1.96 per 1000 births, which is one of the highest worldwide. The overall worldwide rate of cleft lip with or without cleft palate was 0.79 (95% CI, 0.79–0.80) per 1000 births [1]. Specifically, Japan (1.91), Mexico (1.37) and Norway (1.27) had the highest rates and Cuba (0.38), Spain (0.38) and South Africa (0.31) had the lowest rates per 1000 births, respectively [1]. The prevalence of CL/P showed an upward trend in both non-syndromic and syndromic CL/P during 2006–2018 (overall 2.07%, non-syndromic 1.65%, syndromic 3.53%). Both non-syndromic and syndromic CL/P children had higher risk of premature births compared with children without CL/P (odds ratio: non-syndromic 1.43, syndromic 5.29). The mortality rates per 1000 person-years were 0.39 for children without CL/P, 0.98 for non-syndromic CL/P children and 12.20 for syndromic CL/P children. The causes of deaths were not different for children without CL/P in non-syndromic CL/P, but the most common cause of deaths was cardiovascular anomalies in syndromic CL/P.

Conclusion: The reported prevalence of 1.96 per 1000 births is one of the highest prevalence worldwide. Both non-syndromic and syndromic CL/P infants had higher risks of premature births. Both non-syndromic and syndromic CL/P children had higher risks of mortality, especially at ages 1–4 years. The most common cause of deaths was cardiovascular anomalies.

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A Systematic Review and Critical Appraisal of Cleft Lip and Palate Disability Valuation

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Purpose: An unrepaired or inadequately repaired cleft lip or palate (CLP) can be highly disabling functionally and socially. Quantifying this disability often relies on disability weights (DWs) and Disability-Adjusted Life Years (DALYs) to assess burden of disease (BoD) and appropriately allocate healthcare resources. However, it is not clear that DWs are well-established for CLP, nor the degree to which treatment alleviates such disability. This study aims to systematically review the studies describing disability health valuation metrics for CLP and identify methodological variation and knowledge gaps.

Materials and Methods: A systematic search strategy was developed with a licensed librarian to query all manuscripts describing quantification of cleft disability, especially as it relates to DALYs and DWs. A PubMed Revised Strategy using terms encompassing cleft lip and/or palate was executed. English language papers between 2001-2021 were included. Covidence systematic review manager was used by two independent reviewers to screen abstracts and full texts.

Results: The systematic search yielded 1,067 studies, of which 7 were included; the most common reason for exclusion was lack of mention of cleft disability. Three studies calculated DALYs using the traditional equation of DALY = Years of Life Lost (YLL) + Years Lived with Disability (YLD). One study suggested an alternate integral equation for DALY calculated, one study offered an alternate methodology for calculating DWs, using paired comparison scores, and two studies presented non-DALY measures of disability (International Classification of Functioning, Disability, and Health-Children and Youth Version; BoD = incident met need + prevalent need + unmet incident need + unmet prevalent need + unmeetable need). The most common sources for DWs were the Global Burden of Disease (GBD) 2010 (n=2), 2016 (n = 1), and 2017 (n=1) studies ("GBD"). The most recent 2019 GBD DW calculation only accounted for CLP-associated social stigma and speech difficulties. Another study calculated DWs for pediatric surgical conditions using experts and laypeople to derive mean time trade off values ("pediatric surgical.") DWs ranged widely for isolated cleft lip (0.0-0.245) and cleft palate with or without cleft lip (0.0-0.372.) Average DWs were greater for both cleft lip (0.245) and palate (0.372) using the "pediatric surgical" method, compared to the "GBD" method (0.07 and 0.12, respectively.) No means of assessing disability-alleviation by standard cleft treatments were identified.

Conclusions: Although disability is a critical concept for potentially debilitating conditions such as CLP, estimation methodologies of CLP disability and BoD are wide-ranging and poorly defined. Disability valuation is dominated by GBD methodologies; however, newer pediatric-specific metrics appear to better incorporate more comprehensive manifestations of CLP-associated disability.

Decreasing the Burden of Care on Patients with Cleft Lip Nasal Deformities Using Early Cleft Lip Repair

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Background & Purpose: Cleft lip nasal deformities are one of the most common congenital anomalies in the United States with recent lifetime cost estimates totaling $101,000 per new diagnosis. Early cleft lip repair (ECLR) (1-3 months of age) for unilateral cleft lip (UCL) has been the mainstay of cleft lip reconstruction at our institution for the past 6 years. Prior to the introduction of ECLR, traditional lip repair (TLR) was performed at 3-6 months of age with or without adjunctive nasoalveolar molding (NAM). This study aims to determine if ECLR is advantageous for reducing the need for cleft lip nasal revisions as the child ages.

Method/Description: This is an IRB-approved, retrospective review performed on all patients with UCL nasal deformities ± palate who were non-syndromic and received cleft lip nasal repair by two senior attending surgeons from 2009 to 2021. Clinical and operative reports were examined for demographic and perioperative information. Three-dimensional photographs were reviewed by both senior attending surgeons and an independent distinguished professor in cleft surgery. Hospital and physician costs were determined using CPT codes for major and minor cleft lip revisions to estimate the burden of care.

Results: A total of 111 patients with UCL nasal deformities ± palate underwent TLR and 111 patients underwent ECLR. The average follow-up time was 64 months for the TLR cohort and 34 months for the ECLR cohort. The actual revision rate for TLR, including patients who were recommended revision but did not proceed to surgery was 31.5%; the major and minor revision rate in this cohort was 6.3% and 25.2%, respectively. The recommended revision rate in ECLR was 10.8%, with a major revision rate of 1.8% and a minor revision rate of 9.0%. The average age at revision surgery was 3.6-years-old in both ECLR and TLR. Excluding patients with follow-up less than 36 months, the TLR cohort (n=73) revision rate was 42.5% and 28.3% in the ECLR cohort (n=46). On average, revision surgery for the ECLR cohort was $32,188 versus $28,047 in the TLR cohort. Our previous analysis has shown that NAM care costs on average $2,132 in lost income per family and $12,290 in direct costs for the hospital, physician, and device. Including NAM care costs into the TLR cohort, the fully burdened cost of the TLR cohort is $42,469 per patient.

Conclusions: Examining patients with follow-up greater than 36 months, there is a 33.4% relative reduction in total revisions when comparing TLR to ECLR. When evaluating the overall, fully burdened care of TLR to ECLR, this reduction represents a cost savings of $894,012 per 100 patients, which can be redirected into the health care system. This not only represents massive savings in healthcare costs but also translates into an overall decreased surgical burden for the patient and family.

A Murine Calvarial Defect Model for the Investigation of the Osteogenic Potential of Umbilical Cord Stem Cells in Alveolar Cleft Repair

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Background/Purpose: Cleft lip and/or palate (CLP) is one of the most common congenital anomalies and is frequently associated with an alveolar cleft. At many institutions, the standard graft material of alveolar cleft repair (ACR) is autogenous iliac crest bone; however, bone-morphogenetic-protein 2 has shown to be a viable alternative with similar success rates. An alternative potential graft adjunct, umbilical cord stem cells (UCSC), has yet to be explored in vivo. There is ample pre-clinical literature supporting the utility and advantages of UCSC in ACR. Their capacity for self-renewal, pluripotent differentiation, and proliferation allows UCSC to be harnessed for regenerative medicine. Our study seeks to evaluate the feasibility of using UCSC and their osteogenic and regenerative capabilities in a mouse model to improve ACR.

Methods: Sixteen FoxN1 mice were included in the study, which were separated into three groups: (1) calvarial defect surgery and no treatment (n=6), (2) calvarial defect surgery with poly(D,L-lactide-co-glycolide) (PLGA) treatment (n=6), (3) calvarial defect surgery with UCSC mixed with PLGA (n=4). Calvarial defect surgeries consisted of a sagittal skin incision followed by creation of 2 mm diameter, full-thickness, parietal bone defects using a 1.8 mm dental drill; of note, 2 mm is the established critical size defect of murine calvarial bone. The mice underwent microCT imaging at 1-, 2-, 3-, and 4-weeks postoperatively. At 2-weeks postoperatively, one mouse from each group was sacrificed for histologic analysis. At 4-weeks postoperatively, the remaining mice were then sacrificed for histologic examination.

Results: All 18 mice underwent calvarial defect surgeries without postoperative complications or infections. All mice were fully ambulatory with no signs of neurologic deficits throughout the 4-week follow-up period. As evidenced by microCT imaging, at 1-, 2-, 3, and, 4-weeks postoperatively, all calvarial defects in groups (1) and (2) remained patent without significant differences in defect sizes between the two groups. Histologically, group (1) and (2) defects demonstrated patency without significant size differences at both 2- or- 4 weeks postoperatively. In contrast, the UCSC group (3) had significantly greater bone fill in the defects at each of the postoperative time points on microCT imaging and demonstrated a lack of patency histologically at final follow-up.

Conclusions: These results demonstrate a successful calvarial defect murine model for the investigation of UCSC-mediated osteogenesis and bone repair. Further, our findings provide evidence that PLGA alone has no short-term effect on bone formation nor any unwanted side effects, making it an attractive vehicle for graft substitutes. Further investigation using this UCSC and PLGA scaffold combination in a larger animal porcine model is warranted in hopes of future translation to ACR in patients with CLP.

Botulinum Toxin to Improve Scar Quality in Cleft Lip Repair: A Systematic Review

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Objective: Cleft lip is the most common craniofacial malformation. Cheiloplasty, or cleft lip repair/reconstruction (CLR), often performed between 3 to 6 months of age, can be complicated by hypertrophic or keloid scars. Botulinum toxin injection may improve postoperative scarring by reducing muscle tension of the lower face and lip. This review aims to analyze the available evidence regarding the effect of Botulinum toxin on scar quality after CLR.

Design: A systematic review of original English, Spanish, and Portuguese articles was conducted in accordance with PRISMA guidelines. The keywords "botulinum toxin" and "cleft lip" were searched on PubMed, Scielo, Embase, Scopus, Web of Science, and Cochrane databases. Systematic reviews, letters, duplicated articles, and articles with insufficient data were excluded. Extracted data included study type, cohort size, demographics, surgical technique, time and location of botulinum toxin injection, dosage, mean visual analog scores (VAS), mean Vancouver scar scale (VSS), scar width, and botulinum toxin or CLR-related complications.

Results: A total of 1924 studies were identified, of which 979 were unique. Following abstract review, 17 articles were included for full manuscript review. A total of 7 studies with 232 patients (84 control, 148 intervention) met inclusion criteria. Six studies reported on primary CLR during infancy while a single study recruited older patients seeking revision. While ethnicity was not directly reported, 6 studies were from Asian or Latinx nations. For primary

CLR, the mean age at surgical intervention ranged from 3.13 months to 8.91 months in the intervention group, and 3.17 to 7.0 months in the control group. For revision CLR, the mean age at surgical intervention was 24.70 years old in the intervention group, and 21.78 years old in the control group. All patients had botulinum toxin (range: 1-2 units/kg) injected in the orbicularis oris muscle, with additional injections in other perioral muscles documented in 1 study. Most studies reported intraoperative or immediate postoperative botulinum toxin injections (n=5, 71.43%), whereas the remaining 2 studies described preoperative injection at 7-10 days prior to surgery. The Millard modified-rotation advancement CLR was the most common technique. Scar assessment was inconsistent and variable, with 71.4% of studies documenting decreased scar width and 57.1% describing improved scar quality with injection of botulinum toxin. There were no reports of complications associated with botulinum toxin injection or surgery.

Conclusion: Early yet inconsistently documented evidence suggests that botulinum toxin injection may improve scarring following CLR with low concern for complication. The limited available data underscores the need for further studies to evaluate the benefits of botulinum toxin injection after CLR.

Travel Burden to American Cleft Palate Association (ACPA)-Approved Cleft Teams in the United States

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Background: Multidisciplinary team-based care provides comprehensive, long-term treatment for children with orofacial clefts (OFC). American Cleft Palate and Craniofacial Association (ACPA)-certified "Cleft Teams" meet stringent standards to gain and maintain ACPA approval. Despite 179 ACPA-approved Cleft Teams in the U.S., access to cleft-care may still be a challenge for patients from rural areas, thus leading to potential disparities in care. This study aimed to investigate the geospatial relationship between counties across the U.S. and their geographically closest ACPA-approved cleft centers.

Method: The geographic location of all ACPA-approved cleft centers in the U.S. was identified. The distance between individual counties in the U.S. (n=3,142) and the closest ACPA-approved cleft team was determined. Counties were sorted by live births per 1,000 women from 2016 to 2020, then filtered to those counties that were at least 100 miles to the nearest ACPA-approved cleft team. These counties were illustrated on a map to demonstrate the geographic location of counties with the highest birth rates and >100 miles to travel to an ACPA-approved team.

The live birth rate in counties for whom each ACPA-approved cleft team was closest was

tabulated, representing the number of live births per nearest cleft team. The average distance that a patient would have to travel from the county to reach the ACPA-approved cleft team was calculated and averaged.

Finally, the percent of live births who would have to travel over 100 miles to reach the nearest ACPA-approved cleft team was calculated per each ACPA-approved cleft team. This represents what percent of a given patient base is likely to travel a long distance to reach care at that institution.

Results: There are 179 ACPA-approved cleft teams in the US. 29% of all counties in the US had access to an ACPA-approved center >100 miles away (n=912). The counties with the highest birth rate and >100 miles to travel to an ACPA team are in the Mountain West part of the US. The ACPA cleft centers caring for the largest number of patients with the farthest to travel are in the Pacific Northwest. The mean poverty rate in counties >100 miles to travel to the nearest ACPA-approved center was 162.4% higher than the national average of 732 per 1,000 people in any given county.

Conclusions: Patients and their cleft teams are likely to face more challenges in delivering quality cleft care when the institution serves many patients who travel significant distances. These institutions may have much to learn from each other, as their patients face unique challenges of driving long distances for multiple appointments, potentially staying overnight in unfamiliar regions, and being unable to engage in consistent care at the institution. Challenges are likely magnified by limited financial resources and the increased caregiver burden experienced by these patients.

Clinical Outcomes of Bilateral Cleft Lip and Palate Repair with Nasoalveolar Molding from Birth to Facial Maturity

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Background: Accredited cleft centers are increasingly utilizing nasoalveolar molding (NAM) amidst evidence suggesting favorable clinical outcomes in patients with unilateral cleft lip and palate. The impact of NAM on patients with bilateral cleft lip and palate (BCLP) at facial

maturity remains largely unknown. We evaluate one of the largest reported cohorts of facially mature patients with complete BCLP to evaluate the effects of NAM on clinical outcomes, including facial growth.

Methods: A single-institution retrospective study of non-syndromic patients with complete BCLP who underwent NAM between 1991-2000 was performed. The cleft protocol at our institution includes NAM initiated within the first few weeks of life, cleft lip repair with primary rhinoplasty and gingivoperiosteoplasty (GPP) at 3-5 months of age, and cleft palate repair between 10-12 months of age. All study patients were followed from birth to facial maturity, with recorded variables including incidence of alveolar bone grafting (ABG), speech surgery, revisions to the lip and nose, fistula repair, and orthognathic surgery. Lateral cephalogram was performed at facial maturity prior to orthognathic surgery. Mann-Whitney U tests were used to evaluate comparative frequency of total cleft procedures and cephalometric parameters (SNA, position of maxilla; SNB, position of mandible; ANB, relationship between maxilla and mandible) with a previously published external cohort of patients with BCLP in which a minority (16.7%) underwent presurgical orthopedics prior to cleft lip repair without GPP (1).

Results: Twenty-four patients (16 male, 8 female) with BCLP comprised the study cohort. All patients underwent GPP, 13 (54.2%) underwent ABG, and 9 (37.5%) required speech surgery. The average number of procedures per patient was 5.25 [standard deviation (SD) 1.70], compared to 8.47 (SD 1.78) in the published cohort ($p<0.001$). Average age at the time of lateral cephalogram was 18.64 (1.92) years. There was no significant difference between our cohort and the published cohort with respect to SNA [73.23 (5.32) degrees vs. 75.37 (6.40) degrees, $p=0.346$] or SNB [76.59 (5.03) degrees vs. 75.68 (6.14) degrees, $p=0.448$]. Average ANB was -3.34 (3.60) degrees compared to -0.32 (4.10) degrees ($p=0.023$). Twenty patients (83.3%) underwent orthognathic surgery.

Conclusions: Patients with BCLP who underwent NAM and GPP can have significantly fewer total cleft procedures and comparable midface growth at facial maturity compared to patients who did not undergo this treatment protocol.

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US Air Pollution is Associated with Increased Incidence of Cleft Lip/Palate—a CDC Vital Statistics Investigation

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Introduction: Air pollution has negative health effects in the adult population. With rising pollution levels, further investigation is needed to determine the effects of air pollutants on fetal health and birth outcomes. Given that maternal cigarette use increases the risk for non-syndromic orofacial clefts, air pollutants should be investigated for a similar relationship. (1) We hypothesized that incidence of cleft lip with or without palate (CLP) will be positively correlated with levels of air pollution within the US.

Methods: The incidence of non-syndromic CLP per 1000 live births from 2016 to 2020 was extracted from the Centers for Disease Control (CDC) Vital Statistics Wonder Database and merged with national reports on air pollution using the Environmental Protection Agency (EPA) Air Quality Systems (AQS) annual data. Inclusion criteria included patients born with CLP, exclusion criteria included known genetic syndrome and maternal cigarette use. Pollutants analyzed include benzene, sulfur dioxide (SO2), Particulate Matter (PM) 2.5, PM 10, Ozone, and carbon monoxide (CO). Birth records were reported at the county level. Generalized linear models with log link and gamma distribution modeled the incidence of CLP as a function of the 6 pollutant covariates. 95% confidence intervals and p-values were calculated.

Results: The median CLP incidence was 0.25/1000 births, interquartile range 0.19, 0.52. PM10 had a coefficient estimate (CE) of 0.06 with 95% CI [0.02, 0.1] and PM2.5 had a CE of 0.23 with 95% CI [0.11, 0.36]. Thus, PM 10 and PM 2.5 were significantly correlated with increased CLP incidence (p-value = 0.0024, p-value = 0.0008, respectively). Other pollutants were not found to be statistically significant and included: benzene with a coefficient estimate (CE) of –0.001 with 95% CI [-0.002, 0.003], CO CE = 1.06 with 95% CI [-2.81, 4.64], Ozone CE = 15.3 with 95% CI [-40.06, 69.29], and Sulfur CE = -0.001 with 95% CI [-0.65, 0.71].

Conclusion: Among the 6 air pollutants assessed PM 10 and PM 2.5 were significantly correlated with increased CLP incidence. Both pollutants are inhaled and deposited in maternal lungs. PM 2.5 has an increased ability to pass from the lungs to the fetus via blood supply due to its smaller size. (2) Both PM 10 and 2.5 are produced by emissions from gasoline use, oil, diesel fuel, and combustion of wood. In addition, PM 10 is generated from construction, landfills and agriculture, wildfires, and industrial pollution. (3)

This is the first study to evaluate and establish a correlation between air pollution and non-syndromic CLP on a national scale. With 70-75% of clefts being non-syndromic, this can inform policy change and preventative measures in communities with disproportionally elevated non-syndromic CLP and air pollutant levels. (4,5) Future directions of this study include investigation

of the link between area deprivation index and the likelihood for increasing levels for PM 10 and PM 2.5. This will allow an investigation into the inequities in exposure and access to craniofacial care.

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Reconstruction of Post-Ablative Defects of the Mandible in Pediatric Patients Using Vascularized and Non-Vascularized Fibula: A Single-Center Retrospective Review

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Background & Purpose: Post-ablative defects of the mandible following resection of craniofacial tumors are challenging to reconstruct given the functional importance of the bone. Among reconstructive modalities, non-vascularized and vascularized fibula are frequently used when reconstructing small and large defects, respectively. Presently, there is a paucity of data detailing reconstructive and functional outcomes following oncoplastic mandibular reconstruction in the pediatric population because of the low incidence of craniofacial tumors in this patient demographic. The purpose of this study is to assess the efficacy of both reconstructive modalities for oncoplastic mandibular reconstruction in children and adolescents.

Methods: A retrospective chart review of all pediatric patients who underwent reconstruction of post-ablative defects of the mandible by our institution's multidisciplinary head & neck tumor

team from March 2015 to January 2022 was performed. Defects were characterized based on the mandibular subunits that were involved with the resection. Variables analyzed included patient demographics, tumor characteristics, instances of neoadjuvant or adjuvant chemotherapy or radiotherapy, defect characteristics, and reconstructive modalities performed. Recipient- and donor-site complications along with each patient's postoperative swallow assessments were also collected.

Results: A total of 11 patients with a mean age and follow-up of 116.5 and 28.6 months, respectively, were included in our study. Three patients (27.3%) underwent a complete hemimandibulectomy, 5 patients (45.5%) underwent a subtotal hemimandibulectomy with sparing of the condyle, 2 patients (18.2%) underwent a subtotal hemimandibulectomy with incomplete resection of the body distally, and 1 patient (9.1%) underwent a subtotal hemimandibulectomy with sparing of the body and condyle proximal to the sigmoid notch. Bony reconstruction was performed using an osseous fibular free flap (OFFF) in 10 patients (90.1%). One patient (9.1%) with a post-ablative defect localized to the angle, ramus, and distal condyle underwent reconstruction with a non-vascularized fibular bone graft. Of patients who underwent reconstruction with an OFFF, 2 patients developed a hematoma at the recipient site requiring evacuation, and 2 patients experienced flap failure with 1 being due to recurrence of a desmoid tumor which subsequently invaded the neomandible. At the donor site of patients reconstructed with an OFFF, 2 patients developed regional paresthesia, and 1 patient experienced wound dehiscence. No complications were observed in the patient who underwent mandibular reconstruction with a non-vascularized fibular bone graft. Dental reconstruction using osseointegrated dental implants was performed in 2 patients (18.2%), with 1 patient having implants placed at the time of mandibular reconstruction with an OFFF. All patients achieved satisfactory swallow outcomes following surgery and demonstrated no challenges when consuming food on the unaffected side of the mandible.

Conclusion: Mandibular reconstruction using vascularized and non-vascularized fibula is highly reliable and is able to provide excellent functional outcomes in pediatric patients. While our findings are promising, more studies with larger sample sizes are needed to definitively determine the efficacy of vascularized and non-vascularized fibula for mandibular reconstruction and to elucidate the effect of condylar resection on reconstructive outcomes.

Predicting Postoperative Globe Malposition by Orbital Volume in Patients Treated with Iliac Crest Bone Graft in Isolated Blowout Fracture: What to Expect?

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Purpose: Post-traumatic globe malposition is often observed following orbital blowout fractures and may demand secondary procedures to correct the deformity. Measurement of orbital volume and its relationship with postoperative globe malposition has been an area of debate. In this study, we analyze the correlation of post-operative globe malposition with fractured area and orbital volumes measured by computed tomography (CT) scans and evaluate the need for

additional procedures at the time of repair.

Methods: The methodology used was an institutional retrospective analysis with a sample size of 25 patients at Sawai Man Singh Hospital, Jaipur during the years 2018-2020. The patients were analyzed on the 30th postoperative day and pre and post-operative orbital CT scans were assessed. The next follow-up was done at 6 months to inspect for clinical abnormalities.

Results: GMP was observed in 7/25 (28%) patients. It was observed more commonly in fractures >2.5cm2 (41.6%, p=0.007) and in fractures with pre-operative fracture volume >2.5ml (100%, p=0.01) regardless of correction in the operative volume. (p=0.262)

Conclusions: To treat blowout fractures without significant postoperative globe malposition, we must understand the need for restoring infraorbital contents. CT orbit is misleading when it comes to assessing results of orbital floor repair using bone grafts and therefore one needs to rely on clinical assessment intraoperatively or follow up with the patient to treat the deformity secondarily. Globe malposition could be best prevented by restoring and replacing orbital contents with autologous tissue along with bone graft at the time of repair.

A Comparative Photogrammetric Analysis of Soft Tissue Changes following Midface Surgery: LeFort III vs Monobloc Frontofacial Advancement

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Introduction: Patients with syndromic craniosynostosis reap aesthetic and functional benefits from surgical advancement of the midface and forehead. Based on the severity of the deformity and functional needs, surgeons may select monobloc frontofacial advancement to simultaneously advance the forehead and midface, or a staged approach with fronto-orbital advancement to address the anterior cranial vault followed by LeFort III for midface advancement. Both procedures have proven efficacy for skeletal changes; however, their effect on soft tissues has not been quantified. The aim of this study was to perform a quantitative photogrammetric comparison of the soft tissue changes achieved with monobloc and LeFort III midface advancements.

Methods: Patients undergoing LeFort III and monobloc advancements at our institution with frontal and lateral pre- and postoperative clinical photography were included in this retrospective study. ImageJ was used to measure soft tissue anatomy in pixels, including nasal length and width, intercanthal distance, and palpebral fissure height and width, among others. To account for differences in photographic magnification, ratios were established by dividing soft tissue anatomic measurements in pixels by facial height or width in pixels. Facial convexity was quantified by calculating the angle between sellion (radix), subnasale, and pogonion on lateral photographs. Canthal tilt was determined by calculating the angle between 1) a line passing through the lateral and medial canthi and 2) a line adjacent to the inferior palpebra and parallel to the nasal ala. Pre- and postoperative changes were compared between the procedural groups with Mann Whitney U tests.

Results: Forty-three patients (eighteen Crouzon, ten Pfeiffer, ten Apert, five other) undergoing monobloc (n = 13) and Le Fort III or Le Fort II with zygomatic repositioning (n = 30) were analyzed preoperatively and 10.8 ± 5.5 months postoperatively. Patients undergoing Le Fort procedures achieved significantly greater changes in facial convexity (27.2°) compared to patients undergoing monobloc procedures (13.9°) ($p = 0.011$). Patients undergoing Le Fort procedures achieved superior canthal tilt symmetry (0.1% increase in symmetry) compared to those undergoing monobloc procedures (1.9% decrease in symmetry) ($p = 0.037$). Patients demonstrated comparable changes in other soft tissue anatomy (all $p > 0.05$).

Conclusions: Both subcranial LeFort and monobloc frontofacial advancements resulted in quantifiable soft tissue changes, with patients undergoing.

Predictors of Reoperation for Head Shape Relapse and Increased Intracranial Pressure Following Spring Mediated Cranioplasty for Non-Syndromic Sagittal Craniosynostosis

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Introduction: Spring mediated cranioplasty (SMC) has been adopted as our institution's preferred method of treating non-syndromic sagittal craniosynostosis following favorable

evidence for safe peri- and post-operative outcomes and long-term durability for correcting scaphocephalic head shape. Certain variables are known to impact outcomes following SMC including springs parameters, skull thickness, and age at surgery; however, predictors of reoperation are poorly understood. This study aimed to determine factors predicting reoperation for head shape relapse or concern for increased intracranial pressure in patients undergoing SMC for non-syndromic sagittal craniosynostosis.

Methods: Patients undergoing SMC for non-syndromic sagittal craniosynostosis between 2008 and 2021 at our institution were retrospectively reviewed. The force in Newtons (N) of each spring was measured by a tensiometer set at 1.5 cm to simulate the dimensions of the strip craniectomy. Spring length was measured from the footplate to "U"-bend of the spring. Parietal bone thickness was determined from patient preoperative CTs using Materialise Mimics v23 (Materalise, Ghent, Belgium). Data were analyzed with Mann Whitney U tests, student's t-tests, and logistic regression models.

Results: One hundred and twenty-four patients received SMC for non-syndromic sagittal craniosynostosis, and five patients (4.0%) underwent reoperation for head shape relapse or concern for increased intracranial pressure. Two patients (40.0%) underwent fronto-orbital advancement, two patients (40.0%) underwent posterior vault remodeling, and one patient (20.0%) underwent posterior vault distraction osteogenesis.

Four patients (80.0%) undergoing reoperation were male, comparable to the total cohort of 75.0% males ($p = 0.793$). Patients in both cohorts had nearly identical preoperative cephalic indices of 0.69 ($p = 0.958$). Patients requiring reoperation underwent initial surgery at comparable ages (3.4 ± 0.7 months vs 3.6 ± 0.9 months, $p = 0.407$).

Patients undergoing reoperation had significantly shorter anterior spring length (46.4 ± 9.1 mm vs 54.5 ± 8.4 mm, $p = 0.041$) and significantly higher anterior spring force (10.2 ± 1.3 N vs 8.9 ± 1.4 N, $p = 0.038$). Longer anterior spring length was independently protective against need for reoperation (OR: 0.87, $p = 0.047$), while stronger anterior spring force independently predicted the need for reoperation (OR: 2.09, $p = 0.050$). Patients who underwent reoperation had similar middle and posterior springs parameters ($p > 0.05$).

Mean parietal bone thickness was greater in patients undergoing reoperation (2.53 ± 0.99 mm vs 1.82 ± 0.36 mm, $p = 0.002$). On logistic regression models, mean parietal bone thickness independently predicted need for reoperation (OR: 12.8, $p = 0.034$).

Conclusions: Reoperation for head shape relapse and increased intracranial pressure following SMC in patients with non-syndromic sagittal craniosynostosis was associated with anterior spring parameters and parietal bone thickness, while sex, age at surgery, and preoperative CI were non-associative. Increased anterior spring length was protective against need for reoperation, which may be attributed to increased cranial expansion afforded by greater suture patency of the anterior cranial vault. Although statistical significance was achieved, results should be interpreted in the context of a small cohort of patients undergoing reoperation at a single institution.

Suture Fusion, Cephalic Index, and Head Shape in Non-Syndromic Sagittal Craniosynostosis

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Introduction: Sagittal craniosynostosis may present with complete or partial fusion of the sagittal suture.1 Previous studies describe high heterogeneity of phenotypic presentation for non-syndromic sagittal craniosynostosis in absence of particularly compelling evidence explaining such heterogeneity.1 One postulation for variation in head shape at presentation is degree and location of suture fusion; however, relationships between extent of sagittal suture fusion and head shape are currently poorly described.1 The aim of this study was to characterize the degree of sagittal suture fusion in a cohort of patients with non-syndromic sagittal craniosynostosis and determine associations with CI and head shape, including frontal bossing and occipital bulleting.

Methods: Patients with non-syndromic sagittal craniosynostosis at a tertiary care center with available CT imaging between 2014 and 2021 were retrospectively included in this study. Three-dimensional CT head images were imported into Materialise Mimics and parietal bones were manually isolated. The "measure" tool was used to measure the distance of fused suture. The percentage of total sagittal suture fusion was quantified by dividing the distance of fused suture by the total length of the sagittal suture. Similar calculations were performed for anterior and posterior halves, and anterior, middle, and posterior thirds. Degree of sagittal suture fusion was compared to head shape characteristics, including cephalic index (CI), frontal bossing, and occipital bulleting, with Mann-Whitney U tests, Spearman's correlations, and univariate and multivariate linear and logistic regression models.

Results: Ninety patients (69 male) were included in this retrospective study. The sagittal suture was on average 85.6 ± 20.1% fused, and 45 (50.0%) patients demonstrated complete fusion of the sagittal suture. CI was associated with increased degree of fusion for the anterior one-half ($\rho = 0.26$, $p = 0.033$) and anterior one-third ($\rho = 0.30$, $p = 0.012$) of the sagittal suture. Complete fusion of the anterior one-third of the sagittal suture predicted higher CI ($\beta = 13.86$, $SE = 6.99$, $z = -0.25$, $p = 0.047$). Logistic regression models revealed percentage of middle one-third sagittal suture fusion predicted the presence of frontal bossing ($\beta = 2.42$, $SE = 0.96$, $z = 2.53$, $p = 0.012$). Total degree of sagittal suture fusion was not predictive of CI or head shape in any analysis (all p

> 0.05).

Conclusions: Percentage of total sagittal suture fusion was not associated with CI or head shape in patients with non-syndromic sagittal craniosynostosis in this cohort. Decreased fusion of the anterior one-third of the sagittal suture was paradoxically associated with higher CI and more severe scaphocephalic head shape. These findings raise additional questions regarding suture fusion and head-shape morphology, and further research is needed to substantiate these results in patients with non-syndromic sagittal craniosynostosis. These findings may have implications for understanding suture fusion patterns in other variations of craniosynostosis.

References:
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Sickle Cell Disease Association with Premature Suture Fusion In Young Children
Presented During:

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Purpose: Sickle cell disease (SCD) results from a point mutation in the beta-globin chain of hemoglobin which leads to the formation of an atypical hemoglobin tetramer that has an abnormal and reduced capacity to carry oxygen. Although skeletal alterations such as bone infarction and marrow hyperplasia have been described in patients with SCD, craniosynostosis (CS) secondary to SCD has only been briefly mentioned in the literature. This paper aims to determine the prevalence of CS in a cohort of children with SCD, and identify any potential variables correlated with the development of CS in this specific population

Methods: We retrospectively reviewed head CT scans of SCD patients from 0-8 years of age who required a CT for issues unrelated to their head shape between 2012 and 2020. We excluded patients with known history of CS or any CS related syndrome, hydrocephalus, shunt placement, history of cranial surgery, or any reported cerebral or cranial shape abnormality. Patient demographics, family history of neurodevelopmental disease, SCD or sickle cell trait (SCT), chronic use of hydroxyurea, penicillin or folic acid, past medical history of blood transfusions,

age at the time of CT scan, and radiologist report, were recorded as covariates. The demographic and clinical variables were compared between patients with (+CS) and without (-CS) evidence of craniosynostosis. To explore the possible association between these variables and the development of CS, we performed an adjusted analysis using a multivariable Firth logistic regression model.

Results: 94 CT scans were analyzed. The mean age at imaging was 4.48 ± 2.30 years. CS prevalence in this cohort was 19.1%. CS was documented by the radiologist in only 1 (5.6%) patient, and none of the patients had a cranial index value below 0.7. Adjusted analysis between independent variables and patients with +CS showed that the odds of developing CS was eight times higher in patients with SCD associated vasculopathy (odds ratio: 8.2, 95% CI: 1.4 – 51.8, P=0.019) and almost fourteen times higher in patients who had a first-degree relative with SCD (odds ratio: 13.6, 95% CI: 2.9-85.4, P=0.002). Patients who received folic acid medication had seven times higher risk of developing CS.

Conclusion: Approximately 20% of pediatric patients with SCD developed CS. This association was higher is those patients with a family history of SCD, used folic acid, and had SCD associated vasculopathy. While the clinical impact of these findings needs more extensive study, centers that manage patients with SCD should be aware of the relatively high concordance of these diagnoses, vigilantly monitor head shape and growth parameters, and understand the potential risks associated with unidentified or untreated CS.

Clinical Utilization Outcomes in Pediatric Facial Burn Injuries

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Purpose: Burn injury is a major contributor to pediatric morbidity and mortality. In children with facial burns, scarring and facial growth disruption can lead to significant physical and psychosocial consequences. The purpose of this study is to elucidate clinical utilization outcomes, specifically in domains of cost and length of stay (LOS), in a pediatric facial burn cohort and compare this to adults.

Methods: The Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS)

was queried from 2010 to 2012 using International Classification of Diseases, Ninth Revision (ICD-9) to isolate patients with burn injuries to the face or neck. The dependent variable was pediatric designation. Demographics, including race, sex, payment model, household income quartile, chronic conditions, and hospital characteristics, were compared between the two cohorts using t-tests and chi-squared tests for continuous and categorical variables, respectively. Multivariate logistic regression models were used to determine the odds of incurring higher cost and LOS by specifying the 75th percentile (top 25th percentile) as the threshold for association with a given variable. The odds of reaching the top quartile for hospitalization cost incurred and LOS was measured against all aforementioned variables.

Results: A total of 8,298 patients met the inclusion criteria, of which 2,248 patients were children (27.1%). The mean age of the entire population was 35.9 (+/- 24.1), with adults being 47.24 +/- 17.59 and children being 5.34 +/- 5.84. The majority of both the pediatric (42.3%) and adult (67.1%) patients were Caucasian. Approximately 58% of the pediatric cohort was comprised of Medicaid patients compared to 16% of the adult cohort.

The mean LOS of pediatric patients was 6.24 +/- 10.72 days compared to 8.39 +/- 15.51 days for adults. LOS in children was associated with being admitted to larger hospitals (OR 3.572; 1.658-7.696; 95% CI), higher number of chronic diseases (OR 1.246; 1.065-1.460; 95% CI), and higher number of procedures performed (OR 1.622; 1.504-1.748; 95% CI). Along with procedure number and number of chronic diseases in adults, Medicaid status was associated with higher LOS (OR 1.277; 0.999-1.634; 95% CI). Higher age in pediatric patients was associated with higher cost incurred (OR 1.042; 1.013-1.072; 95% CI). The lowest income quartile also incurred the lowest costs (OR 0.489; 0.292-0.819; 95% CI). Cost was associated with LOS (OR 1.360; 1.305-1.417; 95% CI) and number of procedures (OR 1.298; 1.191-1.414; 95% CI).

Conclusions: Overall, pediatric facial burn patients tend to recover more quickly than adult patients as indicated by their shorter LOS. The limitations of this study are that long term clinical utilization and outcomes data are not reported by the database, limiting the overall generalizability of the study. Additionally, the LOS of patients cannot with certainty be attributed to solely the complexity of the burn injury and patient comorbidities. Nonetheless, there are significant disparities in cost among pediatric patients, particularly among families of different socioeconomic status, indicating a need for greater investigation of clinical utilization and reduction of cost burden in pediatric facial burn management.

Use of Dental Silicone Impressions to Fabricate Simple Surgical Guides for Osteotomy Markings: A Reliable Process to Facilitate Craniofacial and Microsurgical Reconstructions

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Purpose: In recent years, computer-aided design/computer-aided manufacturing (CAD/CAM) simulation technology has been widely used in the surgical field and provides reliable and reproducible results. However, three-dimensional (3D) printed models made from sterilizable materials are associated with high healthcare-associated costs. Purchasing a 3D printer and specialized computer software can cost thousands of dollars. In addition, when these devices experience malfunctioning, there are additional issues regarding the repair-associated costs, maintenance costs, and simulation surgery that cannot be implemented immediately in a prompt period. We previously found that surgical osteotomy guides made with dental silicone produced optimal results in craniosynostosis surgery, free fibula flap, and free scapula flap mandibular reconstruction. Additionally, when using outsourcing 3D bone models, we identified various advantages such as fast surgical guides production, low cost, and effective operative navigation during osteotomy. Herein, we summarized the accuracy and characteristics of osteotomy using the dental silicone impression surgical guides (DSSG) that have been used so far.

Methods: A retrospective review was conducted to identify patients who underwent osteotomy procedures for craniosynostosis surgery, free fibula flap, and free scapula flap mandibular reconstruction using DSSG between 2015–2021. High-resolution computed tomography (CT) data were used to make cranium, mandible, fibula, scapular full-scale bone models prepared by outsourcing 3D printing. The surgical guides were prepared using Protesil labor (Vannini Dental Industry; Grassina [FI], Italy), a widely used condensation dental silicone material. The silicone was stretched onto the model to a 3-mm thickness. After hardening for 6 minutes, the material was cut to the exact same size for osteotomy and then autoclaved at 121℃ for 20 minutes. It was then ready for use as a surgical guide to mark the bone cutting line. To assess accuracy, the distance from the left and right Portion and Nasion to the osteotomy line on preoperative models and patients were compared in the craniosynostosis surgery. For the free fibula flap and the free scapula flap, the bone length of the preoperative 3D models and postoperative 3DCT were compared.

Results: The surgical guides showed no major deformity through the autoclavation and intraoperatively fit properly to the bone in all cases. The surgical guide preparation was covered by the government insurance ($200 USD per bone model), while the cost of the dental silicone was under $5 USD per patient. The mean difference between preoperative 3D models and postoperative CT were 3 mm (95%CI 2.5 mm to 4.15 mm, p <.001) in craniosynostosis surgery, 0.727 (95%CI 0.151 mm to 1.605 mm, p=0.1) after free fibula transfer, and 0.95 mm (95%CI -0.85 mm to 1.8 mm; p=0.397) following free scapula flap transfer.

Conclusions: This current system using DSSG provided similar results to those using surgical guides created with CAD/CAM technology but at a much-reduced cost. This is a simple method for simulation surgery and to prepare a surgical guide that is inexpensive, accurate, and easily produced, even in smaller hospitals with limited financial capacities.

National Assessment of Ear Abnormalities as Predictors for Renal Abnormalities

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Purpose: Ear malformations and renal abnormalities are established to have some level of association. However, there is still ongoing debate regarding the utility, cost-effectiveness, and overall need to screen children with ear malformations for renal abnormalities. Herein, we utilized the 2016 Kids' Inpatient Database (KID) to examine the association and relationship between different types of ear abnormalities commonly seen in children and renal abnormalities.

Methods: KID is a large national inpatient database that compiles admissions and data regarding diagnosis, race, procedures etc. Patients who had ICD-10 diagnoses of ear abnormalities (Q17) were identified. Those without ear abnormalities served as the control group. Patients with renal malformations (Q60 and Q63) were identified. Logistic regression was then conducted to analyze if patients with ear malformations had significantly different odds of having renal malformations. Statistical analyses were conducted in STATA using an $\alpha<0.05$ for determining significance of predictors.

Results: 8324 patients were identified with ear abnormalities. 5321 patients were identified with congenital renal abnormalities. Those with microtia were found to be 8.83 times more likely to have congenital renal abnormalities compared to those without. Those with an accessory auricle were 3.5 times more likely to have renal abnormalities compared to those without. Those with a diagnosis of other specified ear abnormalities and other unspecified were found to be 5.92 and 7.75 times more likely to have renal abnormalities compared to those without respectively. Those patients with a congenital misplaced ear were 9.66 times more likely to have renal malformations compared to those without. Figure 1 Additionally, we examined renal agenesis as in relation to ear abnormalities. 4784 patients were identified with renal agenesis. Patients with microtia were found to be 18.17 times more likely to have renal agenesis compared to those without. Those with an accessory auricle were 4.01 times more likely to have renal agenesis compared to those without. Patients with a misplaced ear were 14.40 times more likely to have renal agenesis compared to those without. Those with other specified and unspecified ear abnormalities were found to be 8.11 and 8.48 times more likely to have renal agenesis compared to those without respectively. Patients another mishappen ear were 4.68 times more likely to have renal agenesis compared to those without. Figure 2

Conclusions: Our results indicate a clear association between specific ear abnormalities and renal abnormalities. As such, there may be clinical value and supportive evidence for conducting

screening tests such as renal ultrasounds on pediatric patients who present for ear abnormalities. To our knowledge, this is the first study to evaluate the association of specific ear abnormalities and renal abnormalities using a national database. These associations may aid clinicians in pursuing screening regimens for patients with congenital ear anomalies.

Violent Paediatric Craniofacial Fractures: Features, Indicators, and Outcomes

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Introduction: Paediatric craniofacial fractures incurred through violence present particular challenges to the Plastic Surgeon. Psychiatric and socioeconomic factors that place these children at risk of violence often simultaneously increase the likelihood for worse outcomes, readmission and repeated violence. While distinct fracture patterns of the trunk and extremities have been identified as predictors of violent etiology, no such assessment exists for the craniofacial skeleton. This study aimed to perform an epidemiologic assessment of violent paediatric craniofacial fractures seen at a single institution and identify the most common craniofacial fracture patterns associated with violence in order to assist in sociolegal and surgical decision making when presented with such a patient.

Methods: Ethical approval for this study was obtained. Overall, 378 paediatric patients were identified with a diagnosis of a craniofacial fracture incurred by way of violence at our Children's Hospital across a 16-year period. Violence-based trauma was defined as injuries sustained from the use of force with the intent to hurt the child. Data collected included fracture types, concomitant injuries, socioeconomic data points, comorbidities, key demographic indicators, imaging details, and clinical outcomes. A descriptive statistical analysis was performed to identify hallmarks of violence in paediatric craniofacial fractures.

Results: Craniofacial fractures incurred through violence presented 11.3 % of the craniofacial fracture patient cohort. The majority were male (77.5 %). The average age at presentation was 15.2 ±+/- 0.1 years (range: 0.1-18.9 years). The vast majority of violent craniofacial fractures were secondary to interpersonal violence committed through punches, kicks, beatings with objects and associated falls (98.4%), with a subset of them (10.8%) being secondary to domestic abuse in the home committed by a family member. In these cases, the most common perpetrator was a sibling (39.5%). Approximately a third (33.9%) of the patients had one or more psychiatric comorbidity at the time of presentation, with the most common diagnosis being ADHD (48.8%).

The most common fracture types were orbital floor fractures (22.2%) followed by maxillary sinus (12.1%), mandibular parasymphysis (9%) and angle (8.5%) fractures. A tenth of the patients suffered concurrent dental issues (10.3%). Almost half of the patients had concomitant soft tissue injuries (47.9%), with a relatively high number of facial nerve injuries (8.8%). Few patients were found to have simultaneous fractures of arm/hand bones (1.9%) or spinal injuries (1%). Less than half (42.9%) of the patients received surgery for their fractures. The most common postoperative complication was malocclusion (14.2%).

Conclusion: This study presents the largest epidemiologic review of paediatric craniofacial fractures incurred through violent means in the literature. Our data indicated a disproportionate overrepresentation of adolescents, children of color, children with psychiatric comorbidities, and children living in detention facilities or group homes. Compared to adult patients, it appears craniofacial fractures incurred by violent means in paediatric patients were more frequently isolated to one part of the facial skeleton, less frequently associated with additional injuries, and more frequently committed by someone known to the patient. These epidemiologic features highlight the importance of a multidisciplinary team in caring for these young patients.

Allograft vs Autograft Cranioplasty Outcomes: a 21-year Review

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Purpose: Cranioplasty is a standard neurosurgical procedure used to reconstruct skull defects using either native bone (autograft) or foreign material (alloplast). Though often performed and well-studied, cranioplasty still presents a clinical challenge in minimizing negative outcomes that may lead to graft removal and revision. We hypothesized that the use of alloplastic graft material is associated with a lower rate of complications, and that comorbidities traditionally associated with poor wound healing (e.g., diabetes, prior radiation, smoking) would lead to a higher rate of complications.

Four hundred and twenty-two adult cranioplasty patients between treated from 2000-2021 were studied retrospectively. Demographics, comorbidities, and graft materials were assessed. Graft complication as was defined as events requiring surgical revision or removal.

Conclusion: The overall complication rate was 19.5%. There were 40 revisionary surgeries. Head and neck (HENT) radiation and autograft are associated with an increased risk of

complications (p=0.028 and p=0.004, respectively). The rate of complications differed by indication for surgery, with tumor resection having the highest rate at 38.5% (p=0.003). Equal numbers of alloplast (50.9%) and autograft (48.0%) were used. Smokers were more likely to have an autograft (47.1%, p=0.021). Fifty-nine patients (15.7%) had a revisionary operation. A graft concern was the most common indication for revision. We found no statistically significant association between indication for surgery and indication for revision. In multivariate analysis, HENT radiation alone increased odds of a graft complication by 15.63 fold (p=0.007). No other variables were statistically significant.

In our cohort, previous HENT radiation was associated with increased cranioplasty complication rate. Prospective work must be done to identify positive predictors of cranioplasty outcomes.

Relating Metopic Severity to Optical Coherence Tomography

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Purpose: Surgical treatment of metopic craniosynostosis is driven by twin goals of correcting the visible frontal deformity and reversing cephalocranial disproportion. Neurocognitive deficits in unoperated patients may be related to local compression, elevated intracranial pressure (ICP), and hypoperfusion of the developing brain. However, associations between phenotypic severity and neurodevelopmental outcomes are poorly characterized. The purpose of this study was to assess the relationship between metopic synostosis severity and ICP using optical coherence tomography (OCT).

Materials and Methods: We retrospectively identified patients with non-syndromic metopic craniosynostosis who underwent surgical correction with concomitant assessment of ICP. Metopic synostosis severity was determined based on pre-operative CT assessment of endocranial bifrontal angle (EBFa) and CranioRateTM in 47 patients. CranioRateTM is a novel machine learning algorithm trained to recognize morphologic features of metopic craniosynostosis and use statistical shape analysis to provide quantitative ratings of severity. Output variables included a scaled metopic synostosis severity score (MSS), cranial morphology deviation score (CMD), and severity percentiles in control and metopic populations. Elevated

ICP was determined by established OCT parameter thresholds. [1]

Results: Forty-seven subjects were enrolled between 2014 and 2019, at an average age of 8.5 months at preoperative CT and 11.8 months at index procedure. Fourteen patients (29.7%) had elevated OCT parameters suggestive of elevated ICP at the time of surgery. Ten patients (21.3%) had diagnosed developmental delay, eight of whom demonstrated elevated ICP. There were no significant associations between measures of metopic severity and ICP. A negative correlation was noted between MSS and formally diagnosed developmental delay ($r = -0.387$, $p = 0.008$). Likewise, a negative correlation between age at procedure and both MSS and CMD was observed ($r = -.573$, $p < .001$, $r = -.312$, $p = .025$, respectively). MSS and EBFa were inversely correlated, as expected ($r = -0.545$, $p < 0.001$).

Conclusion: Increased metopic severity was not associated with elevated ICP at the time of surgery. Patients who underwent later surgical correction showed milder phenotypic dysmorphology with an increased incidence of developmental delay.

References:
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Relating Metopic Severity to Mid-term Aesthetic Outcomes: A Machine Learning Approach

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Purpose: Aesthetic deterioration after surgical treatment of metopic craniosynostosis may manifest as bitemporal hollowing (TH), lateral orbital retrusion (LOR), or frontal bone irregularities (FBI). Patients with these complications have reoperation rates of 18-46%. To date, there have been few longitudinal studies assessing the effect of pre-operative dysmorphology on aesthetic outcomes in this cohort. This study evaluates the relationship between metopic severity, including the use of CranioRateTM, a novel metopic synostosis severity measure, and mid-term

aesthetic outcomes.

Materials and Methods: Patients with non-syndromic metopic craniosynostosis who underwent bi-frontal orbital advancement and remodeling (BFOAR) between 2012 and 2017 were reviewed. Metopic synostosis severity was determined based on pre-operative CT assessment of IFA and CranioRateTM. CranioRateTM is a machine learning algorithm trained to recognize morphologic features of metopic synostosis and generate quantitative severity ratings including metopic severity score (MSS) and cranial morphology deviation (CMD). Frontal and lateral photographs of patients with at least four years post-operative follow-up were assessed by attending craniofacial surgeons using masked three-rater aesthetic grading of clinical photos (n=39). Graders assessed Whitaker score as well as the presence of TH, LOR, FBI, or a "catch-all" category of visible irregularities. Binary logistic regression was used to assess predictors of TH, LOR, FBI, and VI. Multinomial logistic regression was used to assess predictors of Whitaker classification.

Results: The average age at preoperative CT scan was 7.7 ± 3.4 months and the average age at BFOAR was 9.9 ± 3.1 months. The average MSS was 6.3 ± 2.7 out of 10 and average CMD was 200.4 ± 44.7 out of 300. Average IFA for the cohort was 116.8° ± 13.8° (range 93° - 138°). The average time from operation to aesthetic assessment was 5.4 ± 1.0 years (range 4.1 – 7.8 years). "Any visible irregularity" was present in 87.2% (n = 34) of patients, temporal hollowing in 76.9% (n = 30), frontal bone irregularities in 61.5% (n = 24), and lateral orbital retrusion in 20.5% (n = 8). Most patients received a median Whitaker classification of II (61.5%, n =24), followed by class III (23.1%, n = 9). There was a significant association between MSS and age at CT scan, with younger patients having more severe metopic severity scores ($r = -.451$, $p = .004$). Similarly, MSS and IFA were negatively associated, with a higher MSS correlating to a lower IFA ($r = -.371$, $p = .034$). MSS was found to be the only independent predictor of visible irregularities (OR 2.18, $B = .780$, $p = .024$). Decreased age at surgery (OR, 1.08; 95% CI, 1.05 to 2.6, $p = .002$) and increased length of follow up (OR, 1.59; 95% CI, 1.59 to 3.54, $p < .001$) were significantly associated with a worse median Whitaker score. No impact of surgical technique, including parietal bone graft use or interpositional bone graft size, was demonstrated ($p > .05$ for both).

Conclusion: More severe cases of metopic craniosynostosis show increased rates of cumulative aesthetic dysmorphologies. Measures of pre-operative metopic severity are predictive of mid-term aesthetic outcomes.

Degree of Posterior Sagittal Suture Fusion is Associated with Elevated Intracranial Pressure by Optical Coherence Tomography in Patients with Non-Syndromic Sagittal Craniosynostosis

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Introduction: Sagittal craniosynostosis can lead to increased intracranial pressure (ICP) with possible neurocognitive sequala. Optical coherence tomography (OCT) of the peripapillary retina is a validated noninvasive method to predict ICP elevation in pediatric patients with craniosynostosis.1 The purpose of this study was to determine associations between degree of sagittal suture fusion and OCT parameters suggestive of increased intracranial pressure in patients with non-syndromic sagittal craniosynostosis.

Methods: OCT measurements were obtained preoperatively in patients undergoing spring-mediated cranioplasty for sagittal craniosynostosis. Previous work demonstrated OCT parameters for predicting ICP elevation above 20 mm Hg required maximal retinal nerve fiber layer thickness of 170.6 μm and maximal anterior projection of 138.3 μm2.1

Three-dimensional CT head images were imported into Materialise Mimics and parietal bones were manually isolated. The "measure" tool was used to measure the distance of fused suture. Degree of sagittal suture fusion was compared to OCT parameters suggestive of increased intracranial pressure with Mann Whitney U tests, Spearman's correlations, and multivariate logistic regression models controlled for age.

Results: Forty patients (31 males) with non-syndromic sagittal craniosynostosis at mean age 3.4 ± 0.4 months were included in this study. The sagittal suture was on average 82.1 ± 21.4% fused.

Maximal retinal nerve fiber layer thickness or maximal anterior projection were not associated with total sagittal suture fusion ($p > 0.05$). Maximal retinal nerve fiber layer thickness was positively associated with percentage of posterior one-half and posterior one-third sagittal suture fusion ($\rho = 0.418$, $p = 0.022$; $\rho = 0.426$, $p = 0.019$, respectively). Maximal anterior projection was also positively associated with percentage of posterior one-half and posterior one-third sagittal suture fusion ($\rho = 0.596$, $p < 0.001$; $\rho = 0.598$, $p < 0.001$, respectively).

Patients with retinal parameter measurements indicating ICP < 20 mm Hg demonstrated no significant difference in percentage of total sagittal suture fusion (86.3% vs 76.4%, $p = 0.377$). Patients with retinal parameter measurements indicating ICP < 20 mm Hg demonstrated significantly higher percentage fusion of the posterior one-half (95.9% vs 72.6%, $p = 0.024$) and posterior one-third (93.7% vs 63.7%, $p = 0.023$) of the sagittal suture. Multivariate logistic regression models revealed percentage of posterior one-half ($p = 0.049$) and posterior one-third ($p = 0.039$) sagittal suture fusion predicted ICP < 20 mm Hg.

Conclusions: In patients with non-syndromic sagittal craniosynostosis, increased percentage fusion of the posterior sagittal suture, but not total suture, was positively associated with retinal parameter measurements suggestive of increased ICP. These findings suggest suture fusion leading to increased ICP may be region-specific and may have implications for other variations of craniosynostosis.

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Does Time Heal All Wounds? Impact of Elapsed Time on Post-Traumatic Craniofacial Quality of Life

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Background: This study employs a craniofacial-specific patient-reported outcome measure to assess predictors of health-related quality of life (HRQoL) following facial trauma in a pediatric cohort.

Methods: The Craniofacial Condition Health-Related Quality of Life Tool (CFC-QoL) is a psychometrically validated __ item questionnaire designed to assess health-related quality of life in children with congenital and acquired craniofacial conditions. The tool is available in patient and parent-report versions in English and Spanish. The CFC-QoL assesses seven domains: Social Teasing, Peer Relationships, Psychologic Worry, Appearance Satisfaction, Desire for Appearance Change, Family Support, and Physical Function using a Likert-type scale ranging from "never" to "almost always". Higher scores indicate worse HRQoL.

The tool was administered in an outpatient setting to patients who presented to plastic surgery following facial trauma. Mechanisms of injury were classified as either crush-related (e.g., fall/collision) versus puncture-related (e.g., dog bite). A collapsed version of the abbreviated

injury scale (AIS) was used to distinguish trauma severity, with patients classified as either minor or moderate-to-severe. Demographic characteristics and key elements of the medical history were also assessed, such as parent's educational status, months since trauma, visit number post-trauma, and required number of operations. Linear regression was employed to assess the impact of key predictors on CFC-QoL domain scores.

Results: Seventy-one parents and 46 patients responded to the CFC-QoL, including 42 patient-parent dyads. The patients were split girl/boy (23 each), with majority white (78.3%), Hispanic (56.5%) representation. Exactly half of patients (n=23) were in the 13–17-year-old cohort, with a cohort average age of 13.2 ± 3.8 years. The most common traumatic etiology was crush-related (80.4%), with resulting soft tissue injury (45.7%) and "minor" AIS score (73.9%). The average number of reconstructions was 0.6 ± 0.9 (range 0-4), and most patients responded to the tool 17.3 ± 25.2 months post-trauma. For parents, the most common respondent was the mother (85.9%), the majority of whom had at least some college education (52.1%).

Analysis of patient responses revealed younger age ($B = -.563$, $p < .001$) and non-Hispanic ethnicity ($B = .406$, $p = .031$) as independent predictors of worse Peer Relationship scores. Psychological Worry was exacerbated by less time elapsed since trauma ($B = -1.426$, $p = .009$). Appearance Satisfaction was worsened by increased age ($B = -1.760$, $p < .001$) and improved by non-Hispanic ethnicity ($B = 1.318$, $p = .007$). Family Support was improved in older patients ($B = 1.256$, $p = .008$) and by decreased time since the traumatic event ($B = -1.200$, $p = .047$).

Parent responses revealed increased patient age as a significant predictor of Desire for Appearance Change ($B = .384$, $p = .028$). No other predictors were identified on any CFC-QoL scale.

Conclusions: Age at trauma, ethnicity, and time since traumatic event emerged as independent risk factors for variations in HRQoL in children with a history of facial trauma. The explanation for these findings is multifaceted but may relate to increased self-awareness and insecurity in older patients and decreased expectation for a full return to normalcy over time.

What CT Findings are Predictive of Post-Traumatic Enophthalmos in Orbital Fractures?

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Background: Surgical indications for orbital fracture repair include entrapment, diplopia, and enophthalmos.1 However, periorbital edema on initial work-up can be an impediment to evaluation of true enophthalmos. Predicting late enophthalmos is a clinical challenge, and objective guidelines to direct surgical management remain ambiguous. We systematically reviewed the existing data on using CT findings to establish objective metrics to predict enophthalmos during initial trauma work-up.

Methods: We used PubMed as a primary search engine to identify articles addressing orbital fractures and enophthalmos. Inclusion criteria were English-language prospective and retrospective studies that utilized CT findings to predict enophthalmos in asymptomatic patients. Case reports, book chapters, commentaries, and letters to the editor were excluded. The Quality in Prognosis Studies (QUIPS) tool was used to assess articles' quality.2 PRISMA guidelines were followed. A random effects model meta-analysis of orbital volume change was completed. A regression analysis of data from 8 orbital volume change studies was performed to determine a pooled threshold for 2mm of enophthalmos.

Results: Initial search delivered 817 abstracts. 70 articles were selected for full-text review. Of these, 34 met inclusion criteria. 29 retrospective studies evaluated a total of 2816 patients and 5 prospective studies evaluated 186 patients. Six domains of each article were assessed for potential risk of bias: study participation, study attrition, prognostic factor management, outcome measurement, study confounding, and statistical analysis and reporting. All 34 studies were good quality with predominantly low risk of bias in all domains. Predictors of enophthalmos assessed were orbital volume change (20 papers), fracture size (12 papers), inferior rectus muscle (IRM) displacements (5 papers), fracture site (4 papers), novel measurements on two-dimensional CT scans (2 papers), and orbital fat displacement (1 paper). With regards to figures predictive of enophthalmos, orbital volume change studies offered values ranging from 0.34 to 4.26cm3, and four out of these 20 papers also offered orbital volume ratios of 105.0% to 112.3%. Fracture size predictor values ranged from 1.50 to 3.38cm2. Displacement of IRM and its height-to-width ratio ≥ 1.0 served as predictors in three and two studies, respectively. Inferior (2 papers), medial (1 paper) and medial-inferior (1 paper) orbital fractures showed highest correlation with enophthalmos. Meta analysis showed an effect size of 1.5cm3 of orbital volume change to predict enophthalmos ($p<0.001$, CI 0.952-2.067). Regression of 224 data points from 8 studies revealed that 3.33cm3 of orbital volume increase was a predictor of 2mm enophthalmos. Egger regression ($p=0.095$) and funnel plot revealed low risk of publication bias.

Conclusions: Orbital volume changes on CT, fracture size and site, and inferior rectus position/shape all have predictive value for late enophthalmos after orbital fracture.

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Gender Diversity among Craniofacial Fellowship Faculty

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Background: Despite modest improvement in the past decade, representation of women among academic plastic surgeons remains low. In 2019, only 19% of plastic surgery faculty positions were held by women, with even greater disparities in leadership positions. While data on gender disparities is available in the field of plastic surgery, less is known regarding individual specialties with separate fellowship training. A complete understanding of current gender distribution in faculty positions is essential to accurately design and measure the results of future efforts to improve the representation of women in craniofacial surgery.

Methods: A cross-sectional study of all 31 craniofacial fellowship programs in North America was performed in January 2022. Lists of programs and faculty members for 2022 were obtained from official program websites. The gender of all craniofacial faculty members was recorded, and gender distribution was compared between different geographic regions (West, Midwest, Northeast, Southeast, and Southwest).

Results: Among faculty at the 31 craniofacial fellowship programs recognized by the American Society of Craniofacial Surgeons, there are currently 122 craniofacial surgeons on faculty, of whom 19 (16%) were female, and 103 (84%) were male. Of the 31 programs, 13 (42%) had at least one female craniofacial surgeon as part of the faculty. The Midwest had the greatest percentage of female craniofacial surgeons 8 (26.7 %) while the Southwest had the lowest percentage 2 (10%). Among female faculty members, 12 (63.2%) were assistant professors, 6 (31.5%) were associate professors and 1 (5.2%) was a professor. For males 29 (28.1%) were assistant professors, 36 (35%) were associate professors and 38 (36.9%) were professors.

Conclusion: While women now make up more than half of medical students, disparities in gender representation persist in many specialties in medicine, including plastic surgery. Our results show that representation of women in craniofacial surgery trails behind recently reported numbers for academic plastic surgery as a whole. Difficulty finding mentors, family responsibilities, and institutional biases have been cited as barriers to women reaching faculty and leadership roles in plastic surgery. Additional years of training in fellowship programs may compound these issues. Future studies are warranted to assess gender disparities in other

subspecialities of plastic surgery and better understand the factors which prevent women from occupying faculty positions in craniofacial surgery.

Prospective Evaluation of a Technique using Temporal Rotation Flaps To Improve Hairline Shape in Facial Feminization Surgery

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Purpose: Hairline advancement is an impactful part of facial feminization surgery. Published hairline advancement techniques involve uniform advancement of the central hair bearing scalp to lower midline forehead height. Unfortunately, this technique does not address the most masculine portion of the hairline: the lateral temporal recession and "M" shape. Our novel technique addresses the hairline shape as well, creating a more feminine appearance without the use of hair grafts. Here we present results from our ongoing database of hairline advancement cases to compare our novel temporal rotation flap technique with standard central hairline advancement.

Method: In our technique, bilateral rotation flaps of hair-bearing temporal scalp were rotated anteriorly and combined with central scalp advancement, allowing a wedge of alopecia in the area of temporal recession to be excised. Control patients underwent central hairline advancement only. We measured the distance between key anatomic landmarks pre- and post-operatively in consecutive patients undergoing hairline advancement Analysis was performed to compare the improvement in these measurements between patients who had temporal rotation flap hairline advancement vs central hairline advancement alone. Our hypothesis is that our temporal rotation flap technique decreases the distance from lateral temporal recession peak (TRP) to lateral brow (LB) and obliquely to the midline glabella (MG) compared to central hairline advancement alone, while still leaving the patient with well-concealed hairline incisions.

Results: A total of 62 cases were reviewed; 47 using temporal rotation flaps and 15 controls. Our measurements showed statistically significant improvement in the lateral temporal recession peak using our technique, demonstrated by greater improvement in lateral hairline height (TRP to LB; 2.3 vs 1.4 cm, p =0.026) and oblique advancement (TRP to MG; 3.2 vs 1.7cm, p=0.022)

compared to controls. This did not sacrifice advancement at the midline (1.5 vs 1.8cm, p>0.05) and there were no major complications. Minor complications were identified in fifteen temporal rotation flap patients (32%), including nine patients (19%) with a wound healing complication (T-point dehiscense or wound edge necrosis) and ten patients (21%) with a post-operative cosmetic concern (widened scar or dog ear). Mean follow up was 108 days (range 14-406). This technique was well tolerated when performed concurrent with other feminizing facial procedures and did not significantly increase the overall operative time.

Conclusion: Our temporal rotation flap technique is a powerful tool to correct temporal recession and feminize the hairline shape in addition to height.

Secondary Surgery in Facial Feminization: Reasons and Recommendations

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Background: As facial feminization surgery (FFS) continues to grow in access and popularity, the need for secondary FFS can be expected to increase. Given the relative novelty of FFS, little is known about reoperation on the FFS patient. The purpose of this study was to identify the reasons for secondary FFS and offer recommendations to minimize secondary surgery.

Methods: A retrospective, single-institution cohort study of all patients with gender dysphoria who underwent FFS by the senior author from October 2017 to October 2021 was performed. Patients who underwent non-staged secondary surgery were identified and sorted in two non-mutually exclusive surgical cohorts: additional surgery, defined as unplanned additional feminization surgery on previously unoperated facial units, and revision surgery, defined as redo surgery on previously operated facial units. Clinical and demographic data were compared between the revision and total cohorts. Reasons for secondary surgery were identified and examined in the context of the senior author's experience.

Results: Out of 161 patients who underwent FFS, 41 (25.5%) underwent secondary surgery consisting of additional surgery on a new facial unit (N=32) and/or revision surgery (N=30). There were no significant differences in clinical or demographic data between the secondary surgery and total FFS cohorts. Among patients who underwent additional feminization surgery, the facial units that had been previously operated on, in descending order of frequency, were nose (46.3%), trachea (31.7%), forehead/brow (22.0%), chin (12.2%), lips (9.8%), and cheeks

(7.3%). Among revision patients, the facial units revised were nose (36.6%), forehead/brow (26.8%), cheeks (17.1%) and chin (17.1%), lips (12.5%), and trachea (2.4%). The main indication for revision for all facial units was undercorrection to feminine ideals.

Conclusions: Approximately one-quarter of patients who underwent FFS at our institution had prior FFS and/or sought revision. FFS surgeons must be well-versed not only in techniques to primarily feminize facial features, but also in the challenges of working with previously operated FFS patients. Keeping in mind that the dominant indication for revision was undercorrection, FFS surgeons can minimize the need for secondary surgery in the future.

Gender Nonbinary Patients Undergoing Facial Gender-Affirming Surgery

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Background: While the literature on facial gender-affirming surgery (FGAS) has grown, little is known about the nuances of surgical care and psychosocial outcomes of nonbinary patients undergoing such procedures. In this work, we characterize our institutional cohort of nonbinary patients who underwent FGAS and compare their surgical characteristics and psychosocial outcomes to binary patients.

Methods: Patients undergoing FGAS at our institution between 2018 and 2022 were prospectively enrolled, and psychosocial functioning was evaluated before and after surgery using Patient-Reported Outcomes Measurement Information Systems instruments. Patient medical and surgical history as well as FGAS characteristics were collected. Fisher's exact test and t-tests were used to compare characteristics between nonbinary and binary groups.

Results: Ninety-six patients were prospectively enrolled, and 58 patients (5 nonbinary and 53 binary) were eligible for inclusion in this study. Nonbinary patients were younger (mean age±SD, 24.8±3.3 years versus 34.0±11.2 years, $p<0.001$) and presented with higher anxiety (mean±SD, 68.8±8.0 versus 57.9±10.0, $p=0.02$) and depressive symptoms (mean±SD, 63.3±6.2 versus 53.6±8.8, $p=0.02$) compared to binary patients. Surgically, nonbinary patients underwent lower amounts of frontal bone setback (mean±SD, 2.7±0.6 versus 4.3±1.2, $p=0.03$) and underwent different techniques for rhinoplasty compared to binary patients.

Conclusions: Nonbinary patients seeking FGAS were younger and presented with higher patient-reported anxiety and depression compared to binary patients, with improvements in these and other psychosocial characteristics after surgery. The nonbinary group also had different

surgical characteristics, shedding light on how nonbinary gender identities may contribute to specific desires of patients undergoing FGAS.

Increased Postoperative Opioid Use After Facial Feminization Is Predicted by Psychosocial Status and Surgical History

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Background: The opioid epidemic has underscored the importance of vigilance towards reducing opioid use after surgery. Transgender and gender diverse patients undergoing surgical transition may be particularly vulnerable to persistent opioid use after surgery due to the potential need for multiple surgeries and higher prevalence of anxiety and depression, known risk factors for persistent opioid use after surgery. In this work, we evaluated potential predictors of increased postoperative opioid use among patients undergoing facial feminization surgery (FFS).

Methods: A retrospective study of patients who underwent FFS at our institution between 2018 and 2021 was conducted. Patient medical and surgical history, FFS characteristics, and medication regimen were collected. Patient psychosocial functioning was evaluated preoperatively using eleven Patient-Reported Outcomes Measurement Information Systems instruments. Descriptive statistics, Pearson correlations, and multiple linear regression analyses were used to identify potential predictors of increased opioid use after FFS.

Results: Ninety-six patients were identified via retrospective chart review, and thirty-seven patients (mean age+/-SD, 32.4+/-9.5 years) met inclusion criteria. Hospital length of stay ($r=0.352$, $p=0.03$) and a history of previous FFS ($r=0.389$, $p=0.02$) were both determined to be correlated with increased postoperative opioid use. Multiple linear regression analyses demonstrated that both a history of previous FFS ($\beta=0.65$, $p=0.001$) and patient-reported anxiety scores ($\beta=0.54$, $p=0.02$), but not depressive-symptoms scores, were significant independent predictors of increased postoperative opioid use.

Conclusions: Prior FFS and increased patient-reported anxiety were found to predict increased opioid use after FFS. Further studies are necessary to determine whether this increased opioid use translates to persistent usage.

Enhanced Recovery after Surgery Protocol for Facial Feminization Surgery Reduces Pain and Length of Hospital Stay

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Background: Patients undergoing gender-affirming surgeries represent a potentially vulnerable cohort for prolonged opioid use. In addition to gender dysphoria, transgender patients are frequently diagnosed with anxiety or depression, known risk factors for persistent opioid use after surgery. This study evaluates the implementation of an enhanced recovery after surgery (ERAS) protocol to reduce opioid use after facial feminization surgery (FFS).
Methods: Seventy-nine patients (mean age 32.5 +/- 10.2 years) who underwent single-stage facial feminization surgery before and after ERAS protocol implementation were retrospectively reviewed. Patient characteristics, length of surgery, complications, pain scores, opioid use in morphine equivalent dosing per kilogram (MED/kg), and length of hospital stay were compared between groups.

Results: Of the entire cohort, 75.9% of patients had a mental health diagnosis, of which anxiety and depression were the most common. Comparison of the pre-ERAS (n=38, 48.1%) versus the ERAS (n=33, 51.9%) groups demonstrated no differences in age, body mass index, mental health diagnoses, length of surgery, or complications. The ERAS group reported lower postoperative pain scores (mean+/- SD, 2.51.8 versus 3.7+/- 1.6, p=0.002) and total inpatient opioid usage (median 0.8 versus 1.5 MED/kg, p<0.001) compared to the pre-ERAS group. The length of hospital stay was also significantly reduced in the ERAS group compared to the pre-ERAS group (median 27.3 versus 32.4 hours, p<0.001).

Conclusions: We report the design of the FFS ERAS protocol and demonstrate that implementation reduced pain scores, opioid use, and length of hospital stay after FFS.

Early Surgical Management of Infants With Robin Sequence in a Large Multi-Center Sample

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Objective: Studies of infants with Robin sequence (RS), the triad of micrognathia, glossoptosis and upper airway obstruction, are limited by the rarity of the condition and heterogeneity of the sample that results from phenotypic and diagnostic variability. Most knowledge of this condition is sourced from small, single-institution samples and is inherently biased. The purpose of this study is to characterize early surgical management of infants with RS in a large multi-institution sample.

Methods: This is a cross-sectional study initiated as part of the Children's Hospital Neonatal Consortium (CHNC) micrognathia working group and includes infants with micrognathia admitted to CHNC centers from 2010-2020. Data was abstracted from the Children's Hospital Neonatal Database (CHND), which captures clinical information for infants admitted to neonatal intensive care units at each of the 34 CHNC centers. Predictor variables included demographic data, birth characteristics, cleft and syndrome status, and operative details. Outcome variables included length of stay, death, feeding and respiratory support at hospital discharge, and need for secondary airway operations. Trends in surgical management between centers and over time were also evaluated. A p-value<0.05 was considered statistically significant for all analyses.

Results: Of the 248,010 patients included in CHND during the study period, 3256 (1.3%) had a diagnosis of micrognathia and 1294 (39.7%) of these had an operation to correct upper airway obstruction during infancy. For those that had an operation, mean age and weight at operation were 34.9±33.6 days and 3515.4±712.8 grams, respectively. A syndromic diagnosis was made in 152 (1.2%) prior to hospital discharge, with Stickler (n=71, 46.7%) and Treacher Collins Syndromes (n=28, 18.4%) most common. Operations included: mandibular distraction osteogenesis (MDO), n=856 (66%); tracheostomy, n=331 (26%); and tongue-lip adhesion (TLA), n=107 (8%). Analysis revealed several notable associations: Compared to MDO and TLA, initial tracheostomy was performed more commonly for male (51.0% vs 58.0%, p=0.03) infants without a cleft palate (35.3% vs 63.1%, p<0.001), and/or with Treacher Collins syndrome (0.4% vs 7.3%, p<0.001). Length-of-stay was shorter for MDO compared to TLA (57.9 +/- 40 vs. 69.0 +/- 40 days, p=0.007), and shorter for TLA compared to tracheostomy (69.0 +/- 40.0 vs. 110.4 +/- 71.0 days, p<0.001). Exclusive oral feeding was achieved by NICU discharge more frequently after MDO than TLA (35.4% vs 15.0%, p<0.001) and least commonly after tracheostomy (3.6%). The rate of gastrostomy tube placement was highest after tracheostomy (76.4%) and was and lowest after MDO (TLA=54.7%, MDO=28.5%, p<0.001). Infants that had MDO were less likely to require a second airway operation than those with TLA (3.5% vs 17.8%, p<0.001). Mortality was low for all operations (0.5%).

Conclusion: In this cohort, the largest dataset of infants with RS ever reported, MDO was associated with shorter hospital stay, improved oral feeding, and lower rates for gastrostomy tube placement and secondary airway operations compared to TLA and tracheostomy. Prospective multi-center studies are necessary to further support these conclusions.

Analysis of Routine Intensive Care Unit Admission Following Palatoplasty in Patients with Robin Sequence

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Background: Previous management of upper airway obstruction (UAO) in patients with Robin Sequence (RS) may impact the need for admission to the pediatric intensive care unit (PICU) following primary palatoplasty (PP). At our institution, patients with RS who underwent tongue-lip adhesion (TLA) or mandibular distraction osteogenesis (MDO) during infancy are routinely admitted to the PICU for care after PP. The current study sought to determine if the need for PICU admission after PP in patients with RS varies upon the prior upper airway management.

Methods: We conducted a retrospective chart review of patients with RS who underwent PP at Children's National Hospital between 2006-2020. Based upon their prior airway management: conservative (n=30), TLA (n=14), and MDO (n=14), patient demographics, perioperative characteristics, ICU admission, and postoperative complications were compared. To analyze the complications, we categorized the events into airway (i.e. reintubation, prolonged intubation >4h, need of supplemental oxygen and length of stay (LOS) of more than 2 days) and non-airway (i.e. prolonged time to feeding >24h, unexpected gavage feeding, transfusion, fistula, readmission) related. Lastly, these events were further classified as major (i.e. prolonged intubation >4h, unexpected ventilatory support via pre-existing tracheostomy, reintubation or transfusion) or minor (i.e. supplementary oxygen via nonbreathable mask, nasal cannula, aerosol mask, prolonged time to feeding >24h, need of gavage feeding, fistula, readmission), based upon the need of ICU care.

Results: Fifty-eight patients were included. Median age at PP was 12.9 [10.8, 15.6] months (median age among groups [months] conservative, 11.2 [9.8, 13.7]; TLA, 14.4 [13.3, 16.6]; MDO, 15.4 [11.6, 18.7]; p=0.002). Overall PICU admission was 65.5%. PICU admission was

significantly higher in patients who underwent TLA and MDO (conservative, 33.3%; TLA and MDO 100%; $p<0.001$). Rates of major airway events that necessitated ICU care were not significantly different between groups (conservative, 6.7%; TLA, 14.3%; MDO, 14.3%; $p>0.05$); post-hoc pairwise analysis documented significant differences only in overall airway events between TLA vs. conservative airway groups (64.3% vs. 26.7%, respectively; $p=0.02$). No statistically significant differences were found among the rates of non-airway complications. Lastly, median LOS was slightly higher in patients with MDO and TLA ([hours] conservative, 34.6 [29.1, 55.5]; TLA, 53.7 [47.5, 78.4]; MDO, 53.7 [48.5, 81.1]; $p=0.013$).

Conclusion: ICU care after PP in patients with RS may not be necessary in infants whose airway obstruction was appropriately managed by conservative measures alone or by MDO, potentially preserving resources for patients with greater need. Special attention may be prudent for post-PP patients who underwent neonatal TLA.

"The Greatest Present You Ever Got Me": Pathway to the Establishment of a Multi-Disciplinary Facial Paralysis Clinic

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Purpose/Background: Very few multidisciplinary pediatric facial palsy clinics exist, precipitating extensive barriers to care for children with this diagnosis. This deficit creates a lack of knowledge in many communities on how to care for these patients. An eight-year-old female who presented to our academic multidisciplinary facial palsy practice validated this challenge. On exam, the patient had undiagnosed hemifacial microsomia associated with ipsilateral facial paresis. She leaves school early due to being teased and struggles with peer relationships. Her parents had previously attempted to establish care, however, insurance and geographic location were obstacles. After years without success and upon family relocation for work, a community physician referred them to our center. The patient told her parents this is "the greatest present you ever got me."

This is the story of many pediatric patients with facial palsies. There is need for large referral networks and access to multidisciplinary care. We present a model for establishing a multi-disciplinary facial palsy clinic. In addition, we elucidate our experience using the International Consortium for Healthcare Outcomes Measurement (ICHOM) database to develop a questionnaire capturing mental health and quality of life information for our pediatric patients. (1)

Methodology and Clinic Structure: Initiation of clinic planning began in 2017, six years prior to seeing the first patient. Now, one day a month a multi-disciplinary team of Oculoplastic, Otolaryngology, and Plastic Surgeons, along with Speech Therapy, Occupational Therapy, Ophthalmology, and Mental Health Providers come together to see patients. One of the largest obstacles was merging cross-disciplinary electronic health records (EHR). Another obstacle was determining which components of the ICHOM data set would be most informative and efficient to collect in a busy clinic.

To mitigate the logistical challenges, our clinic is housed through a primary department. To assess outcome measures we chose to initially focus on mental health aspects of pediatric patients with facial palsy. We met regularly with ICHOM representatives and international groups to share our experience deploying the questionnaire and fine-tuning data collection techniques to build a cohesive international database for pediatric facial palsy.

Conclusion and Future Directions: As with many conditions, pediatric facial palsy is best cared for in multi-disciplinary setting. Though this is a rare diagnosis, it is a life-debilitating one that when left inadequately addressed can have a profound negative impact on patients and families. (2) This clinic serves as a model for the establishment of cross-disciplinary care and an international database allowing for the comparison of treatments, introduction of value-based reimbursement strategies, and patient/family guided care. (3) We hope to serve as a blueprint for future providers at the outset of clinic initiation saving years of challenges, allowing patient care to be expedited. To our knowledge, we are the first clinic in the nation, and 1 of 2 in the world, to collect data via the ICHOM validated questions. Our current focuses are growing the data to better inform care and improving the education of the regional medical community on caring for pediatric facial palsy patients.

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Trends in Craniofacial Fellowship Career Outcomes: A Call for an Evolution in Craniofacial Training

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Purpose: With increasing numbers of trainees completing a craniofacial surgery fellowship in recent years, the rise within a fairly static job market is concerning. Many factors have increased the demand and reduced barriers for craniofacial expertise despite few available practice positions, such as gender affirmation and aesthetic procedures.1 Given these challenges facing the next generation of craniofacial surgeons, we aim to evaluate the current state of career prospects for recent craniofacial graduates.

Methods: Upon approval from the American Society of Craniofacial Surgeons (ASCFS), an anonymous online survey invitation was sent to all craniofacial surgeons who graduated from accredited craniofacial fellowships from 2016 to 2021. The survey period began on December 10, 2021, and ended on January 27, 2022. Descriptive statistics were used to summarize study results. Continuous variables were described by mean and standard deviation (SD) or median and interquartile range (IQR) as determined by the Shapiro-Wilk test of normality. Categorical variables were described by frequencies and percentages. Statistical analysis was performed using STATA v.16.2

Results: A total of 124 eligible participants were identified by ASCFS, of which 30 (24.2%) responded to the survey. The craniomaxillofacial case distribution at respondents' current practice varied, with 42.3% reporting a 50-75% craniofacial case load and 38.5% reporting below 25%. Craniofacial trauma reconstruction was performed most at current positions (92.3%), followed by general reconstruction (92.3%) and breast surgery (69.2%), with least common procedures including facial feminization (23.1%). Most respondents reported desiring an increased craniomaxillofacial case load (65.4%). Seven (26.9%) were unable to secure their current position prior to completion of craniofacial fellowship, and many respondents (80.0%) cited low craniofacial job availability to be a limiting factor in their job search. Respondent recommendations to improve fellowship comprehensiveness and to increase candidate competitiveness within the job search included increased facial feminization, facial aesthetic, and microsurgical experience during fellowship training.

Conclusions: This survey is notable for the unique perspective it obtains from recently graduated craniofacial fellows regarding the gap between their skills following fellowship and ones that would have allowed them to be more competitive in the job search. To adapt to trends in craniomaxillofacial surgery, training programs should implement minimization standards for exposure of fellows to facial feminization, orthognathic surgery, facial aesthetics, and microsurgical reconstruction. Establishing a feedback system eliciting recommendations from recent graduates is a sage investment to ensure training programs are adapting alongside the field. Expansion of training beyond the management of congenital deformities can provide a revitalization of the field and prepare plastic surgeons to remain innovators in facial plastic surgery as competition increases.

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Indications, Outcomes, and Safety of Ambulatory Facial Feminization Surgery

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Background: Facial feminization surgery (FFS) for gender affirmation plays an important role in helping patients achieve an appearance that is congruent with their own gender identity. Traditionally, FFS includes a number of combined procedures that often result in lengthy operative times, hospital admission, or staged operations. Although some studies have investigated the safety of FFS in general, there have been no studies analyzing the risks and benefits of ambulatory facial feminization surgery. The COVID-19 pandemic has demonstrated that with proper screening, many elective procedures are safe to perform in an ambulatory setting.1 This is the first study of its kind analyzing the results, benefits, and safety of FFS without postoperative hospital admission.

Methods: A total of 97 patients who underwent facial feminization surgery at a single institution were evaluated in a retrospective analysis. Patient charts were reviewed for length of stay, operation type, surgery duration, complications, post-operative Emergency Department or Urgent Care (ED/UC) visits, readmission, and demographic factors. Major outcomes including complication rates, readmission, and ED/UC visit rate were compared between groups with same day discharge and postoperative hospital admission.

Results: Emergency Department and Urgent Care visit rates were comparable between patients who were discharged same day (25.0 percent) versus patients who were admitted postoperatively (23.1 percent), $p = 0.83$. There was no significant difference in major complication rates between the two groups (6.25 percent for ambulatory vs 3.08 percent for admission, $p = 0.46$). There was also no significant difference in minor complication rates (12.5 percent for ambulatory vs 12.3 percent for admission, $p = 0.98$), with temporary facial nerve weakness, infection, and hematoma being the most common postoperative complications. Risk of ED/UC visits and readmission was not correlated with longer operative times ($r(95) = 0.03$, $p = 0.78$). There were no mortalities and no difference in the need for operative revision between the two groups (3.13 percent for ambulatory vs 10.8 percent for admission, $p = 0.20$). Patients who had surgeries over 5 hours long were more likely to be admitted postoperatively (0.31 percent for ambulatory vs 0.66 percent for admission, $p = 0.0012$).

Conclusions: There was no significant difference in major complication rates, minor complication rates, ED/UC visits, readmission risk, and need for operative revision between

patients who had same day FFS and postoperative admission. Neither ED/UC visits nor overall complication rates were correlated with increased operative time. Ambulatory FFS is considered a safe practice and does not result in increased adverse events.

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Gender Authorship Trends Among Craniofacial Publications in the Past 20 Years: Where Are We Now?

Abstract Presenting Author:
Fei Wang BA

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Joseph Ricci MD

Purpose: Women surgeons remain underrepresented in academia and leadership, arenas heavily dictated by research productivity. Though recent publications have examined authorship trends in plastic surgery as a whole and other surgical specialties, limited studies have evaluated gender disparities within the subspecialty of craniofacial surgery, a field that is especially academically oriented but in which women only comprise 8% of all practicing surgeons globally.1-4

Methods: Craniofacial articles published in Plastic and Reconstructive Surgery (PRS), Annals of Plastic Surgery (APS), and Journal of Craniofacial Surgery (JCFS) from 2000-2020 were reviewed and evaluated in 5-year increments. Information regarding author gender, authorship distribution, geographic origin, and publication type was collected. ANOVA, chi-square, and multivariable logistic regression modeling were used for analysis.

Results: In total, there were 3,684 articles with 15,206 total authors -- 3,128 (20.6%) were women, including 665 (21.3%) first authors, 1,980 (63.2%%) middle authors, and 487 (15.7%) senior authors. Mean women authorship increased significantly from 2000 to 2020 (0.33 vs. 1.22 $p < 0.001$) with corresponding significant increases in first and senior authorship (8.63% vs. 27.02; 5.65% vs. 16.13%; $p < 0.001$). Statistically significant trends across time were observed for first and senior authorships in all journals with the exception of senior authors in the APS cohort ($p<0.001$). Women were more likely to publish original publications as first and senior authors (OR: 1.83, $p < 0.001$; OR: 1.37, $p = 0.0012$). Conversely, women were least likely to be first or senior authors in editorials (OR 0.4, $p<0.001$, OR 0.6, $p<0.001$). Analysis for global trends demonstrated that the U.S. ranked 3rd in overall publication output by female first authors but was behind all regions except Africa for output by female senior authors.

Conclusion: Research productivity remains a pillar on which academic careers are built. As more women surgeons enter the field of craniofacial surgery, it is essential to maintain

contemporary data for female publication rates within the specialty. Though a significant gap remains, this analysis demonstrates a sustained trend of increasing authorship over the decades.

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Evaluation of Lateral Pharyngeal Wall Motion Following Secondary Palatal Reconstruction Techniques

Abstract Presenting Author:
Annahita Fotouhi

Abstract Co-Author(s):
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Lynn Marty Grames
Gary Skolnick MBA
Alison Snyder-Warwick MD
Kamlesh Patel MD

Background: Surgical management of velopharyngeal dysfunction traditionally focuses on changes in velar closing ratio (soft palate and posterior pharyngeal wall motion) following secondary palatoplasty. Here, we investigate whether lateral pharyngeal wall motion, another vital component of velopharyngeal closure during speech production, improves after secondary palatal reconstruction.

Methods: A retrospective review of all patients who underwent secondary palatoplasty to correct velopharyngeal dysfunction from 2015 to 2021 was performed. Type of secondary procedure was categorized into three groups: pharyngeal flap, palatal re-repair with buccal flaps, and palatal re-repair without buccal flaps. Lateral wall motion and speech outcomes were assessed preoperatively and postoperatively using direct measurements from videofluoroscopic imaging and a four-point perceptual speech score, respectively. Patients were excluded if any portion of

the evaluation was missing.

Results: Twenty patients with complete assessments were included. Lateral wall motion significantly improved following secondary palatoplasty (38% to 75.4%, $p < 0.001$). Patients who underwent a pharyngeal flap demonstrated significantly better improvements in lateral wall motion compared to other repair methods ($p = 0.044$). However, postoperative percent closure was equivalent among the three techniques ($p = 0.174$). Compared to preoperative assessments, postoperative perceptual speech evaluation scores significantly improved (2 to 0, $p < 0.001$).

Conclusions: All patients undergoing either pharyngeal flap, re-repair with buccal flaps, or re-repair without buccal flaps exhibited improvements in lateral pharyngeal wall closure. These findings suggest that assessment of lateral wall motion may be a vital component in evaluating surgical management and postoperative outcomes.

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Teaching Unilateral Cleft Lip Repair: Lessons Learned From Simulation

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Background: Traditionally, learning how to perform cleft lip repair required becoming familiar with markings, followed by learning the operation through assisting with surgery. During a recent study examining the use of cleft lip simulation for evaluating surgical aptitude and impact on long-term learning, we noticed residents and fellows often skip or inadequately perform crucial steps in the procedure. That surprising observation inspired the current study, which aims to identify specific areas for improvement in teaching of cleft lip repair.

Methods: Secondary analysis of existing data looked granularly at performance during an uncoached cleft lip repair on a high-fidelity simulator. Simulation videos were anonymously rated by two surgeons using an 18 item Unilateral Cleft Lip Repair competency assessment tool (1-3 scale for each item), subdivided into "Marking", "Performing", and "Result" sections. Mean scores for each skill were rank ordered to identify elements of the procedure that participants performed best (indicating adequate teaching) and worst (suggesting improvement needed). Association between objective outcome (represented by a digitally measured symmetry index) and performance on particular steps of the procedure was examined using Pearson R to determine which items were most important for a symmetrical result, and which were likely to improve with progression through training (ie. correlated with PGY).

Results: Simulation participants (n=26) of all training levels scored highest on skills in the "Marking" subscale (2.38-2.63 mean score). Participants scored relatively poorly on some items of the "Performance" subscale (2.00-2.46 mean score), and most items of the "Result" subscale (1.67-2.25 mean score). Procedural steps that scored lowest were: closing the nasal floor (2.00), repairing oral mucosa (2.15), avoiding over/under-dissection (2.19), avoid unneccessarily retaining or resecting tissue (2.21), and fully mobilizing the lesser segment (2.23). Interestingly, while the latter three items all significantly correlated with symmetry of the repair (R=-0.54, -0.59, and -0.66 respectively) and with PGY (R=0.48, 0.47, and 0.45 respectively), the former two items did not correlate with either symmetry or PGY.

Conclusion: All elements of marking a unilateral cleft lip repair scored well, suggesting that simulators and likely educators appropriately teach cleft marking. Skills involving tissue handling and understanding tissue mobility improve with higher training levels, likely because these are universal plastic surgical concepts that progress with experience. Scores for closing the nasal floor and repairing the oral mucosa scored lowest and did not improve with higher training levels; this suggests we do not optimally teach these maneuvers, perhaps because they are harder to see and understand while watching an operation. Although they do not correlate with external appearance (symmetry), these elements are important for functional outcome, because leaving the nasal floor open creates a persistent oronasal fistula that allows food escape into the nose. Inadequately repairing oral mucosa can allow the labial sulcus to herniate downward with smiling. Proposed interventions include dedicated teaching for these nuanced steps, and incorporating more video and simulation to demonstrate maneuvers that are difficult to visualize in vivo.

Trends in Natural Decannulation in Patients with Robin Sequence: A Twenty-five Year Retrospective Review

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Introduction: Robin sequence (RS) is defined by micrognathia and glossoptosis that result in upper airway obstruction (UAO). In RS patients who undergo tracheostomy, long-term goals include decannulation without further surgical intervention (natural decannulation). The objective of this study was to identify long-term trends in rate and length of time to natural decannulation.

Methods: A retrospective chart review was performed on 151 RS patients treated at a large pediatric tertiary center from 1995 to 2020. Patients with UAO treated with tracheostomy were grouped by year of tracheostomy: 1995-2004, 2005-2014, and 2015-2020. Demographic data, UAO management, postoperative care, complications, and time to decannulation were recorded.

Results: Thirty-six patients (n=36) met the inclusion criteria (50% syndromic RS). Median UAO

treatment age was 9.5 days [0 to 571 days of age]. Nearly 53% (n=19) of patients were naturally decannulated. Median time to decannulation was 7.2 years. Syndromic RS had significantly longer median time to decannulation (24.6 years vs. 3.0 years; p= 0.003). Natural decannulation rate was higher in the non-syndromic RS patients (78% non syndromic vs. 28% syndromic; p= 0.003) and during the first study period (1995-2004: 73%, 2005-2014: 36%, and 2015-2020: 43%; $p<0.05$). Pre-operative capillary blood gas max-CO_2 was higher in patients with syndromic RS (80 mEq/L vs. 67 mEq/L; p= 0.036). Univariate and multivariate regression analyses failed to demonstrate significant factors associated with barriers in getting decannulated. The rate of tracheostomy-specific complications was 54%, with an overall mortality rate of 3%.

Conclusion: Syndromic RS and higher pre-op max-CO_2 were associated with long-term tracheostomy dependency. Decannulation rates were higher in the 1995-2004 patient subgroup, likely because tracheostomy is now only used in the most severe cases at our institution and mandibular distraction osteogenesis has become accepted primary surgical treatment in severe RS upper airway obstruction.

Cleft-Q Integration At A Multidisciplinary Cleft Lip and Palate Clinic: A Prospective Study Evaluating Clinical Decision Making

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Introduction: Clinical management of patients with cleft lip and palate (CL/P) optimally involves a multidisciplinary team but has historically reflected surgeon assessment of patient appearance and function. For patients undergoing surgical correction of CL/P, Cleft-Q is a condition-specific, validated PRO with twelve modules that assesses aesthetic, functional, and psychosocial outcomes. Cleft-Q is a useful tool for capturing CL/P patient perceived outcomes; however, patient self-reported perceptions captured by Cleft-Q may differ from patient verbally expressed perceptions during clinical visits, as well as clinician perceptions of functional and aesthetic outcomes. Additionally, it is unclear how the use of Cleft-Q alters clinical and surgical decision making. The aim of this study was to 1) characterize discordance between patient reported perceptions via Cleft-Q results and patient verbally reported perceptions in clinic and 2) characterize the impact of Cleft-Q on clinical decision making.

Methods: Patients eight years of age and older were prospectively, consecutively enrolled at a tertiary cleft center. The validated Cleft-Q PRO instrument was completed prior to the clinic visit. The attending surgeon was initially masked to Cleft-Q findings and conducted a standard clinic visit with formulation of a provisional assessment and plan. The Cleft-Q data was then reviewed by surgeon and patient together, and clinical plans were appropriately revised. Discrepancies in verbal and scored PRO responses greater than one standard deviation from normative data were considered discordant.

Results: Twenty-three patients (14 males) at average age of 14.1 ± 3.1 years were included in this prospective study. Nine patients (39.1%) had at least one module of discordance. Discordance was most common in sectors of lip appearance (n = 5, 21.7%), jaw appearance (n = 5, 21.7%), and lip scar appearance (n = 4, 17.4%). Discussion of discordant Cleft-Q results prompted additional conversation regarding management options or clinical course in seven patients (77.8%) and augmented the original clinical management plan in four (44.4%) cases. Two patients were provided non-surgical subspecialist referral and two patients were suitable for surgical management. One patient underwent a recent surgery where an opportunity for concurrent surgical treatment of a separate problem was missed.

Conclusions: Early results in this ongoing prospective study suggest implementation of Cleft-Q can identify discordance between patient perception and goals compared to standard surgeon assessment in over one-third of cases, most commonly around lip, lip scar, and jaw appearance. Furthermore, the use of Cleft-Q generated additional conversation or augmented clinical management in a high proportion of patients with discordant results.

Concurrent Furlow Palatoplasty and Tonsillectomy for the Simultaneous Treatment of Velopharyngeal Insufficiency and Tonsillar Hypertrophy is Safe and Does Not Compromise Restoration of Velopharyngeal Competence

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Background: The primary goal of cleft palate repair is restoration of normal speech production. Cleft palate-related velopharyngeal insufficiency (VPI) is common, and surgery is the mainstay of treatment. Most surgical treatments for VPI, such as Furlow palatoplasty, decrease the size of

the velopharyngeal (VP) port, and in doing so incur a risk of postoperative obstructive breathing. In patients with VPI and concomitant tonsillar hypertrophy with baseline sleep disordered breathing (SDB), tonsillectomy at time of Furlow palatoplasty has been employed. Tonsillectomy itself, however, demucosalizes the pharynx and alters the size of the VP port, and it remains unclear whether this incurs increased surgical complications or compromises speech outcomes when done concurrently with Furlow palatoplasty.

Methods: A retrospective review of patient records from the University of Rochester Medical Center from January 2015 to January 2022 was conducted. Patients with cleft palate related VPI treated with Furlow palatoplasty were identified. Patients with submucous cleft (SMC) palate who underwent primary Furlow palatoplasty for treatment of VPI and patients with prior straight line primary palatoplasty who underwent conversion Furlow palatoplasty for treatment of VPI were included. Data points included patient demographics, Veau classification, postoperative complications, and preoperative and postoperative Modified Pittsburgh Weighted Speech Scale (mPWSS) scores.

Results: Thirty-two patients met inclusion criteria. Eight patients (25%) underwent Furlow palatoplasty and concomitant tonsillectomy, while 24 patients (75%) underwent Furlow palatoplasty alone. The median age at time of surgery for the Furlow-tonsillectomy group was 6 years [IQR 4.5-8.5] compared to 4 years [IQR 2.75-5, p=0.039] for the Furlow only group. Twelve patients (37.5%) had a Veau III or IV cleft palate, 11 patients (34.4%) had a SMC palate, and 9 patients (28.1%) had a Veau I or II cleft palate. There was no significant difference in cleft palate type between groups (p=0.431). There was a greater number of syndromic cleft palates in the Furlow-tonsillectomy group (n=2, 25%) compared to the Furlow only group (n=0, 0%, p=0.01).

There was no significant difference in median preoperative mPWSS scores for patients in the Furlow-tonsillectomy (11.5, IQR 9.75-12) versus Furlow only (12, IQR 11-14, p=0.252) groups. A significantly lower median postoperative mPWSS score, corresponding to better velopharyngeal function, was reported for patients in the Furlow-tonsillectomy group (0, IQR 0-0) compared to the Furlow only group (1, IQR 0-9, p=0.046). Nonetheless, the delta between pre- and post-operative mPWSS scores was not significantly different between groups (p= 0.743). No surgical complications were encountered in either group. Five patients (20.8%) in the Furlow only group required an additional surgical procedure, Pharyngeal Flap or Sphincter Pharyngoplasty, for persistent VPI post-Furlow palatoplasty. No patients in the Furlow-tonsillectomy group required additional surgical treatment for VPI (0%, p=0.16).

Conclusion: Tonsillectomy at time of Furlow palatoplasty is utilized in patients with both VPI and baseline tonsillar hypertrophy to lessen the risk of postoperative obstructive breathing. Despite demucosalizing the pharynx and altering the size of the VP port, tonsillectomy performed concurrently with Furlow palatoplasty is safe, without increased risk of surgical complications, and does not compromise post-Furlow palatoplasty speech outcomes.

Analgesics and Antibiotics Utilization After Mandibular Distraction Osteogenesis in Infants with Pierre Robin Sequence

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Introduction: Determining appropriate treatment for patients with Pierre Robin Sequence (PRS) requires considering potential airway lesions in concordance with potential feeding problems [1-2]. Treatment options may include observation, tongue-lip adhesion, mandibular distraction osteogenesis (MDO) or tracheostomy [3-5]. MDO has shown superior outcomes in many studies, but there is currently a dearth of literature evaluating the use of antibiotics and analgesics in patients undergoing MDO. In this study, we investigated the effects of duration and dosage of analgesic and antibiotic administration on outcomes for this cohort of patients.

Methods: An IRB-approved retrospective review was performed on every patient who underwent MDO by a single surgeon at our tertiary care center between September 2016 and May 2021. Variables included were patient demographics, analgesics administration, antibiotics administration, and post-operative outcomes. Statistical analysis was performed using R.

Results: There were 39 total cases with the majority being isolated PRS (iPRS) with no significant differences in age, sex, or age at time of operation when stratified by isolated and syndromic PRS (sPRS; $p>0.05$; table 1). In this cohort, 28% of patients were treated with a Methadone wean. sPRS patients were more likely to receive IV antibiotics for longer periods of time and were more likely to be on a Methadone wean ($p<0.05$). The patients who required Methadone had a shorter latency time of 10.4±1.4 days compared to 12±7 days in the cohort that did not have a wean ($p = 0.04$). Patients who required Methadone were on IV antibiotics for 8±2 days compared to 5±3 days in those who did not require Methadone ($p = 0.01$).

Conclusion: There were no significant differences in patient demographics between the iPRS and sPRS cohorts. sPRS patients received more IV antibiotics and were more likely to be treated with a Methadone wean from their analgesic utilization. Patients who required Methadone had a shorter latency time and received IV antibiotics for longer periods of time. There were no significant differences in surgical complications between the sPRS and iPRS cohorts and the Methadone use cohorts.

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The Effects of Gingivoperiosteoplasty and Cleft Palate Repair on Facial Growth

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Purpose: Though gingivoperiosteoplasty (GPP) can stimulate bone growth across an alveolar cleft in up to 60% of patients, some providers remain hesitant to adopt this practice due to concerns regarding associated negative effects on maxillary growth. The coexistence of hard palate surgery, an intervention known to have negative effects on midface projection, has confounded previous studies investigating the impact of GPP on maxillary growth. This study quantifies the effects of GPP with and without cleft palate repair on maxillary growth at the age of mixed dentition.

Methods: A single institution, retrospective study was performed of all patients with unilateral cleft lip and alveolus, with or without cleft palate, who underwent primary reconstruction between 1993 and 2014. All study patients had lateral cephalograms obtained at age of mixed dentition (6-13 years). Patients were stratified into four mutually exclusive groups: isolated cleft lip and alveolus with GPP (CLA+GPP), CLA without GPP (CLA-GPP), cleft lip and palate with GPP (CLP+GPP), and CLP without GPP (CLP-GPP). Demographic and surgical data were collected from review of patient records. Lateral cephalograms were digitized and traced by an orthodontist. Cephalometric measurements included: sella-nasion-point A (SNA, maxillary projection), sella-nasion-point B (SNB, mandibular projection), and A point-nasion-B point (ANB, maxillomandibular relationship). Landmarks were compared to age-matched Bolton normative data using a paired Wilcoxon rank test, and between patient groups using an independent samples Kruskal Wallis test.

Results: A total of 110 patients met inclusion criteria. Among patients with CLA, seven patients

did not undergo GPP and 16 underwent GPP. Among patients with CLP, 24 patients did not undergo GPP and 63 underwent GPP. For patients with an isolated cleft clip and alveolus with or without GPP compared to normative data (CLA+GPP vs. normative, and CLA-GPP vs. normative), there was no significant difference in SNA or ANB, though SNB was decreased for the CLA+GPP group compared to normative data ($p<0.05$). For patients with a cleft palate with and without GPP compared to normative data (CLP+GPP vs. normative, and CLP-GPP vs. normative), SNA, SNB, and ANB were significantly lower ($p<0.01$). However, there were no significant differences in SNA, SNB, and ANB when comparing CLP patient groups with and without GPP (CLP+GPP vs. CLP-GPP). In patients who did not receive GPP, SNA was significantly lower in patients with a cleft palate compared to patients with an intact palate (CLP-GPP vs. CLA-GPP, $p < 0.05$).

Conclusion: Patients with isolated cleft lip and alveolus who underwent GPP had maxillary growth patterns that were comparable to Bolton normative data at the time of mixed dentition. In patients with cleft palate, there was a significant decrease in maxillary projection regardless of GPP status. Our findings confirm the known deleterious effect of palate repair on maxillary growth, while also suggesting that GPP is not associated with maxillary growth disturbance by the age of mixed dentition.

Implementation of an Ambulatory Cleft Lip Repair Protocol: Surgical Outcomes

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Purpose: Cleft lip repair has traditionally been performed as an inpatient procedure. Consistent with recent focus on reducing healthcare costs, there is growing interest in ambulatory cleft lip repair. Retrospective reviews have reported comparable outcomes between inpatient and outpatient cleft lip repair, but only based on pooled data without protocol-driven care. We report surgical outcomes following implementation of an ambulatory protocol for unilateral (UCL) and bilateral (BCL) cleft lip repair.

Methods: We performed a single-institution retrospective study of patients undergoing primary cleft lip repair between 2012-2021 comparing surgical outcomes before and after protocol implementation in 2016. The ambulatory protocol selected non-syndromic patients without airway or cardiac abnormalities and involved morning surgery, long-lasting local anesthesia, and included parental education with direct post-operative access to the clinical team. Variables

included patient demographics, operative details, length of stay, surgical outcomes including 30-day readmission and 30-day reoperation, and patient contact with clinic following discharge.

Results: 226 patients with UCL and 58 patients with BCL met study criteria. The UCL group contained 82 pre-protocol and 144 post-protocol patients; the BCL group contained 10 pre-protocol and 48 post-protocol patients. There were no differences in rates of 30-day readmission, reoperation, or wound complications between pre- and post-protocol cohorts. Following protocol implementation, 116 (80.6%) of the UCL group and 27 (56.3%) of the BCL group underwent ambulatory surgery. Average length of stay decreased from 27 to 7 hours ($p<0.05$). The 32 (22.2%) of UCL group and 21 (43.8%) of BCL group staying overnight had higher rates of congenital abnormalities (UCL 42.9%, BCL 38.1%) than the ambulatory cohort (UCL 8.8%, BCL 7.4%), with higher ASA class ($p<0.05$). Ambulatory and overnight stay patients had no differences in surgical outcomes. Contact with the clinic between discharge and follow up was made by 9 (32.1%) families in the UCL group and 4 (19.1%) families in the BCL group staying overnight versus 21 (14.6%) in the UCL and 7 (25.9%) in the BCL ambulatory cohorts. Most common reasons for contact by family were wound management (40%), feeding concerns (23.3%), and pain management questions (16.7%). In the UCL group, one patient in each ambulatory and overnight stay group followed up in an emergency department following discharge prior to their follow up appointments for respiratory complaints. No patients required admission. In the BCL group, one patient required readmission for management of non-cleft related problem and two patients required prolonged hospital stay due to pre-existing respiratory issues. No discharged patients required cleft-related healthcare visit prior to first clinic follow up.

Conclusions: An ambulatory cleft lip repair protocol incorporating morning surgery, appropriate patient stratification, and parental education allows for safe ambulatory surgery in unilateral and bilateral cleft lip patients, reducing length of stay without adversely affecting surgical outcomes. Pending patient eligibility and cleft center resources, utilization of an ambulatory protocol can help decrease costs and utilization of healthcare resources while maintaining an appropriate standard of care.

Patient Factors Associated with Novel Ear-Q Appearance, Psychological and Social Scales: A Cross-sectional Study and Regression Analysis

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Introduction: Our research team rigorously developed and validated the EAR-Q, a patient-reported outcome measure that evaluates ear appearance and health-related quality of life (HRQL) in patients with congenital or acquired ear conditions. Scales are scored from 0-100, with higher scores representing better outcomes. The aim of this study was to conduct an

exploratory regression analysis to examine factors associated with scores on Ear appearance and HRQL scales.

Methods: Participants were aged 8-29 years, with a congenital or acquired ear conditions, and completed at least one scale of the EAR-Q as part of the international field-test study. Patients completed demographic and clinical questionnaires, 4-point Likert satisfaction with ear appearance, as well as the EAR-Q. A simple linear regression analysis was used to identify factors associated with scores on each scale. Statistically significant predictor variables were included in a multivariable regression model.

Results: At least one EAR-Q scale was completed by 862 participants. Most participants were male (57.4%), awaiting treatment (55%), with a microtia diagnosis (70.4%). Mean participant age was 13(±4). Worse Appearance scale scores were associated ($p<0.01$) with male gender, microtia, no history of treatment, ear surgery within 6 months, unilateral involvement, and self-reported dissatisfaction with ear appearance (4-point scale). Decreased psychosocial scale scores were associated ($p<0.01$) with increasing participant age, no history of treatment, recent ear surgery and participant reported dissatisfaction with ear appearance (4-point scale). Lower Social scale scores were associated ($p\leq0.04$) with patients who had no history of treatment and awaiting surgery, ear surgery within 6 months, bilateral involvement, and self-reported dissatisfaction with ears (4-point scale).

Conclusions: This analysis provides evidence of patient factors that may influence Ear appearance and HRQL scale scores. Clinicians should follow-up patients who are pre-treatment, had recent surgery, and/or express dissatisfaction with their ears to address areas of concern in their scale scores.

Determination of Novel, Cranium-based Relationships for Construct Placement in Microtia Reconstruction for Hemifacial Microsomia Patients

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Purpose: Microtia reconstruction is a challenge among the Hemifacial Microsomia (HFM) population. Namely, mirroring the usual facial landmarks is a moot endeavour in regards to placement of the constructed auricle. In reality, however, the ear lies on the cranium, which may be unaffected in HFM. Therefore, the goal of this study is to determine if the ideal location of the construct in microtia reconstruction for HFM can be accurately derived from the cranium.

Methods: A retrospective review of all HFM patients treated at our institution from 2000 - 2021

was conducted. Age-matched controls were similarly retrieved. High-resolution CT images were analyzed through craniometric linear relationships on Multi-Planar Reconstruction (MPR) images, generated by the Voxar 3D workstation. A Bonferroni correction was applied to all statistical analyses.

Results: Thirty-six patients accounting for 44 CT scans were included. Patients were on average 10.57 +/- 7.2 years old. Image analysis suggests the posterior cranial vault is unaffected in HFM ($p > 0.001$). Further, craniometric relationships between the tragus and the foramen magnum, as well as between the tragus and the posterior cranium, have been shown to be highly similar and equally precise in predicting tragus position in healthy controls ($p > 0.001$). These relationships hold true across all age groups ($p > 0.001$), and importantly among HFM patients, where the mean absolute difference in predicted tragus position never surpassed 1.5mm.

Conclusions: Rather than relying on often distorted facial relationships or one's experience, simple but effective relationships between the tragus and the cranium are proposed to guide in the pre-operative planning of symmetric construct placement in microtia reconstruction for HFM patients.

Characterization of Regional Morphological Changes in Metopic Craniosynostosis following Endoscopic Strip Craniectomy with Post-operative Helmeting

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Background: Metopic craniosynostosis (MC) accounts for 10-25% of all craniosynostosis cases with clinical features including trigonocephaly and hypotelorism.1,2 Endoscopic assisted strip craniectomy (ESC) with subsequent use of orthotic molding helmets provides a minimally invasive alternative to open fronto-orbital advancement. 3 Historically, two-dimensional craniometric data such as cephalic index and cranial vault asymmetry index have been used to measure outcomes following surgical intervention for CS. 4 The objective of this study was to use 3D photogrammetry data to examine regional cranial growth patterns following ESC and band therapy as well as establish its use in generation of an interfrontal angle (IFA) as an outcome measure.

Methods: Institutional Review Board (IRB) approval was obtained, and a single center retrospective review was performed of patients from 2015-2019 with MC who were treated with

ESC and band therapy. Patients received 3D photogrammetry at pre- operative, post-operative, and post-helmet therapy time points. Craniometric landmarks were established using Vectra TM (Canfield Scientific, Parsippany, NJ) and cranial regions were specified by the following borders: Frontal (Anterior fontanelle (AF), sagittal frontal prominence (SFP), frontal process of zygoma (FZ), and pterion (PT)), Temporal (FZ, PT, Tragus (TR), and Eurion (EU)), Parietal (AF, PT, EU, and Occipital Prominence (OCP)), and Occipital (TR, EU, and OCP). These regions were then compared between the pre-surgical and post-band images to assess for root mean square (RMS) change. IFA was determined by the angle generated by the SFP and supraorbital notches. Data was then compiled (Excel, Microsoft Corporation), and analyzed using R Software (R Foundation for Statistical Computing, Vienna, Austria).

Results: Twelve patients with MC met inclusion criteria and had complete records. Median age at surgery was 4 months (2.75-5) with mean treatment time in band of 5.67 months ± 1.97. ANOVA demonstrated a significant difference in mean RMS change ($p < 0.001$), with post-hoc testing showing that frontal (14.04mm ± 5.64) and parietal (15.37mm ± 4.55) were significantly greater than changes in the temporal region (7.39mm ± 3.67, $p = 0.015$ and 0.002 respectively). No significant differences were identified with the occipital region (10.98mm ± 4.9) . IFA was found to be significantly increased in post-band vs pre-operative imaging (117.28 ° ± 10.99 vs 127.87 ° ± 7.59, $p = 0.02$).

Conclusion: In patients with metopic craniosynostosis, those undergoing endoscopic strip craniectomy with postoperative helmet molding had an improvement in their inter-frontal angle. Furthermore, the helmeting period led to region-specific changes, preferentially in the frontal and parietal areas with less change in the temporal area. These observations may assist in providing morphologic expectations for both the surgeon and their patients.

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Critical Analysis of Spring Assisted Cranioplasty Peri- and Post-Operative Results: Does Spring Selection Make a Difference?

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Introduction: Spring-Assisted Cranioplasty (SAC) is an effective surgical treatment for scaphocephaly in sagittal craniosynostosis for patients who present early in life. The goal of SAC is to widen the cranial vault in the lateral dimension in order to restore normal aesthetic head shape and minimize brain growth restriction. There are several modifiable parameters in SAC procedures: the number of springs, the spring force and maximum excursion width, and the age at surgery. The purpose of this study is to examine the relationship between these parameters and postoperative head shape outcomes as measured by cephalic index (CI).

Methods: Patients with sagittal craniosynostosis who underwent spring-assisted cranioplasty at a single center from 2014-2021 were included. Patients with multi-suture involvement were excluded. Clinical and radiographic data were collected to summarize the pre-, peri-, and postoperative courses.

Results: Sixty-two patients were identified who underwent SAC for isolated sagittal craniosynostosis. Forty-five patients were male (73%) and 3 patients were syndromic (5%). The average age at surgery was 4.54 ± 0.83 months (range 2.93 – 6.43 months). The average number of springs implanted was 2.4 ± 0.5, the average spring force used was 7.4 ± 0.4 N, and the average excursion was 72.3 ± 4.0 mm. The average operative time was 1.4 ± 0.3 hours, the average EBL was 37.7 ± 36.2 mL, and the average length of hospital stay was 1.3 ± 0.6 days (range 1-3 days). One patient (1.6%) developed a scalp abscess that required a washout and zero patients required additional reconstructive surgery. The average preoperative CI was 67.8 ± 4.4, the average postoperative CI was 75.0 ± 4.7, and the average percent change in CI from pre to post-op was 10.2 ± 7.2%. There were no statistically significant linear associations between age at surgery and change in CI ($p=0.53$, $R2=0.009$), spring force and change in CI ($p=0.69$, $R2=0.004$), spring excursion and change in CI ($p=0.88$, $R2=0.002$), number of springs and change in CI ($p=0.30$, $R2=0.027$), or duration of implantation and change in CI ($p=0.23$, $R2=0.03$). There was, however, a significant association between preoperative CI and postoperative CI ($p<0.001$, $R2=0.33$) and between preoperative CI and change in CI ($p<0.001$, $R2=0.30$).

Conclusion: The change in CI from pre- to post-op was not affected by age at surgery, spring force or excursion, or number of springs. Despite the hypothesis that such parameters can be selected to increase or decrease the degree of head shape change, these modifiable factors do not seem to correlate with CI. However, CI is a reductive measure of scaphocephaly and aesthetic results in sagittal CS – more robust analyses will be performed with vertex position algorithmic severity indices. Nonetheless, these results confirm the excellent success of spring cranioplasty at our institution over the nine-year period.

Quantification of Surgical Overcorrection and Long-Term Outcomes in Patients with Metopic Craniosynostosis Using a Novel Machine Learning Assessment Tool

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Introduction: Surgical correction of metopic craniosynostosis is variable, with many different techniques in practice. Operations range from no overcorrection to significant overcorrection of the bandeau anteriorly and temporal regions laterally. The purpose of this study is to objectively quantify the degree of overcorrection using our surgical technique and long-term morphological changes using CranioRateTM, a novel machine learning skull morphology assessment tool.

Methods: Patients with preoperative and postoperative CT scans who underwent fronto-orbital advancement (FOA) for metopic craniosynostosis were included. CranioRateTM, a novel shape analysis algorithm, was used to quantify the severity of metopic synostosis at each time point; Metopic Severity Score (MSS) measures "metopic-ness" and Cranial Morphology Deviation (CMD) measures cumulative difference from a normal skull in a non-specific direction.

Results: Fifty-five patients were included, average age at surgery 1.3 years. Twenty patients underwent long-term CT scan at an average of 1.8 years postoperatively. Preoperative MSS was 6.3 ± 2.5, postoperative MSS was -2.0 ± 1.9, and long-term MSS was 1.3 ± 1.1. Preoperative CMD was 199.0 ± 39.1, postoperative CMD was 208.0 ± 27.1, and long-term CMD was 179.8 ± 28.1. Both measures approached normal values at long-term follow-up (defined as 0 for MSS, 182 for CMD). There was a significant relationship between preoperative MSS and long-term MSS (R^2=0.70) but no relationship between preoperative MSS and postoperative MSS (R^2=0.01).

Conclusion: MSS and CMD show precise postoperative results that quantify surgical overcorrection and capture the normalization of head shape over time. The MSS outcomes show the result of overcorrection, as patients had a negative MSS value indicating a skull that is less "metopic" than a normal patient. CMD worsened postoperatively, which is a result of the bony changes and dysmorphology following FOA. All patients had statistically similar postoperative metopic severity, with no significant association with preoperative severity, a result that confirms that every patient receives the same overcorrection procedure at this institution regardless of presenting severity. However, more severe patients had worse long-term severity, which reinforces that regression to the metopic shape is a postoperative risk that increases with preoperative severity. It is hypothesized that this long-term regression of shape may be due to tight soft tissue closure over the newly formed bandeau and temporal regions, although contributing factors must be investigated further. In addition, these results reinforce the need for

surgical overcorrection in patients with metopic craniosynostosis. This novel study demonstrates the quantification of short- and long-term follow-up in metopic patients.

Management and Outcomes of Patients who Present with Sagittal Craniosynostosis After the Age of One Year and 6-Year Follow-Up

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Introduction: While early diagnosis and management are the hallmarks of successful craniosynostosis treatment, some patients present after the age of one year with new-onset or previously undiagnosed sagittal craniosynostosis. Potential long-term sequelae of untreated craniosynostosis include elevated ICP, vision loss, neurologic deficits, and developmental delay. We previously published our protocol to treat this complex group of patients. Here we present a follow-up and update of this cohort to evaluate intermediate-term outcomes of our treatment protocol.

Methods: This study includes patients with isolated sagittal craniosynostosis who presented to UPMC Children's Hospital between July 2013 and April 2021 for an initial consultation after the age of one year. All patients underwent a detailed physical exam, a dilated fundoscopic exam and visual evoked potential testing. Reconstructive surgical intervention was recommended for patients with abnormal ophthalmic examinations, elevated intracranial pressure or severe head shape anomalies.

Results: 108 patients met inclusion criteria. The average age at presentation was 5.2 ± 3.4 years. Seventy-nine (73.1%) were male, and 15 (13.9%) were syndromic. The indications for imaging were head shape (54.6%), headache (14.8%), trauma (9.3%), seizure (4.6%), papilledema (2.8%), and other (13.9%). Of the 108 patients, 12 (11.1%) underwent surgery following their initial consultation: 5 for papilledema, 4 for elevated ICP, 2 for severely scaphocephalic head shapes, and 1 for abnormal fundoscopic findings. Two of these patients underwent additional reconstructive surgery, one for the recurrence of papilledema and headache and the other for forehead contour irregularities. The average length of time between surgeries was 4.9 years. Of the 96 patients who were initially conservatively managed, 4 (4.2%) underwent surgery at an average of 1.2 ± 0.5 years later (average age 4.4 ± 1.5 years) for aesthetic concerns (n=1), persistent, refractory headaches (n=1), Chiari malformation with syrinx (n=1), and shunt-

dependent hydrocephalus (n=1). The average follow-up was 23.9 ± 24.5 months.

Conclusion: We present our protocol for the management of late-presenting sagittal synostosis, involving symptomatic evaluation, objective testing, and morphologic assessment to recommend treatment. Patients who present with single-suture sagittal craniosynostosis after the age of one year require surgical correction less often than patients who present earlier in life, likely due to decreased severity of phenotype. The most common indications for operation were related to increased ICP or morphology. Few patients placed in the conservative treatment arm based on our algorithm ultimately required surgery (4%). Cranioplasty remains safe in older patients.

The Application of 3D Scanning and Ultrasound Technique in the Congenital Microtia Reconstruction with Tissue Expander

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Objective: The tissue expansion technique plays an essential role in microtia reconstruction surgery by creating an excellent skin envelope. Currently, there is no precise, non-invasive, and easy-to-operate method to evaluate the quantity and the quality of expanded skin flap in a real-time fashion. This study aimed to present our results combining 3D surface scanning technique with ultrasound technique to evaluate both the quantity and quality of expanded skin and help the surgeons with the decision-make process in nine microtia patients reconstructed with tissue expander and autologous cartilage.

Methods: Using the two-stage procedures, nine microtia patients were reconstructed by tissue expander and autologous cartilages. During the expansion, the surface area of the normal ear and expanded remnant ear were measured by the EinScan-pro 3D scanning machine. The coordinate system was established, and the 3D model of the ear and expander with its floor area was analyzed using the software. The thickness and elasticity of the expanded flap were measured by the Ultrasound and its shear wave elastography (SWE). The plastic surgeons proceeded with the second stage procedure of reconstruction based on these 3D scanning measurements, expanded skin condition, and other related factors such as the skin texture and total volume of expansion accordingly.

Results: Nine congenital microtia patients were enrolled in the study. The patients' age ranged from 8 to 28 years old. The expanders applied were 70 ml kidney shaped. The expansion time ranged from 121 to 176 days. The mean total volume of expansion was 181.6ml. After the expansion, the 3D scanning showed the mean expanded surface area of the remnant ear was 129.87cm2, the mean surface area of the normal ear was 42.29cm2. By subtracting the mean base area of the expander, which was 59.12cm2, all the measurements indicated there was extra skin for the following stage procedure. The thickness and elasticity of the expanded flap tissue are site-specific, range from 0.10cm-0.35cm and 40kPa-200kPa, respectively. All cases were successfully reconstructed by two-stage procedures with tissue expander and autologous cartilage with no complications. After one year of follow-up, the reconstructed ear showed stable and favorable contour.

Conclusions: Tissue expansion is an effective way to obtain excess skin envelop for microtia reconstruction. 3D scanning and Ultrasound technique helps the surgeons in the decision-making process by providing precise and objective information of the quantity and quality of the expanded skin flap.

Ultrasound as Sole Diagnostic Imaging Modality in Craniosynostosis

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Introduction: Craniosynostosis can present as syndromic or non-syndromic with varied clinical significance of both presentations. Simple craniosynostosis can present with a misshapen skull as the brain growth is biased away from the closed suture. In cases of multi-suture cranisynostosis, brain growth may be restricted leading to changes in neurological development or reduced bone growth to allow for brain tissue expansion. Many children with single-suture synostosis have normal intellectual development but are burdened with differences in their physical appearance, a major concern for their social and emotional development. Beyond physical differences, infants that have craniosynostosis are also at risk for other manifestations of their condition, for instance, defects in speech, vision, and hearing can manifest as cranial nerve impingement progresses. Craniosynostosis syndromes are diagnosed clinically and with imaging studies. In the United States, the gold standard of diagnosis is a computed tomography (CT) scan. This study, however, may be overly relied upon for the diagnosis of suspected craniosynostosis. Given the high sensitivity of ultrasound studies, and the risk of radiation from repeated CT scans, it is critical to update the diagnostic protocol of craniosynostosis, a condition that already poses risks to development even without the added risk of radiation exposure.

Methods: Patients at our institution with suspected craniosynostosis routinely undergo cranial suture ultrasound as their sole method of diagnosis. Data was retrospectively collected on patients evaluated for craniosynostosis and children who had craniosynostosis surgery at our institution including imaging modalities and results, surgical findings, diagnosis, and demographics.

Results: Craniosynostosis was diagnosed via ultrasound alone in 7 patients. This was subsequently confirmed intraoperatively on all patients. Patient age range was from 3-10 months. Two patients had sagittal synostosis, two had metopic synostosis, one had both metopic and sagittal synostosis and two had bicoronal synostosis.
Conclusion: Developing a diagnostic protocol that does not rely on CT scan would be of clinical benefit to the practitioners and patients alike. Historical studies have found cranial US to be a specific, sensitive, and reliable method of diagnosing craniosynostosis, but it has not been the sole diagnostic modality. This study demonstrates the utility of using ultrasound as a sole diagnostic modality in craniosynostosis.

Suture Fusion Severity and Midface Morphology in Crouzon Syndrome and Bicoronal Craniosynostosis

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Introduction: Early onset minor suture fusion in syndromic craniosynostosis is associated with midface dysplasia and is a common indication for craniofacial surgery. [1] However, the potential effects of fusion severity on craniofacial growth patterns is not well understood. This study seeks to describe the impact of minor suture fusion severity on midface morphology in Crouzon syndrome and bicoronal craniosynostosis.

Methods: Pre-operative computed tomography images (CT) of 63 patients with Crouzon syndrome, 29 patients with bicoronal craniosynostosis, and 63 normocephalic controls were included. Degree of suture fusion was assessed for the front sphenoidal suture, sphenoethmoidal suture, sphenosquamosal suture, sphenopetrosal suture, spheno-occipital synchondrosis, frontoethmoidal suture, and zygomatic sphenoidal suture. Sutures were evaluated in a thin client viewing platform (AQNet Version 4.4.13, TeraRecon Inc). Each suture was graded by two independent operators using on a 5-point scale introduced by Madeline and Elster. [2] Interrater reliability was assessed using Cohen's kappa. The sella (S), nasion (N), A point (A), basion (BA), and anterior nasal spine (ANS) landmarks were located and marked in Mimics® (version

24.0, Materialise). These points were then used to calculate the SNA angle, BA – ANS length of the lower midface, and N – S length of the upper midface. All analyses were performed using multiple linear regressions with $\alpha = 0.05$, 0.01, and 0.001 prior to Bonferroni corrections in R Statistical Software (version 4.1.0; R Foundation for Statistical Computing).

Results: The mean age was 42.9 ± 75.5 months and 43.9% were female. The control group had a significantly older age ($p < 0.01$) than the patients with Crouzon syndrome and bicoronal craniosynostosis. Interrater reliability indicated substantial agreement ($\kappa = 0.79$) between independent operators scoring degree of suture fusion.

Multiple linear regression results indicate the advanced fusion of the spheno-occipital synchondrosis in Crouzon syndrome correlates with regression of the BA – ANS length by 0.564 mm per incremental increase in suture fusion ($p < 0.01$). It was also found that the lower midface (BA – ANS) was restricted to a greater degree than the upper midface (N – S) with progressive suture fusion in all patient types with ratios of these rates ranging between 0.602 and 0.89 for the 7 sutures analyzed. Suture fusion severity did not impact the SNA angle in any of the analyses performed.

Conclusions: These results suggest the severity of sheno-occipital synchondrosis fusion in Crouzon syndrome is correlated with lower midface regression. Similarly, all anterior skull base sutures limited lower midface growth to a greater degree than the upper midface. These findings suggest structural consequences in the midface resulting from the rate and severity of suture fusion. Further investigation is needed to determine the effectiveness of early surgical intervention comparing outcomes when performed at each stage of suture patency.

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In-House Sterilized 3D-Printed Templates for Pediatric Cranioplasty: A Comparative Analysis

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Introduction: Reconstruction of pediatric cranial defects requires increased consideration of compact anatomy, unique congenital features, and decisions that will impact children over time.

The use of patient-specific three-dimensional printing (3DP) is expanding within the field of medicine and has the potential to help address the heightened demands in pediatric care by improving procedure efficiency, decreasing complications, and providing patient-specific solutions in comparison to conventional methods (1-3). We review the differences in surgical outcomes between 3DP-assisted cranioplasty and non-3DP-assisted cranioplasty performed at our pediatric hospital using our in-house 3D-printer.

Methods: Sequential patients were identified who underwent pediatric cranioplasty from 2015 to 2021. CT images were used to visualize the negative space of the cranial defect and create in-house 3D-printed patient-specific sterilizable templates. The 3D-printed guides were used intraoperatively to design the autologous bone graft used for cranial defect reconstruction. All harvested calvarial bone was split for autologous bone graft, with the priority being full autologous bone for the cranial defect. If this split was not complete enough for full reconstruction of the donor defect, bone allograft was utilized to augment the inadequate autologous bone at the donor site. Surgical outcome data was collected over an average follow-up period of 1.6 years, and pre-operative skull defect sizes were measured by two independent raters by utilizing 3DP software.

Results: In the past 5.5 years, 30 patients were identified who underwent 32 pediatric cranioplasty procedures, including 21 3DP-assisted and 11 non-3DP-assisted cranioplasty procedures. Cranial defect etiologies included prior craniosynostectomy (n=9), trauma (n=7), prior cranial vault remodeling (n=7), prior tumor resection (n=5), and prior fronto-orbital advancement (n=4). The average size of defects was 31.9 cm2 for 3DP patients, and 19.0 cm2 for non-3DP. The average procedural time was 3.3 hours for 3DP and 3.2 hours for non-3DP. The average efficiency per square centimeter of defect was 9.0 min/cm2 for 3DP and 14.6 min/cm2 for non-3DP ($p<0.05$). No major complications were seen in either group.

Conclusion: 3D-printing can be translated to pediatric cranioplasty technique with the use of 3D-printed surgical guides. The use of these guides allows for precise representation of the negative space of a defect that requires reconstruction. Guides may be used to harvest a split-cranial bone graft of the exact shape needed, which may increase efficiency and precision in comparison to conventional methods.

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Introduction: Reconstruction of pediatric cranial defects requires increased consideration of compact anatomy, unique congenital features, and decisions that will impact children over time. The use of patient-specific three-dimensional printing (3DP) is expanding within the field of medicine and has the potential to help address the heightened demands in pediatric care by improving procedure efficiency, decreasing complications, and providing patient-specific solutions in comparison to conventional methods (1-3). We review the differences in surgical outcomes between 3DP-assisted cranioplasty and non-3DP-assisted cranioplasty performed at our pediatric hospital using our in-house 3D-printer.

Methods: Sequential patients were identified who underwent pediatric cranioplasty from 2015 to 2021. CT images were used to visualize the negative space of the cranial defect and create in-house 3D-printed patient-specific sterilizable templates. The 3D-printed guides were used intraoperatively to design the autologous bone graft used for cranial defect reconstruction. All harvested calvarial bone was split for autologous bone graft, with the priority being full autologous bone for the cranial defect. If this split was not complete enough for full reconstruction of the donor defect, bone allograft was utilized to augment the inadequate autologous bone at the donor site. Surgical outcome data was collected over an average follow-up period of 1.6 years, and pre-operative skull defect sizes were measured by two independent raters by utilizing 3DP software.

Results: In the past 5.5 years, 30 patients were identified who underwent 32 pediatric cranioplasty procedures, including 21 3DP-assisted and 11 non-3DP-assisted cranioplasty procedures. Cranial defect etiologies included prior craniosynostectomy (n=9), trauma (n=7), prior cranial vault remodeling (n=7), prior tumor resection (n=5), and prior fronto-orbital advancement (n=4). The average size of defects was 31.9 cm2 for 3DP patients, and 19.0 cm2 for non-3DP. The average procedural time was 3.3 hours for 3DP and 3.2 hours for non-3DP. The average efficiency per square centimeter of defect was 9.0 min/cm2 for 3DP and 14.6 min/cm2 for non-3DP ($p<0.05$). No major complications were seen in either group.

Conclusion: 3D-printing can be translated to pediatric cranioplasty technique with the use of 3D-printed surgical guides. The use of these guides allows for precise representation of the negative space of a defect that requires reconstruction. Guides may be used to harvest a split-cranial bone graft of the exact shape needed, which may increase efficiency and precision in comparison to conventional methods.

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A New Measure of Posterior Morphology in Sagittal Craniosynostosis: The Occipital Bulleting Index

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Background: Sagittal craniosynostosis (SC) is associated with scaphocephaly, an elongated narrow head shape. Assessment of regional severity in the scaphocephalic head is limited by the use of serial CT imaging or complex computer programing. Three-dimensional measurements of cranial surface morphology provide a radiation-free alternative for assessing cranial shape. This study describes the creation of the Occipital Bulleting Index (OBI), a novel tool using surface morphology to assess posterior severity in patients with SC.

Methods: Surface imaging from CT scans or 3D photographs of 359 individuals with sagittal craniosynostosis and 224 normocephalic individuals were compared to identify differences in posterior morphology. Cartesian grids were created on each individual's surface mesh using equidistant axial and sagittal planes. Area under the curve (AUC) analyses were performed to identify trends in regional morphology and create measures capturing population differences. Two craniofacial surgeons scored the same sample of 28 patients in order to test the measure's correlation to physician assessment.

Results: The largest protrusion differences between the two populations was located in the central posterior cranium. Using these population trends, multiple measures and internal controls for head size were tested to maximize AUC. The Occipital Bulleting index has an AUC of 0.94 with a sensitivity of 86.6% and a specificity of 88.4%. When used in tandem with the Frontal Bossing Index1 the AUC increases to 0.99 and specificity and sensitivity increase to 96.4% and 96.7%. Correlation between the two scores in individuals with SC was found to be negligible with a intraclass correlation coefficient (ICC) of 0.018. Correlation of the OBI with physician assessment was found to be sufficient (ICC = 0.57). Severity in the OBI was found to be independent of age, sex, and imaging modality.

Conclusions: This index is a powerful tool for differentiating control head shapes from those

with sagittal craniosynostosis and has potential to allow for objective evaluation of the preoperative severity of SC, outcomes of differing surgical techniques, and tracking shape changes in individuals over time, without the need for radiation.

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Durotomies During Craniosynostosis Repair: Friend or Foe?

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Purpose: Disruption of the dura mater during craniosynostosis repair can be unintentional, occurring during craniotomy, or intentional as part of a procedure to directly measure intracranial pressure (ICP). At our institution, durotomies are managed with immediate intraoperative repair using suture and collagen-based dural grafts. This study aims to describe the outcomes of unintentional and intentional dural disruption in patients undergoing surgical repair of craniosynostosis.

Materials and Methods: Patients who underwent their first bilateral fronto-orbital advancement with forehead remodeling (BFOAR) at our institution between 2013 and 2021 were included. Charts were retrospectively reviewed for demographic information, medical history, admission timeline, operative and anesthetic details, and complications. All operative notes were reviewed by a craniofacial surgeon (D.Y.C). Analysis of the whole cohort was performed using multiple logistic regression. Additionally, a matched cohort was generated using coarsened exact matching (CEM), whereby patients were matched on the following factors: sex, race, age, affected suture(s), syndromic status, prior craniofacial surgery, and postoperative antibiotics. Complications were distinguished as perioperative or postoperative, with postoperative occurring at least one-week post-discharge.

Results: 310 patients were included in our whole cohort analyses (136 with dural disruption, 174 without), with patient demographics shown in Table 1. Patients in the dural disruption group were significantly older than those without dural disruption (24.3% vs. 10.3% $\geq$ 5 years old, $p <$

.001). There were no significant differences between cohorts for any other characteristics (p>.05).

The most common perioperative complication was a transfusion requirement (n = 9, 39%), followed by CSF leak (n = 2, 8.7%).

The most common postoperative complications were related to delayed wound healing (n = 22, 44.0%). Infectious complications developed in (n = 18) 5.8% of patients. Ten (55.6%) of these cases were related to the wound site, with five requiring operative intervention.

Application of CEM yielded 84 matched cohorts, with 35 patients in the unintentional durotomy group and 74 in the ICP measurement group. The matched cohort had a comparable male, metopic, non-syndromic, 0–12-months-old majority (p > 0.999 for all).

Adjusted whole cohort analysis revealed intentional durotomy for ICP measurement as a protective factor for perioperative complications (OR = 0.18, 95% CI: 0.03 – 0.70, p = 0.032). CEM similarly revealed ICP measurement as a protective factor for perioperative complications (OR = 0.125, 95% CI:0.01 – 0.93, p = 0.039. Unintentional durotomy did not significantly increase the risk of any negative outcome, including perioperative, postoperative, or infectious complications (p > .05 for all).

Conclusions: Durotomies, intentional or unintentional, are not associated with an increased risk of complications in BFOAR, including infection. Intentional durotomy for ICP measurement was a protective factor for our cohort in matched and unmatched analyses. While causation cannot be gleaned due to methodology, this may be due to the effect of normalization of PCO2 to 35 mmHg for ICP measurement, thereby lowering cerebral blood flow and intraoperative blood loss.

A Novel Angle to Reliably Diagnose Sagittal Craniosynostosis

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Purpose: Premature closure of the sagittal suture causes restricted growth perpendicular to the suture line and compensatory changes including temporal narrowing, frontal bossing, occipital bulletting, scaphocephalic head shape, and lowering of the vertex. This study assesses the ability of a novel photogrammetric diagnostic angle, largely based on cranial vertex position, to reliably distinguish sagittal craniosynostosis (SS) from control and false positive cases (SNS).

Materials and Methods: All head CT imaging at our institution between 2014-2020 was reviewed for patients with sagittal synostosis (SS, n =177), presumed sagittal synostosis with normal imaging (n=30), and controls (n = 100). A novel measurement reflecting the anterior-posterior location of the vertex was measured by an angle drawn between the cranial vertex, nasion, and opisthocranion (VNO) in profile view with the head in a neutral position. This VNO angle was measured on 307 3D head CTs and 172 lateral clinical photos using NilRead Viewer and Microsoft PowerPoint respectively. Cranial index (CI) was measured on axial pre-operative head CTs. A threshold to determine maximum diagnostic sensitivity and specificity of the VNO angle was established based on receiver operating characteristic (ROC) curve analysis. Logistic regression was used to assess the ability of VNO angle to predict true SS diagnosis.

Results: Mean age at pre-operative head CT was 9.5 months for the SS cohort, 4.2 months for the SNS cohort, and 8.9 months for controls (p=.327). Mean age at pre-operative clinical photo was 9.5 months for the SS cohort and 4.2 months for the SNS cohort (p=.149). The average VNO angle measured on clinical photos was 54.7°±3.8° for the SS group, 43.1°±2.2° for the SNS group, and 41.1°±3.7° for controls (p<.001). Pearson correlations revealed no significant association between VNO angle and age at scan or age at clinical photo for any group (p = .232 - .924). Evaluation of standardized clinical photos revealed frontal bossing in 66% of SS patients (n = 104), 17% of SNS patients (n = 3), and zero controls. Occipital bulleting was present in 43% of SS patients (n = 83), 33% of SNS patients (n = 6), and zero controls. Receiver operating characteristic (ROC) analysis yielded a cut-off of ≥ 50° to identify SS. Diagnostic sensitivity and specificity were 96.6% and 99.2% respectively. Lastly, a logistic regression analysis to investigate the ability of a VNO angle ≥50° to predict a diagnosis of SS revealed a 95.3 times greater likelihood of having sagittal synostosis with a VNO angle greater than or equal to 50° [Exp (B) = .047]. The unstandardized Beta weight for the predictor variable was B = 8.198, S.E. = 1.086, Wald = 56.938, p < .001. ROC analyses including FB, OCB, and CI measurements were not as sensitive or specific as VNO angle alone.

Conclusions: Measurement of the VNO angle is a reliable screening tool to diagnose sagittal craniosynostosis, with an angle ≥50° strongly suggesting suture synostosis. This method relies on the relationship between the anterior displacement of the vertex and occipital bulleting to approach the diagnostic accuracy of CT imaging.

Skull Vertex Position as A Novel Craniometric Measurement to Assess Severity and Surgical Outcomes in Sagittal Craniosynostosis

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Background/Purpose: Premature fusion of the sagittal suture is the most common type of craniosynostosis, leading to an elongated head shape and potential neurologic sequalae affecting vision, hearing, respiration, and cognitive development. Surgical correction attempts to increase biparietal diameter and caudally reposition the cranial vertex. Cephalic index (CI), the ratio of the maximum head width to maximum length, has traditionally been used to assess preoperative severity and postoperative outcomes following surgical correction of sagittal synostosis. However, CI is a 2-dimensional measurement that fails to describe overall head shape. The purpose of this study is to define a novel measurement, skull vertex position, in patients who underwent cranioplasty for sagittal synostosis in order to better assess craniometric and aesthetic outcomes.

Methods: Patients with a history of isolated, no syndromic sagittal craniosynostosis who underwent open vault cranial reconstruction at a tertiary care children's hospital from 2009-2020 were included. Cases were age and gender-matched to patients without any cranial bony pathology. Craniometric analysis on pre- and postoperative CTs was performed using Analyze Pro (V12, Overland Park, Kansas). Measurements included CI and vertex position. After orienting the skull to the sella-nasion plane, the vertex was defined as the highest point on the skull and was designated as a fraction of the occipitofrontal diameter.

Results: Twenty-four patients met inclusion criteria (87.5% male). Mean ages at initial head CT and immediate postoperative CT for the entire cohort were 1.57 ± 1.70 years (n=24) and 2.00 ± 1.65 years (n=24), respectively. Thirteen patients had an additional long-term follow-up CT at a mean age of 4.28 ± 1.92 years. There were significant differences in both the CI and vertex position when comparing controls with pre-operative patients with sagittal synostosis ($p<0.001$). Importantly, there was significant improvement in caudal repositioning of the vertex in patients who underwent long-term CT imaging when compared to control patients ($p=0.043$) but no significant change in CI in this same population.

Discussion/Conclusion: Cephalic index is the currently accepted measure of deformity severity and postoperative efficacy in sagittal synostosis. Our study introduces a novel measurement, skull vertex position, as an objective and reproducible measure for guidance in surgical planning and outcome assessment to maximize aesthetic and clinical outcomes.

A Novel Technique for Early Rhinoplasty: A 12-Year Review

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Background/Purpose: Cleft lip nasal deformities are one of the most common congenital anomalies affecting approximately 1 in every 1,600 births. Reconstructing the cleft nose is one of the most challenging aspects of the surgical management of cleft patients. Most providers recommend patients reach skeletal maturity before undergoing rhinoplasty. The senior author prefers to treat the nasal deformity surgically at a younger age to improve the overall aesthetic before adolescence. The purpose of this study is to share this technique of early open rhinoplasty using pedicled subcutaneous tissue at the nasal tip and to report our outcomes in order to improve the standards of cleft care.

Methods: An IRB-approved retrospective chart review was conducted on all pediatric patients <10 years of age with unilateral and bilateral cleft lip nasal deformities who underwent open rhinoplasty by a single surgeon from January 1, 2009 to March 3, 2021. Patient demographics, comorbidities, cleft phenotype, surgical technique, revisions, and early versus late complications, including but not limited to bleeding, infection, or dehiscence, were recorded.

Results: Upon review, a total of 26 open rhinoplasties were performed on 14 female (53.8%) and 12 male (46.2%) patients. The average age at primary cleft lip repair and open rhinoplasty was 4.0 ± 2.5 months and 63.4 ± 17.5 months old, respectively. The average time between lip repair and open rhinoplasty was 59.4 ± 17.9 months. Average follow-up time after rhinoplasty was 20.6 ± 25.9 months. Cleft phenotype included 12 bilateral clefts (46.2%), 9 right-sided clefts (34.6%) and 5 left-sided clefts (19.2%). Nine patients (34.6%) had medical comorbidities, including ophthalmologic congenital ptosis, congenital hypothyroidism, holoprosencephaly, hypertelorism, anisometropia, symbrachydactyly, malrotation with duodenal web, and gastro-esophageal reflux disease; of these patients, two were syndromic with amniotic banding syndrome and blepharocheilodontic syndrome. All patients except one (96.2%) had alveolar cleft involvement, 17 patients (63%) had secondary palate involvement, and 16 patients (61.5%) received preoperative nonalveolar molding (NAM). All patients underwent nasal dorsum and tip augmentation with subcutaneous tissue rearrangement using dorsal fibrofatty fat. There were no intraoperative or postoperative complications associated with the open rhinoplasty procedures. To date, only two patients (7.4%) have undergone revisional surgery: one following trauma and one for cyst resection.

Conclusions: Our single surgeon review supports early nasal reconstruction via open rhinoplasty for secondary cleft lip nasal deformities. Early rhinoplasty using a dorsal fibrofatty flap shows durable improvement in the cleft nasal deformity. Additionally, early intervention does not cause increased surgical burden, nor does it cause unforeseen complications. However, long-term follow-up is needed to assess the true revision rate and final aesthetic and functional results of this technique.

The Impact of Genes and the Environment on Calvarial Bone Repair and Remodeling in a Murine Model of Craniosynostosis

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Background/Objectives: Craniosynostosis is a congenital craniofacial disorder that presents in around 1 in 2,000 to 1 in 2,500 live births. The pathophysiology of the disease involves fusion of the sutures, fibrous joints that connect the bones of the skull. Currently, surgical correction remains the mainstay of repair, but is associated with complications and the potential need for reoperation due to re-synostosis. TWIST1 mutation leads to Seathre-Chotzen syndrome. In the literature, reoperation rates for patients with this syndrome are reported to reach 35-42%. Recent studies have shown that exposure to a selective serotonin reuptake inhibitor, citalopram, can cause craniosynostosis. The purpose of this study is to investigate the genetic and environmental mechanisms underlying aberrant bone repair in a murine model of craniosynostosis to elucidate factors that contribute to need for reoperation.

Methods/Study Design: Thirteen Twist1+/- mutant mice and wild-type (WT) mice with or without in utero citalopram exposure (20 mg/kg per day) were generated: WT (n=5), Twist1+/- (n=5), WT + citalopram (n=5), and Twist1+/- + citalopram (n=5). At six weeks of age, mice underwent a calvarial defect surgery, which consisted of a sagittal skin incision followed by creation of bilateral, 2 mm-diameter, full-thickness, critical-sized parietal bone defects using a 1.8mm dental drill. The mice underwent microCT imaging at 1, 2, 3, and 4 weeks postoperatively, at which point they were sacrificed for histological analysis.

Results: All mice were fully ambulatory following surgery, with no intraoperative or postoperative complications. MicroCT analysis demonstrated that all Twist1+/- mice exposed to citalopram had a uni- or- bicoronal craniosynostosis phenotype and exhibited excessive and disorganized bone growth following injury. Some Twist1+/- mice without citalopram treatment also developed craniosynostosis and exhibited a similar excessive bone growth pattern; Twist1+/- mice without suture fusion had bone repair similar to that of WT mice. All WT defects

remained incompletely healed at 4 weeks postoperatively. In contrast, the Twist1+/- mice with citalopram exposure demonstrated full bone fill of the defect at 4 weeks. Twist1+/- mice without citalopram demonstrated more bone fill than WT, but the defect was not entirely filled.

Conclusions: These preliminary findings following calvarial defect surgeries improve our understanding of bone repair in craniosynostosis. Further, RNAscope analysis throughout the bone healing process will enable additional insight into the molecular mechanism mediating the excessive and disorganized osteogenesis in the Twist1+/- craniosynostotic mice. By continuing to investigate the mechanisms of bone injury and repair in craniosynostosis, we can better understand and prevent the factors implicated in re-synostosis following surgery.

Supported by R01 DE030901, NIDCR, NIH

The Interaction of Genes and Environment at the RNA Level in the Development of Twist1-Related Craniosynostosis

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Background/Purpose: Craniosynostosis is a congenital defect characterized by the premature fusion of calvarial sutures. While the genetic basis of craniosynostosis can be identified in about a quarter of patients, the pathophysiology underlying development of this disease is mostly unknown. Mutation in TWIST1 leads to Saethre-Chotzen syndrome with coronal synostosis. Recent studies using a Twist1+/- mouse model have demonstrated evidence that environmental factors, including in utero exposure to the selective serotonin reuptake inhibitor citalopram, can exacerbate disease incidence and severity. Given that the Twist1+/- coronal suture typically fuses between P9-14, this study sought to use RNA sequencing analysis at P7 to examine the effects of both genes and the environment on suture fusion.

Methods/Study Design: Sixteen Twist1+/- mutant mice and wild-type (WT) mice with or without in utero citalopram exposure (20 mg/kg per day) were generated: WT (n=5), Twist1+/- (n=4), WT + citalopram (n=3), and Twist1+/- + citalopram (n=4). At P7, the mice were sacrificed, and the coronal sutures were dissected under a microscope and subjected to RNA extraction. The samples were analyzed for quality, and then Hitech sequencing was conducted at the University of California, Los Angeles. Post-sequencing data analysis was performed using Partek Flow and Ingenuity Pathway Analysis.

Results: Twist1+/- mice exposed to citalopram demonstrated significant upregulation of genes involved in the pathophysiology of osteoarthritis [S100a8: 4.616; S100a9: 3.815] and in

biomineralization during tooth development [Amelx: 44.32] in comparison to Twist1+/- mice without citalopram exposure. WT mice exposed to citalopram demonstrated a significant downregulation of genes in the Igf1 signaling pathway [Igfbp4: -1.476; Igfbp5: -1.447] compared to WT mice without citalopram exposure. Twist1+/- mice without citalopram treatment had significant downregulation of genes involved in Ephrin signaling [Epha3: -1.562; Cxcl12: -1.279; Grin2b: -2.357] in comparison to WT mice without citalopram treatment. Finally, Twist1+/- mice with citalopram exposure had significant downregulation of growth factor receptors in the STAT3 pathway [Fgfr3: -1.262; Igf1r: -1.246; Igf2r: -1.306] in comparison to WT mice with citalopram exposure.

Conclusions: RNA sequencing data provide valuable insights into the potential signaling pathways and regulatory mechanisms involved immediately preceding suture fusion. Future in vivo studies focusing on implicated pathways will guide further mechanistic investigation into the pathophysiology that leads to craniosynostosis. By analyzing the interplay of the environment and genetics involved, we can better understand how to prevent and treat this devastating disease.

Supported by R01 DE030901, NIDCR, NIH

Cell-Augmented Scaffold-Enhanced (CASE) Cranioplasty: A New Regenerative Paradigm for Interval Autologous Cranioplasty

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Objective: Autologous interval cranioplasty has become the standard of care following decompressive craniectomy. Replantation of the stored bone graft has infection and bone resorption rates upwards of 30%. We propose a new paradigm for autologous cranioplasty incorporating novel regenerative techniques that aims to improve fidelity of grafts and reduce infection and resorption.

Methods: An IRB-approved cohort of 10 consecutive patients who underwent Cell-Augmentation Scaffold-Enhanced (CASE) regenerative cranioplasty were compared to 10 who underwent traditional autologous cranioplasty. All were followed for at least 6 months postoperatively. For the CASE cranioplasty, frozen autologous bone graft was thawed and washed in accordance with institutional protocol. Tenets of standard interval cranioplasty were

followed. Cell-augmentation of the autologous bone graft scaffold was performed; channels were created in the diploic space, then packed with a 1:1 mixture of fresh autologous bone graft harvested from surrounding cranium and bone allograft. Traditional technique was as per the attending. Primary outcome measures included post-operative graft infection, bone resorption after >6 months and need for graft explantation. Additional datapoints collected include gender, age at cranioplasty, days between craniectomy and cranioplasty, indication for craniectomy, greatest linear dimension of cranioplasty and duration of surgery. Quantitative statistics performed include Student's independent t-test and X2 analysis with a significance level set to p = 0.05. Descriptive statistics include risk differences, means and standard deviations (SD).

Results: Clinical evaluation for ≥ 6 months postoperative demonstrated a bone graft infection rate of 0%, and resorption rate of 0% for CASE subjects and 20% (n=2) and 0% for traditional patients, respectively; risk difference for post-operative infection was 0.2. No patients had bone resorption requiring reoperation or explantation from the CASE cohort, while 2 subjects (20%) from the traditional cohort required explantation (risk difference 0.2). Mean age at cranioplasty was 45.2 years (SD±17.1) for CASE subjects vs 58.5 years (SD±14.1) for traditional (p=0.07). Amongst CASE subjects, the most common cause for craniectomy was ischemic stroke (70%, n=7) vs hemorrhagic stroke (40%) for traditional subjects (p=0.11 across all causes). Amongst CASE subjects, 70% were male compared with 60% for traditional subjects (p=0.64). Mean number of days between craniectomy and cranioplasty was 125.4 (SD±53.8d) for CASE subjects vs 86.0 (SD±59.5d) (p=0.14). Mean greatest linear dimension was 131.7mm (SD±14.2mm) for CASE vs 125.0mm (SD±6.9mm) for traditional (p=0.20). Mean duration of surgery was 217.7min (SD±54.0min) for CASE subjects vs 105.3 (SD±30.6min) for traditional (p<0.01).

Conclusions: Cell-Augmented Scaffold-Enhanced cranioplasty represents a safe novel paradigm modification to standard autologous interval cranioplasty technique with reduced rates of post-operative infection, bone flap resorption and reoperation. Duration of surgery is significantly increased compared to traditional methods.

Underreported and Highly Variable: A Systematic Review of Shunt-Related Craniosynostosis Occurrence

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Background: Secondary craniosynostosis is the premature fusion of cranial sutures, which can be due to early environmental insults, regional trauma, or as a consequence of intraventricular shunting. In the treatment of hydrocephalus, over drainage can cause shunt-related craniosynostosis (SRC) due to loss of tension across the dura and suture lines. Prior literature has

investigated the determinants of SRC; however, outcomes remain highly variable, and consensus continues to be influenced by the limitations of single-institution studies. To our knowledge, this is the first systematic review to assess the incidence and determinants of SRC.

Methods: A systematic search of PubMed, Embase, and Web of Science from inception to February 2022 was conducted. Studies retrieved were screened by two independent reviewers for eligibility against predefined inclusion/exclusion criteria with discrepancies resolved by consensus. Included studies were subjected to the Modified Downs & Black (MD&B) checklist to assess methodological quality. Outcomes included the incidence of SRC, shunt type, and SRC suture involvement.

Results: Following screening, 8 original articles were selected for inclusion. According to MD&B, studies were of poor (5/8 studies), fair (2/8 studies), and good (1/8 studies) quality. Minimum follow-up time (7/8 studies) ranged from 6 months to 4 years and the average follow-up time (2/8 studies) ranged from 4 to 4.2 years. The pooled incidence of SRC was 5.4% (113/2083) and ranged from .67% (1/188) to 48.8% (61/125). Of the 4 studies that specified SRC suture involvement, the sagittal suture occurred in 96.4% (80/83) of cases. All of the studies described the type of shunt valve used, with 6 reporting the use of fixed (non-programmable/ flow-regulated) shunt valves, 1 reporting the use of adjustable (programmable) shunt valves, and 1 reporting both. Overall, 86% (1783/2079) of the described patients had a fixed valve placed. The median time from shunt placement to SRC diagnosis (2/8 studies) ranged from 9.5 to 26.1 months. Of the 7 studies that specify SRC development by shunt-type, 2.3% (38/1670) and 4.9% (14/288) of patients who had a fixed and programmable valve developed SRC, respectively. However, 5 of these 7 studies were published before 1980, and thus this cohort is likely influenced by patient selection bias. The only study that conducted multivariate analysis found that older age at shunt placement and a greater number of shunt revisions were independent predictors of SRC. The lack of standardization in reporting of patient-specific factors made a meta-analysis of patient demographics unfeasible.

Conclusions: SRC is likely an underreported complication in the treatment of hydrocephalus. Better standardization of data reporting processes and the creation of more recent studies of shunted cohorts would facilitate a more exact estimation of the incidence of SRC, as well as elucidate its determinants and indications for treatment.

Outcome Guided Reconstruction of Scalp and Skull Defects in Neurosurgical Patients

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Purpose: This study aimed to formulate reconstructive recommendations for neurosurgical patients presenting with scalp and skull defects based on evaluation of outcomes in a large series of patients.

Methods: An IRB-approved retrospective review of patients who underwent scalp and/or calvarial reconstruction by plastic surgery and neurosurgery with a minimum of one year follow-up was conducted. Complications were divided into minor and major; early, intermediate, and late. Univariate logistic regression models were conducted to identify risk factors associated with the occurrence of complications. Mann-Whitney U tests were used to compare survival time. Additional outcome differences were determined using chi-square tests. Kaplan-Meier curves were developed to compare exposure of titanium and bone cranioplasties.

Results: One hundred seventy-one patients who underwent 418 procedures were included (median 1 [1-3] surgeries per patient). Average age was 55±15 years; 53% of patients were male. Median follow-up was 25.5 [13.9-55.6] months and 57 patients (33%) were deceased at last follow-up.

Plastic surgery procedures included 181 scalp flaps (43%), 86 free flaps (21%), 63 complex layered closures (15%), and 21 simple closures (5%). Complications occurred following 48% of procedures. Forty-four percent of these postoperative complications occurred early (≤30 days), 21% intermediate (>30-90 days), and 36% late (>90 days). There were 183 major (92%) and 19 minor (8%) complications. The top three complications were titanium hardware exposure, non-healing wounds (23% of cases), and infection (9% of cases). Titanium hardware exposed after 35.6% of cranioplasties, at a median of 4.3 [2.3-18.2] months postoperatively. There were no significant relative risk factors identified for hardware exposure. Titanium cranioplasties became exposed at a median of 0.47 [0.3-4.0] months; 60.0% of these exposures occurred within 2 months postoperatively. There were two exposures of autologous bone cranioplasty, occurring at 10.3 and 4.3 months. Frontal location of the defect was a risk factor for major complications (OR 1.59 (95% CI 1.06 - 2.39), p=0.026). There was a trend towards significance between complication rates for primary closure (37%), scalp flaps (48%), and free flaps (56%, p=0.073). Mortality rate for patients with malignant intracranial neoplasms was 68.4% (surviving 4.3 [1.9-8.4] months), 39.1% for scalp and skull neoplasms (7.0 [4.3-16.6] months), 37.5% for scalp neoplasms (16.0 [14.6-28.2] months), and 16.7% for meningiomas (28.2 [26.7-45.1] months). There was an increased likelihood of patients undergoing a free flap when plastic surgery was involved at initial presentation (OR 4.58 (95% CI 1.98 -11.18), p=0.0005) and if they had ≥1 medical comorbidities (OR 2.77 (95% CI 1.20 - 6.86), p=0.021). Patients with preoperative infection had a higher likelihood of undergoing a scalp flap (OR 2.49 (95% CI 1.59 -3.94), p<0.001).

Conclusion: Neurosurgical patients requiring scalp and/or skull reconstruction represent a complex population that undergoes multiple procedures with a high rate of postoperative complications despite timely expert team approach. Due to high mortality, it is imperative to

consider patient prognosis in selection of the appropriate reconstructive technique. Given high exposure rate of titanium hardware in oncologic patients shortly after reconstruction, alloplastic reconstruction is recommended in patients with a prognosis estimated less than 2 months.

Speech Outcomes of Palatal Lengthening using Buccal Myomucosal Flaps for Velopharyngeal Insufficiency

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Background: Velopharyngeal insufficiency (VPI) remains a challenging problem for surgeons as many of the typical surgical techniques used often predispose patients to airway complications, like obstructive sleep apnea (OSA). The purpose of our study is to evaluate speech outcomes and airway complications with use of the buccal myomucosal flap (BMMF) for VPI management.

Methods: Retrospective chart review of patients undergoing palatal lengthening using BMMF for VPI between 2017 and 2022 at Cincinnati Children's Hospital was performed. Pre- and postoperative evaluation of outcomes included perceptual evaluation of VPI severity by a speech-language pathologist, nasometry, and nasopharyngoscopy (when applicable). Based on perceptual evaluation, VPI severity was classified into 4 categories: none or inconsistent, mild, moderate, and severe. Nasometry scores were used to objectively measure improvements in velopharyngeal function. Statistical analysis was performed using the RStudio software. Comparison of nasometry and speech indices was performed using the Wilcoxon matched pairs signed rank test. Logistic regression was used to determine whether age at surgery or pre-operative nasometry were predictors of better post-operative outcomes. $p < 0.05$ was accepted as statistically significant.

Results: Twenty-four patients (13M:11F) underwent palatal lengthening using BMMF for VPI. Seven patients were excluded due to less than 6 months speech follow up. Seventeen patients (7M:10F) are included at this time. Postoperatively, 9 (52.9%) were determined to not need surgical revision, 6 (35.3%) to need revision, and 2 (11.7%) was too soon to make a determination. The mean age at surgery was 6.38 (range 5-12).

Preoperatively, 5 patients (29.41%) had mild VPI, 6 (35.29%) had moderate VPI, 6 (35.29%) had severe VPI. Postoperatively, 5 patients (29.41%) had no VPI or inconsistent VPI, 5 patients (29.41%) had mild VPI, 3 (17.64%) had moderate VPI, and 4 (23.52%) had severe VPI. The Wilcoxon test demonstrated a significant difference ($p = 0.012$) between the preoperative data and the postoperative VPI data. Nasometry demonstrated that oral passage nasalance improved significantly postoperatively, with a mean of 47.2% preoperatively and 38.1% postoperatively ($p = 0.034$). Nasal passage nasalance did not show a significant improvement, with a mean of 57.1% preoperatively and 61.1% postoperatively.

Resonance, airflow, and consonant strength were measured both pre- and post-operatively for included patients. There were significant postoperative improvements in consonant strength ($p = 0.015$), airflow ($p < 0.01$), and resonance ($p = 0.020$). For age, oral passage nasalance, and nasal passage nasalance measurements, there was no significant effect on need for surgical revision ($p = 0.318$, $p = 0.608$, $p = 0.653$, respectively).

Two patients had dehiscence of their buccal flaps leading to persistent fistulas and unchanged VPI. One patient had minimal dehiscence without fistula present that had complete resolution of VPI. This patient also had OSA requiring CPAP use postoperative; however, pre-operative assessment was not clear if there was OSA with their prior pharyngeal flap. No other surgical complications, infections, or de-novo OSA or fistulas were reported.

Conclusions: Our preliminary results suggest that palatal lengthening with BMMF is effective at improving speech and VPI severity without causing or worsening OSA.

Determining When to Perform Maxillofacial Computed Tomography: Evaluation of Over 2000 Trauma Patients

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Purpose: Assessment of concomitant facial fracture in multisystem trauma can be a challenge. In 2011, University of Wisconsin developed a screening criterion to determine when to perform a maxilofacial computed tomography (MFCT) during the valuation of a trauma patient. These criteria are boney step-off or instability, periorbital swelling or contusion, Gascow Coma Scale less than 14, malocclusion, or tooth absence. In the initial study, patients with isolated nasal bone fractures (NBFx) were excluded. External validation studies demonstrated mixed results with their ability to generalize the use of the "Wisconsin Criteria" (WC) to other facilities. The

purpose of this study is to identify factors associated with facial fractures, in addition to the ability of WC to screen for operative facial fractures.

Methods: 2027 patients were identified as having sustained facial trauma or undergone MFCT from January 2015 to December 2016 at a tertiary academic center. Demographic information, mechanism of injury, and presence of WC were collected in a retrospective chart review. MFCT reports were accessed to determine the presence and type of facial fracture. The data were analyzed to determine the sensitivity (SN), specificity (SP), positive predictive value (PPV), and negative predictive value (NPV) when WC was applied. Data were further subdivided to exclude patients with isolated nasal bone fractures, as was done in the initial and internal validation studies of the WC. Analysis was also performed to determine the utility of the WC for patients for whom operative intervention was required.

Results: 2027 patients were screened. 1236 patients were included in the analysis. 73% (875/1236) were males. 708 patients had facial fractures identified and 115 had an operative intervention. NBFx accounted for 68% of fractures, followed by fractures of the orbit, maxilla, then zygoma. The most common mechanism of injury was assault which occurred in 47% of patients. WC were found to have a SN of 68%, SP of 64%, PPV of 72%, and NPV of 59%. Excluding patients with isolated nasal bone fractures led to increased sensitivity but decreased specificity (SN=81%, SP=63%). Regarding operative case identification in this patient group, WC possessed high SN (97%) and a high NPV (99%). 7 of 98 operative cases were missed by WC. Four of these cases were isolated NBFx, two cases of nondisplaced mandible fractures and one displaced mandibular condyle fracture. 42% (505/1236) of patients who received MFCT had no evidence of facial fracture. If WC had been utilized, 27% (332/1236), of these patients would not have been imaged. If applied specifically to operative fractures, 529/1089 (44%) would not have been imaged if screened with WC.

Conclusion: This study evaluated the utility of WC in identifying facial trauma patients in need of maxillofacial imaging as well as in identifying operative facial fractures. While the sensitivity and specificity of the Wisconsin criteria in this patient population did not support the initial validation studies overall, we find WC to be an excellent screen for operative facial fractures, with a SN of 97% and NPV of 99%, making this a meaningful tool.

Ballistic Facial Trauma Reconstruction: Incidence and Practice Patterns in the Civilian Population

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Background: Management of non-fatal ballistic facial trauma is currently well-described in literature delineating reconstructive practices for military combat wounds. However, there's a paucity of literature describing these patients and associated injury management in civilian practice. We aimed to describe non-military patients in California with severe non-fatal facial injuries from ballistic trauma using the California Office of Statewide Health Planning and Development (OSHPD) patient database.

Methods: A retrospective study was performed using the OSHPD Ambulatory Surgery and Inpatient datasets, which include patient demographics, admission factors, discharge disposition, and diagnoses and procedure codes. All adults with ICD-10 codes corresponding to non-fatal ballistic facial trauma requiring emergent surgical management during 2016-2020 were included. Patient characteristics assessed include injury diagnosis, hospital length of stay (LOS), number of admissions, timing of definitive management (excluding outpatient cosmetic revisions), and lifetime hospitalization costs. Injury diagnoses were coded as severe if it reasonably required surgical intervention within the first 24 hours of diagnosis. Severe injuries included: open facial fractures; LeFort fractures; malocclusion; jaw dislocation; CSF leaks; complete loss of teeth; hemoptysis; optic, oculomotor, trigeminal, facial nerve injuries; and pharynx injuries.

Results: A total of 545 traceable patients who experienced ballistic facial trauma were identified. Average age was 35.9 years (SD=15.6) and 87% were male. Median index admission LOS was 8 days (IQR 3-15 days); this median LOS was similar between both severely and non-severely injured patients. Subsequent readmission was required for 206 (39.6%) patients. Fifty-two (9.5%) patients died during index admission, 94.2% of whom had severe craniofacial injury (n=49). Patients with a severe injury were significantly more likely to have received a craniofacial repair within the first 24 hours of admission compared to those without a severe injury ($p<0.001$). Similarly, patients without severe injuries were more likely to not receive any repair during the study period. Time to readmission was shorter for severely injured patients (13 days vs. 26 days for non-severe injuries). Among severely injured patients, those who had a repair within the first day of admission had the shortest time to readmission (within 10 days). Total median charges per patient for all admissions during the study period were $273,179 (IQR $128,242-$543,250).

Discussion: To our knowledge, this is the first assessment of civilian characteristics of non-fatal ballistic facial trauma in California. Most repairs are performed within the first day of admission, especially if the injuries are severe. While nearly all mortalities had severe craniofacial injury, the similarity in median index LOS between severely and non-severely injured patients suggests that after initial craniofacial management in the first 1-2 days, hospital courses to discharge are similar. Further analysis regarding whether civilian management aligns with well-defined military reconstructive protocols for facial ballistic injuries is planned. Identifying differences in management and their benefits may help better inform reconstructive surgeons in their medical decision-making.

Head and Neck Manifestations of Necrotizing Fasciitis: A Case Series and Meta-Analysis

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Purpose: Plastic surgeons are specifically trained in head and neck anatomy and management of its wounds. They cover facial trauma call, which among its responsibilities may include infection care. The head and neck is a site of presentation for necrotizing fasciitis that requires a high level of suspicion and prompt action for diagnosis and treatment. We present two patients treated for a diagnosis of necrotizing fasciitis of the head and neck (HNnf) at a large academic center, and perform a meta-analysis of the literature to summarize clinical factors, causative organisms, and treatment.

Methods: After institutional review board approval, medical records of two patients presenting with a diagnosis of HNnf at The University of Texas Dell/Seton Medical Center, Austin, Texas, were retrospectively reviewed, July to September 2021. Additionally, a meta-analysis of the literature was completed on HNnf from 1990-2021, analyzing: demographics, comorbidities, sites of presentation, putative organisms, morbidity, mortality, and treatment. Systematic reviews in the literature without individualized patient data were excluded. Outcomes for the meta-analysis were statistically determined with bivariate analysis. For two-categorical variables, we used Chi-Squared or Fisher Exact Tests, where appropriate. Logistic regression analysis was run where correlation of dichotomous and continuous variables was sought.

Results: Our case series of 2 patients with HNnf was combined with the systematic review of the literature. Over a 30-year period, a total of 149 individual cases were reviewed, most cases published between 2010 and 2019. The most common associated comorbidity was diabetes mellitus. Most frequent sites of infection origin were: submandibular, parapharyngeal, and periorbital regions. Most patients required serial debridements in addition to IV antibiotics. Streptococcus pyogenes was the most frequent pathogen; however, most infections were polymicrobial. Infections in the periorbital region were significantly monomicrobial ($p = 0.011$). Tracheostomy was required in 47 (31.5%) patients. Reconstructive surgery requirements: 27 patients had skin grafting, nine with flap reconstruction. Mortality rate was 12.3%. There were no comorbidities significantly correlated with morbidity or mortality; however, increasing age was a significant predictor of mortality ($p = 0.01$). Infection with Klebsiella pneumoniae was significantly more likely to occur in cases occurring more recently (OR = 1.09, $p = 0.009$), whereas infection with S. pyogenes and S. viridans were significantly less likely to occur in

cases occurring more recently (OR = 0.956 and 0.917, p = 0.032 and 0.001 respectively). Cases arising from K. pneumoniae (p < 0.001), and infection in the parapharyngeal region (p = 0.049) were independently associated with serial debridement.

Conclusion: Our experience with HNnf along with meta-analysis of the literature revealed trends in demographics, presentation, organisms, and outcomes, increasing the collective knowledge of this rare entity.

History of a Previous Venous Thromboembolism Event as a Risk Factor for Complications in Head and Neck Free Flap Reconstruction

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Background: Venous thromboembolism (VTE), including deep venous thrombosis (DVT) and pulmonary embolism (PE), results in increased mortality, postoperative complications, length of hospitalization, and hospital-related costs in head and neck cancer patients. Patients are at elevated risk of VTE when undergoing complex microsurgical reconstruction. Some patients present with a history of prior VTE. The impact of prior VTE on complications after head and neck microvascular free flap surgery, specifically relating to the incidence of postoperative VTE and flap vascular compromise is not well studied. We aimed to assess the complication rates of patients with a history of thrombotic event, undergoing free flap reconstruction of the head and neck region.

Methods: A retrospective review of the patients who underwent head and neck free flap reconstruction at a tertiary center between 2012-2021 was performed from a prospectively maintained database. Data regarding patient demographics, past medical history, VTE chemoprophylaxis and overall outcomes was collected. History of VTE was defined as reported past PE or DVT events. Patients with a history of a VTE event were compared with the rest of the cohort. Outcomes studied included postoperative 30-day VTE rates, bleeding events requiring an intervention or return to the OR, vascular compromise of the flap requiring return to the OR, and total and partial flap failure rates.

Results: Free flap reconstruction of the head and neck region was performed in 928 patients. Fifty-nine patients (6%) had a history of a prior VTE event. Among these patients 7 (12%) had a blood clotting disorder, while 8 (14%) had a peripheral vascular disease. Patients with a positive

history of VTE had a higher Caprini score (9±3 vs 6±2, p<0.001), higher percentage of cardiac (76% vs 62%, p=0.032), pulmonary (46% vs 26%, p=0.001), gastrointestinal (48% vs 35%, p=0.044) comorbidities and rates of prior chemotherapy treatment (19% vs 8%, p=0.005). Patients with a VTE history had lower rates of vascular compromise of the flap requiring return to the OR (0% vs 8%, p=0.029) but there was no difference between the flap loss rates (0% vs 3%, p=0.161). In both cohorts, the primary mode of postoperative VTE chemoprophylaxis was enoxaparin 30 mg BID. However, a significantly higher portion of the patients with a VTE history had a different prophylaxis regimen (19% vs 42%, p<0.001). These included seven patients (12%) with a prophylactic heparin dosing (5000 BID or TID), two patients (3%) with heparin drips, and nine patients (15%) receiving therapeutic enoxaparin. Although statistically not significant, there was a trend towards increased rates of major postoperative bleeding events in patients with a history of VTE (15% vs 8%, p=0.073). Postoperative 30-day VTE rates were not different than the rest of the cohort (3% vs 4%, p=0.874).

Conclusion: Successful free flap transfer for head and neck reconstruction is possible in patients with a preoperative history of thrombotic events. Management of these high-risk patients requires careful preoperative evaluation and adequate prophylaxis in the postoperative period. The chemoprophylaxis regimens can be adjusted to prevent recurring VTEs but may incur a greater bleeding risk.

Successful Dental Implant Insertion Using the Split Crest Method After Free Scapular Flap Transfer for Mandibular Reconstruction: Optimizing the Rehabilitation Process

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Purpose: When using vascularized bone to reconstruct composite or segmental mandibular defects, insertion of integrated dental implants facilitates prosthetic rehabilitation. Among the different donor sites, the fibula, scapula, and ilium are the most common. Nonetheless, due to varicose veins and a Peronea Arteria Magna or due to back pain, the scapular bone becomes the only alternative as a possible donor-site. In these cases, the thinness of the scapular bone may limit the insertion of dental implants due to its insufficient width. Using the split crest technique (SCT), the transplanted bone can be expanded after dividing the cortical bone for implant insertion. Here, we present four cases in which mandibular defects were reconstructed using a chimeric free scapula flap with SCT for dental implant insertion.

Methods: Four patients were included in this study. Five months after mandibular reconstruction with chimeric scapular flaps, a sagittal osteotomy was created, and the groove was expanded

using 2-mm bone spreading wedges. Vertical bone-relaxing osteotomies were also carried out using a ridge expander. The total osteotomy depth was approximately 10 mm. Tapered internal implants were gently positioned. After implanting the implant fixture, a cover screw was connected to the upper hole and the incised mucosa was sutured. Five months later, after confirming the absence of instability or infection, we removed the cover screw, and the healing abutment was connected to the implant fixtures. When soft-tissue healing was completed, the abutment was removed, and the provisional restorations were connected. The patients were observed for several months to confirm optimal occlusion. Then, the provisional restorations were replaced by the final restorations.

Results: The average age was 67 ± 8.9 years. No bone fracture occurred, and the masticatory function was restored in all patients over a 2-year follow-up. Bone grafts harvested from the anterior mandible were used at the SCT site in two patients. The average time to complete the final implant set was 20.8 months from the time of scapular transfer. The average bone width after the SCT procedure increased by 1.2 mm ($p = 0.042$), while the average bone height decreased by 2.02 mm ($p = 0.3$) with shaving for implant insertion. All patients' occlusion was good, and all had unrestricted oral diet. No implant shedding or agitation was observed. Using a self-completed questionnaire survey, the eating time and food intake were equal to preoperative scores.

Conclusions: Originally, SCT was a technique for establishing an implant in thin alveolar bone. In our study, SCT was also effective after reconstruction with a scapular flap to ensure good occlusion and food intake after prosthetic rehabilitation. Patients' satisfaction was optimal. These results suggest it is possible to establish implants and improve the quality of life in patients requiring similar reconstructions.

Alterations in Sphenoid Anatomy in Craniosynostosis: Implications for Fronto-Orbital Advancement

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Objective: Fronto orbital advancement (FOA) requires the removal of the fronto-orbital bandeau via an anatomically challenging osteotomy that passes from the anterior cranial fossa to the middle fossa. During the intracranial portion of the osteotomy, visualization of the saw blade is

lost as it passes through the fronto-orbito-sphenoid junction, prior to entering the middle cranial fossa. This places the temporal lobe dura and parenchyma at risk of injury. The aim of this study is to provide a 3-dimensional analysis of the space surrounding this osteotomy and determine differences amongst different types of craniosynostosis.

Method: 18 head CT scans of patients from ages 2 to 24 months with craniosynostosis (6 Metopic, 6 nonsyndromic Bicoronal, and 6 Unicoronal) were reconstructed to 3D skulls using Mimics 24.0 (Materialise NV, Lueven, Belgium). Unicoronal skulls were mirrored as necessary to be right sided. These skulls were landmarked with 47 cephalometric points. Measurents and volumetric analysis was performed to determine differences in sphenoid anatomy between the 3 craniosynostoses.

Results: For the 3 craniosynostosis groups, metopic, bicoronal and unicoronal, the average distance from the lateral orbital rim to temporal lobe tip was significantly different (17.37mm, 10.15mm, 14.76mm, respectively ($p<0.05$)). The mean depth of the temporal lobe tip from the edge of the sphenoid was also significantly different (16.23mm, 27.5mm, 22.8 mm respectively, $p<0.05$). The thickness of the fronto-orbito-sphenoid junction at the level of the supraorbital rim was significantly different between the three groups as well (7.75mm, 3.60mm, 8.04mm; $p=0.01$). Distances from the cornea to the lateral orbital rim, anteroposterior depth of the lateral orbit, and overhang of the lesser sphenoid wing over the middle cranial fossa were not significant between groups.

Conclusion: Sphenoid shape and the zone of the fronto-orbital-sphenoid junction differs between types of craniosynostosis. Bicoronal craniosynostosis has the most unfavorable anatomy in this area, with minimal distance between the orbit and the anterior portion of the temporal lobe, a vertically deep middle cranial fossa, and thin bone at the fronto-orbital sphenoid junction, all of which make retraction and protection of the temporal lobe more challenging. Careful understanding of the patient's specific anatomy is necessary to perform this osteotomy safely.

Nasal Skin Cancer Defect Reconstruction: Revisiting The Marchac Flap

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Introduction: Small-Medium nasal defects are common after skin cancer resection, although middle and distal defects represent a significant challenge for plastic surgeons. The aesthetic outcome is the result of the plastic surgeon´s expertise to adequately restore the nasal subunits, properly manage skin tension vectors and scar placement. 1,2,3,4

The objective of this study is to describe the surgical technique and assess the cosmetic outcome of the Marchac axial frontonasal flap after middle and distal nasal oncological resection over a 6-year period in a Plastic Surgery Department.

Materials and methods: A descriptive, retrospective review of patients with <2cm nasal oncological defect who underwent a Marchac nasal flap repair, between February 2016 and December 2021, carried out by single plastic surgeon, specialized in Mohs Surgery, in a Plastic Surgery Department.

Results: 23 patients were enrolled. The female-male ratio was 8:15. Mean age 67.4 years (45-83). The average nasal defect size in all cases was <2cm (largest diameter). 18 cases (78.3%) were Basal Cell Carcinomas while 5 (21.7%) Squamous Cell Carcinomas. Mean follow-up was 28.9 months (2-69). No flap necrosis, bleeding, infection, dehiscence, trap door defect nor distortions of the nasolabial angle and alar rims were recorded.

Conclusion: Marchac flap is a versatile and aesthetically predictable one-stage procedure flap. According to our case series, the Marchac flap is an adequate alternative for the reconstruction of <2cm middle and distal nasal defects.

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Evidence of Linear Bone Flap Resorption in Patients Undergoing Autologous Cranioplasty Following Decompressive Craniectomy: A 3D Slicer Segmented Analysis of Serial CT Images

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Introduction: Autologous cranioplasty (CP) following decompressive craniectomy (DC) carries significant risk of bone flap resorption (BFR), which is clinically diagnosed in as many as 50% of patients. When quantified radiographically, BFR is identified in up to 90.2% of cases. While several groups have described the occurrence of BFR both qualitatively and quantitatively, the current literature offers limited information regarding the natural progression of BFR, and the

rate at which it occurs. This study aims to characterize the progression of BFR over time and elucidate potential risk factors for accelerated rates of BFR.

Methods: A retrospective analysis was conducted on patients who underwent DC and autologous CP. Serial computed tomography (CT) images were used to quantify flap volume changes over time, and the Oulu Resorption Score was used to evaluate for degree of BFR. Possible risk factors included age, diabetes, smoking status, flap fragmentation, defect size, and DC-CP time interval. Chi-square analyses and Student's t-tests were performed to examine differences between patients who experienced BFR and those who did not. Student's t-tests were used to detect between patients who experienced BFR and those who did not.

Results: Overall, 82% of patients demonstrated evidence of clinically relevant resorption on CT. However, only 12.5% of patients were clinically identified with BFR. On average, the bone flap decreased in volume by 36.7% within the first year. After several years of follow-up, in the majority of cases, we observed a linear pattern of bone volume loss (Figure 1). There was no evidence of plateau or deceleration in the loss of volume from the implanted bone segments. Individuals who developed greater BFR were significantly younger (43 ± 17 vs. 56 ± 12, $p=0.022$), had a lower incidence of diabetes (5.9% vs. 43%, $p=0.037$), and had more bone flap fragments (1.4 ± 0.67 vs. 1.00 ± 0, $p < 0.001$) than those who did not.

Conclusion: The optimal management of cranioplasty patients has not been clearly defined, especially in the context of clinical and radiological follow-up. We found that resorption following CP with cryopreserved bone appears to progress in a fairly linear and continuous fashion over time. Using serial CT images, we found a resorption rate of 82% at our institution, whereas only 12.8% of our cohort was clinically diagnosed as such. We identified several possible risk factors for resorption, including flap fragmentation, younger age, and absence of diabetes.

Predicting Obstructive Sleep Apnea Outcomes after Mandibular Distraction Osteogenesis in Patients with Isolated Pierre-Robin Sequence

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Background/Purpose: Pierre-Robin Sequence (PRS) is characterized by micrognathia, glossoptosis, and obstructive sleep apnea (OSA). Mandibular distraction osteogenesis (MDO) is a common treatment modality to improve OSA; however, post-surgical outcomes, including supplementary oxygen requirements, are difficult to predict. This study aims to determine how

OSA classification, and pre-MDO patient metrics relate to postoperative OSA-related outcomes. In addition, we aimed to evaluate the sleep study outcomes of maximizing the mandibular distraction distance on patients born with OSA secondary to micrognathia.

Methods: A retrospective chart review was conducted for patients with isolated PRS who underwent MDO at Children's Hospital Los Angeles between January 2006-September 2021. Patient demographics, pre-and postoperative sleep studies, and distraction variables were collected. Relationships between demographics, preoperative sleep variables, and postoperative OSA outcomes were analyzed. Results were stratified according to OSA severity and distraction distance (30mm vs. <30mm).

Results: A total of 73 patients met inclusion criteria (39.7% female, 60.3% male). Average follow-up was 5.1 ± 4.0 years. Fifty-eight patients were distracted to 30mm, while the remaining 15 patients experienced premature termination of distraction; reasons for premature termination included persistent infection, parent preference, and loss to follow-up. Average age at MDO was 2.5 ± 5.1 months. Average distraction was 28.7 ± 2.8 mm. Mean distraction rate was 1.7 ± 0.3 mm/day. Mean activation duration was 17.7 ± 5.5 days. Mean consolidation duration was 23.3 ± 24.5 weeks. No patients required tracheostomy and all survived.

When comparing patients who were fully distracted to 30mm with those who were distracted to less than 30mm, distraction to 30mm had a significantly greater improvement in AHI compared with patients who received distraction to less than 30mm when controlling for preoperative sleep study variables ($p=0.044$).

Following MDO, significant improvement was observed in lowest oxygen saturation (preoperative: 78.6%, postoperative: 85.2%, $p <0.001$), AHI (preoperative: 29.9, postoperative: 9.6, $p <0.001$), highest carbon dioxide level (preoperative: 50.1, postoperative: 45.5, $p<0.001$), and highest oxygen requirement (preoperative: 0.73, postoperative: 0.22, $p<0.001$).

There was no relationship between age at surgery and change in AHI, oxygen saturation, oxygen requirement, or highest carbon dioxide level. Patients with a higher preoperative AHI had greater improvements in AHI postoperatively ($r = -0.903$; $p <0.001$). For patients with severe OSA, 30.7% had resolution of and 46.2% had mild OSA postoperatively. For patients with moderate OSA (21), 41.2% had resolution of and 17.6% had mild OSA postoperatively. In patients with mild OSA, 50.0% had resolution of symptoms after MDO.

Conclusion: Patients with PRS who have more severe OSA experienced greater improvements in OSA, oxygen requirement, and oxygen saturation after MDO with over 89% of patients with severe OSA achieving mild or complete resolution of disease. Regardless of OSA severity, two-thirds of patients who were oxygen-dependent no longer required oxygen after MDO. Our results provide tangible evidence for how maximally distracting patients to 30mm can improve disease parameters, which can assist clinicians and families in anticipating outcomes after MDO for patients with PRS.

Mandibular Reconstruction with a Custom Endoprosthesis: Optimizing Bone Height and Border Contour

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Background/Purpose: The primary goals of mandibular reconstruction are to restore form, function, and aesthetics while providing a platform suitable for future dental restoration. Though most reconstructive techniques can recreate the inferior border of the mandible, most fail to address both form and function in a manner that optimizes dental rehabilitation. We describe a surgical technique using a novel custom endoprosthesis that recapitulates the native mandibular contour while supporting the bone construct in a cephalad direction with a medial ledge to facilitate implant placement and oral rehabilitation.

Methods: This is a multi-institutional, IRB-approved, retrospective chart review at high-volume plastic and maxillofacial surgery departments at pediatric tertiary-care referral centers between January 2018 and June 2021. Patient demographics, comorbidities, mandibular pathology, lesion size, endoprosthesis specifications, postoperative complications, and follow-up time were collected.

Results: Eleven pediatric patients, who met inclusion criteria of a large surgical defect, underwent en bloc mandibular resection and custom endoprosthesis reconstruction with free fibula bone osteocutaneous flaps (n=9), rib graft (n=1), and iliac crest bone graft (n=1). Five patients (45%) required revisional surgery for distal flap necrosis (n=1), an intraoral granuloma (n=1), and orocutaneous fistulas (n=3), of which one resulted in endoprosthesis removal. One patient experienced transient foot drop. The average follow-up time was 10.5 months. Excellent cosmetic outcomes and mandibular reconstruction were achieved in all patients. Thus far, two patients (18%) have completed dental restoration.

Conclusion: This custom endoprosthesis represents an untapped avenue toward more comprehensive mandibular reconstruction. It shows compatibility with microvascular flaps as well as skeletally immature and mature patients alike. By optimizing facial contour and bone height, this novel endoprosthesis is an attractive option for patients whose ultimate goal is dental restoration. In light of these advantages, the substantial financial barriers to dental restoration should be addressed.

Outcomes of Mandibular Reconstruction in a Rural Population: Is the Free Fibula Flap the Best Choice for All Patients?

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Background/Purpose: Patients undergoing mandibular resection have a variety of reconstructive options, including plating only, plating with soft tissue reconstruction, and osteocutaneous free flap reconstruction.1,2 The free fibula flap (FFF) is considered a workhorse in mandible reconstruction, and provides the option of osseointegrated dental implants. However, the rates of dental rehabilitation after mandible reconstruction vary significantly in current literature. At the same time, FFF is technically demanding, often requires virtual surgical planning that poses timing limitations and costs more compared to soft tissue flap reconstruction. The purpose of this study was to examine the outcomes of three common reconstruction types after mandibulectomy in a southern rural population.

Patients included in our prospectively enrolled tumor registry databases that underwent mandibulectomy from 2017-2021 were evaluated for inclusion by retrospective chart review. Patients were divided into 3 groups based on reconstruction method, including mandibular plating only (MP), radial forearm free flap with plating (RFFF) and fibula free flap (FFF). Surgical outcomes were assessed. Statistical analysis utilizing frequencies and percentages, descriptive statistics, chi-square analysis, and independent sample t-tests were performed.

Conclusions: 135 patients were included. Average length of follow-up was 30.1 months. 67 (49.6%) patients underwent MP only, 15 (11.1%) underwent RFFF, and 53 (39.3%) underwent FFF. Resection was performed for neoplasm in 69 (51.1%) patients, osteonecrosis (ON) in 62 (45.9%) and osteoradionecrosis (ORN) in 4 (3%). Reconstructive timing was significantly different between groups ($p < 0.001$), with delayed definitive reconstruction most common in the FFF group (35.8%), and immediate definitive reconstruction most common in the MP (100%) and RFFF groups (93.3%). Rates of reoperation after reconstruction (24.5%, 26.7% vs. 6.0%; $p < 0.001$), as well as overall complications (46.7%, 45.3% vs. 9.0%; $p < 0.001$) were similar between RFFF and FFF patients but significantly higher than MP. Dental reconstruction was performed in 18.9% of the FFF patients. There was no significant difference in rates of flap failure, hardware failure, recurrence, or disease status at last follow-up between groups.

Patients undergoing mandibulectomy had similar surgical outcomes, regardless of reconstruction method, at a single tertiary center serving a rural population. However, the rate of patients that successfully completed dental rehabilitation after FFF was low (18.9%). Insurance coverage, high out-of-pocket costs and personal preferences are possible explanations. Our findings suggest that the RFFF is a reasonable alternative to the FFF in select patients that require reconstruction but do not wish to pursue dental restoration. This consideration may be more salient in oncologic patients that need timely surgical intervention or patients whose insurance plans do not cover dental implants or other methods of dental rehabilitation. Transparent preoperative counseling is critical for optimal decision-making and promotes patient-centricity.

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Restricting the Development of Oronasal Fistulas: The Effect of Post-Operative Restraints on Outcomes Following Palatoplasty

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Purpose: Post-operative restrictions such as arm restraints (AR) and suction-less feeding are commonly used to decrease rates of oronasal fistulas after cleft surgery; however the utility of these restrictions remains unclear [1-4]. We hypothesize that the use of arm restraints and suction-fewer feeding methods do not impact the rate of oronasal fistula development following palatoplasty.

Methods and Materials: A retrospective case-control study identified demographic, socioeconomic, and clinical data for patients undergoing primary palatoplasty at two tertiary care pediatric medical centers from 2009 to 2020. 52 patients underwent bottle feeds and did not have arm restraints (Limited Restrictions group, LR); 53 patients underwent suction-less feeding

methods and used arm restraints (Highly Restricted group, HR). Between these cohorts, primary outcomes including the rate of reoperations, post-operative length of stay (LOS), and the rate of oronasal fistula development were compared. Patients with intensive care unit stays resulting in LOSs greater than 30 days were excluded.

Results: 105 patients met inclusion criteria during the study period. Cleft width and Veau type were similar between groups (all $p > 0.05$). 9.6% (5/52) and 3.8% (2/53) ($p > 0.05$) of patients underwent reoperations between the LR and HR cohorts, respectively. There was no difference in LOS between groups (LR: 1.90 vs. HR: 2.06, days) ($p > 0.05$). Additionally, there was no difference in the rate of oronasal fistula development between LR and HR patients (LR: 9.6% (5/52) vs. HR: 7.5% (4/53) ($p > 0.05$)). The rate of oronasal fistula development did not vary by race, ethnicity, insurance type, or syndromic status ($p > 0.05$).

Conclusions: Our preliminary data suggest that restrictions do not impact the rate of oronasal fistula development in patients undergoing primary palatoplasty. Our findings also indicate that post-operative restrictions do not impact the rate of reoperation or LOS. In light of this, we suggest a reconsideration of the utility of highly restrictive post-operative protocols.

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Outcomes of Surgical Pharyngeal Flap for Management of Velopharyngeal Insufficiency in 22q11.2 Deletion Syndrome

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Purpose: Management of velopharyngeal insufficiency (VPI) in 22q11.2 deletion syndrome (hereafter 22q) is challenging given the heterogeneous clinical presentation and unique anatomic features. Pharyngeal flap is a common operation in this population because of the ability to treat large velopharyngeal gaps even in children with poor muscle tone. This study characterizes outcomes of pharyngeal flap in children with 22q compared to a control group of children with non-syndromic cleft lip and palate (CLP) to determine if those with 22q are at higher risk of poor speech outcomes or complications after surgery.

Methods: This retrospective cohort study evaluates children with either genetically confirmed 22q or CLP treated with pharyngeal flaps at a single multidisciplinary VPI clinic between February 2007 and April 2021. Children who underwent prior surgery for VPI elsewhere were excluded. Pre- and postoperative perceptual speech characteristics, velopharyngeal competence score (VPC; "competent," "borderline," "incompetent"), snoring, obstructive sleep apnea (OSA), postoperative complications, length of stay, and need for ICU admission were systematically extracted from the medical record.

Results: 34 children with 22q and 34 with CLP underwent superiorly based pharyngeal flaps. One patient in the 22q cohort was nonverbal at both pre- and post-operative visits, thus VPC and resonance data were not obtained. Age at surgery was similar between the 22q (6.1 ± 2.2 years) and CLP (7.3 ± 3.6 years; p=0.10) groups. Pre-operative VPC (p=0.68) and resonance (p=0.31) were also similar between groups. Four patients were lost to follow-up in the 22q cohort and five in the CLP cohort. Post-operative perceptual speech evaluations were performed at 6.0 ± 5.4 months and 7.3 ± 3.6 months for the 22q and CLP cohorts respectively (p = 0.22). Of those who returned for follow-up speech evaluation, significantly fewer children in the 22q cohort (n= 24, 80%) demonstrated improvement in resonance after surgery compared to the CLP control group (n=29, 100%; p = 0.017*). Twelve children with 22q achieved a VPC score of "competent" after surgery compared to 16 with CLP (p=0.24). Mean length of stay was significantly longer for the 22q cohort

(1.6 ± 0.71 days) compared to the CLP control group (1.3 ± 0.53 days; p = 0.05*). Prevalence of snoring pre- (p=0.82) and post-operatively (p=0.12) were similar between groups. Three children with 22q were newly diagnosed with OSA postoperatively compared to one with CLP (p = 0.32). One patient in each group required an unplanned ICU admission. Two children (6%) in the 22q cohort underwent revision surgery for persistent VPI compared to five (14%) in the CLP cohort (p =0.25).

Conclusion: Unsurprisingly, children with 22q are at increased risk of having no improvement in speech after pharyngeal flap compared to children with non-syndromic CLP. However, we were heartened to find the majority of patients do improve, with a comparable number of 22q children reaching "competent" speech after surgery compared to non-syndromic CLP controls. Although length of stay was longer in the 22q cohort, more importantly there were no differences in complication rates or negative sequelae like snoring and OSA between groups.

Reimbursement Rates Among Surgeons for Facial Trauma Call

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Background: Facial trauma accounts for over 3 million emergency room encounters each year. Currently there is no specific data regarding reimbursement rates, scope of practice, or hospital requirements when it comes to facial trauma call. This study aimed to survey all active members of the American Society of Maxillofacial Surgeons (ASMS) to determine the current practices of members concerning emergency calls.

Methodology: In December 2021, a 27-question online survey was sent to all active members of the ASMS assessing facial trauma call practices. The electronic survey was sent three times over six weeks, and responses were collected through Qualtrics. Information collected included, surgeon age, gender, primary specialty, scope of practice, call frequency as well as several detailed questions regarding facial trauma call coverage and compensation. Other survey questions included willingness and obligation to take call, as well as barriers to providing emergency call. Financial aspects of call were also questioned. Multivariate logistic regression models were performed to assess the relationship between variables and the likelihood of being compensated for taking call.

Results: 45 ASMS members completed the survey. Of these respondents, 64% were required to take facial trauma call and 44% were compensated for call. Among members required to take facial trauma call, a smaller proportion were compensated for taking call (38%). ASMS members that were in the North-East were 0.234 (CI: 0.054,1.015; $p = 0.052$) times as likely to be compensated for taking facial trauma call when compared to the other regions. Surgeons who worked at level 1 trauma centers were 5.42 (CI: 0.892, 32.89; $p = 0.066$) times more likely to be compensated for taking trauma call when compared to those at level 2-4 trauma centers combined. 76% of the level 1 trauma center surgeons were required to take call, and only 43% were compensated. Finally, surgeons that were required to take facial trauma call were 4.646 (CI: 1.203,17.944; $p = 0.026$) times more likely to be in a high-call category.

Conclusion: This study evaluated trends in reimbursement for facial trauma and found that more than half of respondents indicated being required to take facial trauma call but less than half were compensated. We further identified geographic disparities based upon the level of trauma surgeons treat. Compared to level 2-4 trauma centers, surgeons at trauma level 1 centers had an increased likelihood of being required to take call but also of being compensated. Increased

awareness and consideration of these trends will be useful for hospitals, and surgeons to assure continued access to surgical facial trauma care in the United States.

Use of the Radial Forearm Fasciocutaneous Flap for Palatal Reconstruction: A Twenty-Two Year Retrospective Review

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Introduction: The radial forearm fasciocutaneous free flap (RFFF) is widely considered to be a reliable free flap for reconstruction of acquired and congenital palatal defects in adult and pediatric patients. However, such cases are rare, seen in cases of the most severe palatal defects, where local tissue rearrangement cannot be utilized for reconstruction. The RFFF is considered the end-game approach for the multiply operated palate, especially in pediatric patients.

Methods: A retrospective review was performed to identify cases of palatal defects that were reconstructed using RFFF under the care of the senior author (S.A.W). Demographic information and diagnoses were recorded. Peri-operative and post-operative outcome parameters were assessed. Outcome measurements included post-operative assessment of speech, velopharyngeal insufficiency (VPI), complications (defined as infections, wound dehiscence, fistulas, failure of flap inset, flap failure) and revisions.

Results: Twenty-three patients were identified who met inclusion criteria. Thirteen patients had palatal defects due to congenital anomalies, including unilateral and bilateral cleft lip and palate, Treacher Collins Syndrome, and Goldenhar Syndrome with hemifacial agenesis. Ten patients had acquired palatal defects due to cocaine use disorder (7/10) or head and neck (H&N) cancer (3/10). Mean age was 13±8 years in the congenital anomalies' cohort, 52+7.5 years in the cocaine use disorder cohort, and 50.3±26.0 years in the head & neck cancer cohort. Mean palatal defect size pre-operatively was 9.2±8.1 x 7.6±7.3 cm and mean flap size was 12.1±9.6 x 9.1±8.4 cm. Mean ischemia time was 63.5±2.1 minutes and mean estimated blood loss was 229.2±147.3 ml. There were no incidences of flap failure or infection. There was one incidence of wound dehiscence in one patient that had been heavily irradiated for H&N cancer. In one patient with diagnoses of pyoderma gangrenosum and cocaine use disorder, there was failure of flap inset despite multiple procedures due to poor tissue quality. Pre-operatively, all cleft palate patients had palatal fistulas that did not resolve with prior palatal repairs or palatal absence that could not be corrected with local soft tissue reconstruction including posterior pharyngeal or sphincter pharyngoplasty.

Conclusions: RFFF for palatal reconstruction provides a definitive separation between oral and sinusonasal cavities. It improves quality of life by improving speech, swallowing, and chewing. It should be considered an integral component therapy and rehabilitation for cleft palate patients and palatal defects secondary to H&N cancer. The RFFF also plays an important role in rehabilitation of patients with palatal perforation secondary to cocaine use disorder. While most of the literature discusses the use of the RFFF for nasal reconstruction secondary to cocaine use disorder, RFFF can also be effective for the even more severe presentation of palatal perforation. Although RFFF have traditionally been considered a salvage operation the end of the reconstructive ladder, for selected patients with very large defects, previous attempts at closure, and poor tissue quality, RFFF may be considered earlier in the treatment algorithm. The RFFF may pose less of an inconvenience than multiple stages of reconstruction and provides the advantage of an extraoral and extra facial donor site.

Demineralized Bone Matrix in Osseous Genioplasty: Long-Term Follow-Up

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Background: Osseous genioplasty is an important technique used to alter chin prominence and improve facial aesthetics. The drawback to this procedure, however, is the development of an intersegmental gap and lateral step offs, particularly in cases of significant advancement.

While demineralized bone matrix (DBX) has been used in various aspects of craniofacial surgery as an adjunct to or replacement of autogenous bone graft, including Le Fort I osteotomy sites as well as in alveolar cleft repair, the evidence in favor of DBX in osseous genioplasty remains limited. The purpose of this study is to investigate the long-term efficacy of using a DBX in patients undergoing osseous genioplasty.

Methods: A retrospective chart review was conducted of all patients undergoing osseous genioplasty using DBX between the years 2013-2021 was performed. Demographic information, surgical indication, type of genioplasty, and magnitude of plate were obtained for each patient. Post-operative complications of infection, tooth root loss, implant removal, unresolving pain at osteotomy site >3 months, hardware loosening, hardware extrusion, and return to the OR for hardware removal was recorded.

Osseous calcification within the osteotomy site was assessed on visual radiographic interpretation as well as objectively measured in patients receiving postoperative CT scan at least 3 months following surgery using Hounsfield Units within a best fit oval region of interest that included the tissue within the osteotomy gap on the coronal slice at the midpoint between the upper and lower segments of the plate.

Results: A total of 262 patients were included in the study, with 13.8% undergoing shortening, 6.1% undergoing lengthening, 35.6% undergoing advancement, and 44.4% undergoing lengthening and advancement genioplasty. The mean size of the plates used was 5.71 ± 2.16 mm. 74% underwent concurrent orthognathic surgery and 5% underwent concurrent rhinoplasty.

Among all patients, 94.3% experienced no genioplasty-related complications, while 4.9% of patients experienced infection, and 1.5% experienced residual pain at the osteotomy site greater than 3 months after surgery, and 2 patients required hardware removal. All 47 who patients received post-operative imaging at least 3 months following surgery (28.14 ± 22.88 months) demonstrated bony growth on visual assessment of the scan, with a mean of 583.62 ± 197.92 HU in the intersegmental gap.

Conclusions: The use of DBX placed in the interposition between bony segments in an osseous genioplasty is safe and effective.

Photogrammetric Quantification of Soft Tissue Changes Following Midface Surgery

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Introduction: Patients with genetic craniofacial syndromes such as Apert, Crouzon, and Pfeiffer commonly present with a constellation of phenotypic findings including midface hypoplasia and concavity, exorbitism, and malocclusion. Midface surgical procedures, such as the Le Fort III and frontofacial monobloc advancement, are commonly used to improve anatomy and physiology of the syndromic midface. However, objective soft tissue changes following midface surgery are poorly characterized. The aim of this study was to develop a set of soft tissue analyses applicable to standard clinical photographs to quantify soft tissue changes after midface surgery.

Methods: Patients undergoing midface surgery at our institution with frontal and lateral pre- and postoperative clinical photography were included in this retrospective study. ImageJ was used to measure soft tissue anatomy in pixels, including nasal length and width, intercanthal distance, and palpebral fissure height and width, among others. To account for differences in photographic magnification, ratios were established by dividing soft tissue anatomic measurements in pixels by facial height or width in pixels. For example, nasal length ratio = (nasal length)/ (facial height) × 100. Facial convexity was quantified by calculating the angle between sellion (radix), subnasale, and pogonion on lateral photographs. Canthal tilt was determined by calculating the angle between 1) a line passing through the lateral and medial canthi and 2) a line adjacent to the inferior palpebra and parallel to the nasal ala. Pre- and postoperative measurements were compared with Wilcoxon signed rank tests and paired t-tests.

Results: Nineteen patients (eight Crouzon, seven Pfeiffer, three Apert) undergoing monobloc (n = 11) and Le Fort III distraction osteogenesis (n = 8) were analyzed preoperatively and 9.5 ± 8.6 months postoperatively. Patients achieved an average of 20.0° ± 11.9° improvement in facial convexity postoperatively (191.4° ± 11.7° vs 211.4° ± 8.7°, $p < 0.001$). Patients demonstrated significantly greater nasal length ratios (29.7% vs 32.3%, $p < 0.001$) and nasal width ratios (25.0% vs 29.8%, $p < 0.001$) postoperatively. Intercanthal ratio increased from 27.7% to 29.8% postoperatively ($p = 0.001$). Patients' palpebral height (7.2% vs 5.1%, $p < 0.001$) and width (22.1% vs 21.4%, $p = 0.011$) ratios decreased postoperatively. Patients demonstrated significantly worse canthal tilt symmetry postoperatively (1.9° difference vs 3.7° difference between eyes, $p = 0.046$).

Conclusions: Midface surgery yields quantifiable changes in soft tissue anatomy for patients with syndromic craniosynostosis. Post-surgically, patients achieved significantly greater facial convexity, increased nasal length and width, and reduced exophthalmos. Patients demonstrated worse symmetry in canal tilt angles, suggesting a role for canthopexy at the time of midface surgery. This toolbox of soft tissue analyses may be applicable in assessing soft tissue changes following other craniofacial surgeries.

Age at Diagnosis and Disease Trajectory in Fibrous Dysplasia of the Orbit

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Purpose: Fibrous dysplasia (FD) frequently affects the craniofacial bones and is the most common craniofacial tumor encountered by plastic surgeons. A subset of FD patients will have disease affect the orbit or optic canal, threatening compressive neuropathy and irreversible vision loss. Our institution stratified management of these complex patients based on extent and location of orbital involvement. The purpose of this study is to evaluate the longitudinal outcomes of 36 patients with orbital fibrous dysplasia (FDO) who underwent one of three paths of surgical management: 1) conservative contour reduction, 2) partial contour reduction and resection with or without bone grafting, or 3) "radical" complete excision with immediate reconstruction.

Materials and Methods: All patients treated for FD from 2015 to 2021 were identified by ICD-10-CM codes for monostotic and polyostotic disease, yielding 186 patients. Of these patients, 36 had orbital involvement. Demographic information and disease course were obtained by chart review. Impressions from head CTs were employed to track the natural history of tumor growth and operative records were reviewed to determine surgical approach (conservative, moderate, or radical).

Results: Average patient age at FD diagnosis was 10.6 ± 4.8 years (range 0.7 – 18.8 years), with many families noting facial symmetry from a much younger age (4.5 ± 0.7 years). The average timespan covered by CT was 3.8 ± 4.4 years (range 0.7 – 16.7 years), with an average in-person follow up of 5.4 ± 4.7 years (range 0.15 – 16.6 years). Eleven patients (30.6%) had polyostotic FD, including five patients (13.9%) diagnosed with McCune Albright syndrome. Fifteen patients (41.7%) had bilateral orbital disease, and for 100% of patients, the involved orbit(s) did not change over time from the initial to final CT scan. Of the 72 optic nerves evaluated, 36 nerves (50.0%) belonging to 28 (77.8%) patients were at least partially encased by FD, with 83.3% completely encased. Patients with 100% encasement were not significantly more likely than those with partial encasement to require orbital decompression ($p = .298$), with only 8 of 13 patients (61.5%) who required optic canal decompression demonstrating 100% optic nerve encasement. Thirteen patients (36.1%) required at least one therapeutic optic nerve decompression. Younger age at diagnosis was significantly associated with increased number of surgical interventions ($r = -.458$, $p = .008$), younger age at first optic canal decompression ($\beta = .678$, $t(35) = 3.963$, $p = .003$) and worse visual outcomes ($\beta = -.402$, $OR = 0.669$, $p = .209$). Neither MAS diagnosis nor GH excess were significantly associated with the requirement for orbital decompression ($p > .05$ for both).

Conclusion: Laterality of FDO is stable over time. In our cohort, patients diagnosed at a younger age required more surgeries, underwent optic canal decompression earlier, and had worse visual outcomes. Our findings support the conceptualization of FDO as a progressive disease.

Denervation During Mouse and Human Mandibular Distraction Osteogenesis Results in Impaired Osteogenesis

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Purpose: Craniofacial distraction osteogenesis (DO) is a powerful regenerative technique. It can however be marred by complications, necessitating surgical revision. Mandibular DO is mediated by skeletal stem cells (SSCs) in mice, which enact bone regeneration via neural crest re-activation (1). As peripheral nerves are essential to progenitor function during development and in response to injury (2-6), we question if denervation impairs mandibular DO in both mice and humans.

Methods: Eight-week old C57Bl6 mice were divided into two groups: DO with inferior alveolar nerve (IAN) denervation ("DO-Den") and DO with IAN intact ("DO-Inn"). An IAN segmental defect was created in the DO-Den cohort following mandibular osteotomy. The IAN was protected in Do-Inn. Following a latency period, all mice underwent gradual DO. Specimens were harvested at POD 10, 15, 23 for analysis of the stem and progenitor cell populations using fluorescence-activated cell sorting (FACS) and at POD 43 for microCT and histological analysis.

A unique opportunity arose to question if our animal findings were conserved in a clinical specimen. A young patient underwent bilateral mandibular DO and was noted post-operatively to have a new unilateral IAN clinical deficit. Bone specimens were obtained at the time of distractor removal from the clinically denervated and innervated mandible. Osteogenesis was examined using CT, histology and scRNAseq. Using anchor transfer, we compared human and mouse SSC populations to identify congruent cell clusters.

Results: In mice, DO-Den resulted in reduced histological and radiological osteogenesis and SSC expansion relative to DO-Inn (*p=0.018). Impaired histological and radiological DO in the setting of denervation was also conserved in the human specimen. Anchor transfer of mouse and human SSCs demonstrated congruency of transcriptional pathways implicated in impaired osteogenesis in denervated mouse and human samples.

Conclusion: Together these data suggest that peripheral nerves play a role in DO by promoting non-neuronal tissue repair and identify key clinical targets for further investigation. Our findings were conserved in mice and humans where mandible distraction in the setting of IAN denervation led to reduced osteogenesis relative to IAN innervation.

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Ergonomic Practices and Interventions in Plastic & Reconstructive Surgery: A Systematic Review

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Introduction: Ergonomics, or the study of human engagement with the working environment, has significant implications for a surgical workforce that performs at the interface between human-operated equipment and patient anatomy to achieve operative results. The field of ergonomics has garnered significant interest in surgery secondary to high rates of work-related musculoskeletal disorders and desire to optimize surgical performance.

Plastic surgery takes pride in its profound depth and breadth of head-to-toe surgical practices, which inevitably precipitate a spectrum of ergonomically unfavorable circumstances. The purpose of this systematic review was to evaluate literature discussing ergonomics in plastic surgery and present current knowledge, evaluate trends, and identify gaps prime for future study.

Methods: A systematic search strategy was developed with a licensed librarian and attending plastic surgeon to query all manuscripts evaluating ergonomics in plastic and reconstructive surgery:

("Musculoskeletal Pain"[Mesh]) OR ("Ergonomics/physiology"[Mesh] OR "Ergonomics/physiopathology"[Mesh] OR ("Occupational Diseases"[Mesh]) OR ("Cumulative Trauma Disorders"[Mesh]) OR "repetitive motion disorder*" OR "musculoskeletal pain" OR ergonomic*) AND ("Surgeons"[Mesh] OR "plastic surgeon*" OR "reconstructive surgeon*" OR "cosmetic surgeon*" OR "craniofacial surgeon*" OR "microsurgery*" OR "hand surgeon*" OR "gender surgeon*")

Articles were included if they primarily addressed ergonomics in plastic surgery. Ergonomics was defined broadly as plastic surgeons' engagement with their work environment. The covidence systematic review manager was used by two independent reviewers to import articles, screen abstracts, evaluate full texts, and extract data. Data were evaluated with Spearman's correlations, Wilcoxon signed-rank tests, and descriptive statistics.

Results: The search strategy generated 980 studies, of which 46 were ultimately included. 2241 plastic and reconstructive surgeons participated across all studies. The number of published studies increased significantly over time when evaluated by year ($\rho = 0.660$, $p < 0.001$), with 17 (36.9%) written since 2020. The most represented subspecialties included general plastic surgery (n = 21, 45.7%) or microsurgery (n = 17, 36.9%), compared to craniofacial surgery (n = 6, 13.0%, $p < 0.001$), hand/peripheral nerve surgery (n = 1, 2.2%, $p < 0.001$), or aesthetic surgery (n = 1, 2.2%, $p < 0.001$).

Studies more commonly discussed musculoskeletal pain/disorders (n = 23) compared to surgical instrumentation or technology (n = 18, $p = 0.390$), operative posture (n = 14, $p = 0.041$), surgical technique (n = 6, $p = 0.002$), peri-surgical practices (e.g. breaks, stretches, sleep) (n = 5, $p < 0.001$), and surgeon physiology (e.g. vital signs) (n = 3, $p < 0.001$). Original studies more often collected survey data (n = 23) over data from interventions (n = 19). Interventional approaches more frequently involved novel instrumentation or technology (n = 14, 73.4%) compared to peri-surgical practices (n = 3, 6.5%, $p < 0.001$) or operative posture (n = 2, 4.3%, $p < 0.001$).

Conclusions: Ergonomics in plastic surgery has gained significant interest over time, with recent years representing a large proportion of published literature. Work on ergonomics is least represented in hand/peripheral nerve surgery and aesthetic surgery. Although most studies discuss musculoskeletal pain and disorders, the proportion of interventional studies addressing posture and surgical practices are comparatively underrepresented, suggesting a welcome opportunity for future intervention.

Characterization of Integrin Expression on Human Mesenchymal Stem Cells Seeded on Nanoparticulate Mineralized Collagen Scaffolds

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Purpose: Current clinical options in skull reconstruction include both autologous bone as well as alloplastic materials. However, drawbacks such as donor site morbidity and availability for the former and cost and infection risk for the latter suggest that alternative strategies require consideration. Extracellular matrix (ECM)-inspired regenerative materials utilize the instructive capabilities of ECM to direct progenitor cell differentiation and cell fate determination. We previously reported on the ability of nanoparticulate mineralized collagen glycosaminoglycan (MC-GAG) materials to promote rabbit skull regeneration in the absence of ex vivo-expanded osteoprogenitor cells and exogenous growth factors. Mechanistically, we recently reported that MC-GAG partially regulated osteogenic differentiation of primary human mesenchymal stem cells (hMSCs) via stiffness of the material and the mechanosensitive YAP/TAZ pathways. Integrins are heterodimeric proteins with extracellular domains that serve as mechanosensors of the extracellular environment and cytoplasmic domains functioning as assembly points for focal adhesions, protein complexes responsible for mechanotransduction. As integrins are responsible for detection of the biomechanical properties of the extracellular environment, characterization of their expression and properties on MC-GAG is of interest in order to further elucidate the osteogenic properties of these scaffolds.

Methods: Primary hMSCs were cultured on both MC-GAG and nonmineralized collagen glycosaminoglycan scaffolds (Col-GAG). Lysates of cells cultured on scaffolds were subjected to quantitative real-time polymerase chain reaction (qPCR) and western blot in order to evaluate for expression of integrin αV, β1, and β3 subunits as well as other proteins involved in signaling and osteogenesis.

Results: Results of qPCR demonstrated significantly increased upregulation of integrin subunits αV and β1 on MC-GAG compared to Col-GAG. Results of western blot demonstrated increased protein expression of integrin αV, β1, and β3 on MC-GAG versus Col-GAG, and protein expression of Runx2, focal adhesion kinase (FAK), and phosphorylated FAK was also higher on MC-GAG.

Conclusions: MC-GAG induced higher gene and protein expression of integrin αV and β1 subunits in primary hMSCs when compared to a control, non-mineralized Col-GAG material. The combination of these findings and the known effects of the mechanical properties of MC-GAG on osteogenic differentiation suggest that the specific integrin subunits may be important to MC-GAG induced bone regeneration. Work employing downregulation of the specific integrin subunits is currently underway to determine the necessity of each subunit for differentiation.

The Impact of elevated BMI on Venous thromboembolism (VTE), Hematoma and Pedicle Thrombosis in Patients Undergoing Free Flap Reconstruction of The Head and Neck Region Who Received Chemoprophylaxis Heparin 5000 Units TID

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Background: Venous thromboembolism (VTE) is a complication after free tissue transfer to the head and neck (H&N) region. Different chemoprophylaxis regimens could be tailored for each patient. Our previous research demonstrated that the standard dosing of enoxaparin might be not adequate in patients with higher BMI. Therefore, in this study, we changed our focus to a different agent used in VTE chemoprophylaxis - heparin. The purpose of this study is to explore the association of high BMI (BMI ≥25) with venous thromboembolism (VTE), hematoma, and flap pedicle thrombosis in patients undergoing free flap reconstruction of the head and neck region and received chemoprophylaxis of heparin 5000 units three times daily (TID) subcutaneously (SQ).

Methods: All patients who underwent head and neck reconstruction with free tissue transfer from January 2012 to July 2021 in a tertiary center were reviewed retrospectively. The cohort was divided into two groups based on BMI cut-off point 25. The study outcomes were VTE, hematoma that required surgical evacuation, and flap pedicle thrombosis (arterial, venous, or both) that required return to the OR. All outcomes were recorded within 30 days from the index surgery. Patients who obtained chemoprophylaxis other than heparin 5000 units TID SQ were excluded.

Results: Eighty-four patients with a mean BMI of 25.24 ± 6.12 met the inclusion criteria. Out of those (n=40, 48%) patients had a BMI ≥ 25. The mean of the Caprini score was similar between the patients with BMI ≥ 25 and those with BMI < 25 (6.47 ± 1.48 vs. 6.36 ± 1.41, p=0.72). The VTE, hematoma, and flap pedicle thrombosis rates for the whole cohort were (n=8, 10%), (n=7, 8%), and (n=3, 4%), respectively. The VTE, and flap pedicle thrombosis rates were higher in those with BMI ≥ 25 (n=5, 12.5% vs. n=3, 6.82%, p=0.46), (n=2, 5% vs. n=1, 2.27%, p=0.6), respectively. However, the differences failed to reach statistical significance. In contrast, hematoma rates were higher in patients with BMI < 25 with no statistical significance (n=1, 2.5% vs. n=6, 13.64%, p=0.11)

Conclusions: This is the first study to explore the effects of BMI on VTE with standard heparin dosing in head and neck microsurgical reconstruction patients. The incidence of developing VTE and flap pedicle thrombosis in those with BMI ≥25 was almost double that of patients with BMI < 25. In contrast, the hematoma rate was six times higher in the group with BMI < 25 versus those with BMI ≥ 25. However, none of these clinically significant results reach statistical significance, probably due to the lack of power and the rarity of VTE in patients who received heparin chemoprophylaxis. Multi-institutional studies are required to assess these outcomes.

The Utility and Viability of Allogeneic Cadaveric Cartilage For Construction of The Auricular Framework in Type III Microtia Repair

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Objective: Allogeneic cadaveric cartilage is commonly used for grafts in nasal reconstruction surgery; however, limited information exists on its use in total ear reconstruction for type III Microtia. In this case series we describe the novel use of allogeneic cartilage for auricular framework construction and review preliminary histologic evidence of long-term allogeneic cartilage viability.

Methods: Patients requiring complete reconstruction of the auricle from August 2020 to December 2021 were eligible and underwent ear reconstruction using cadaveric costal cartilage. Patients were evaluated for surgical site infection (SSI), skin necrosis, cartilage resorption, and cartilage exposure during regular follow up visits. Two cartilage samples were taken after two separate second stage scaffold reconstructions which were completed 52 weeks post first stage reconstruction. These samples were histologically assessed for chondrocyte viability, host incorporation, local inflammation, and immune rejection.

Results: A total of thirteen ear reconstruction procedures using cadaveric costal cartilage were performed across 11 patients; 12/13 ears were classified as type III Microtia, along with one case of type IV Microtia. 2/13 were revisions of previous reconstructions. Patients' ages ranged from 4 – 51 years at the time of surgery, with an average age of 13 years for primary reconstruction. Follow up time ranged from 12 to 64 weeks, with a mean follow up time of 32 weeks. No patients experienced any visibly significant cartilage resorption or warping. One patient experienced partial exposure of the construct, which was successfully salvaged with a local TPF flap. One patient experienced a fungal infection that was successfully treated with topical antifungal medication. One patient with a previous TPF flap which we attempted to replace with a new construct had flap necrosis requiring explantation. The second revision patient experienced a bacterial infection requiring explantation, Of the eleven primary ear reconstructions performed, none had postoperative complications related to the use of the cadaveric cartilage. Preliminary histologic analysis of the two samples taken 1-year post-implantation has shown viable chondrocytes that depict proper host incorporation. Furthermore, there was no evidence of immunologic rejection or any local inflammation/host foreign body response.

Conclusion: Cadaveric costal cartilage serves as a viable alternative to autologous cartilage and other biomaterials for construction of auricular frameworks in Microtia reconstruction.

Preliminary histologic results are promising, but longer follow up times and an increased sample size are needed for assessment of long-term efficacy.

The Liverpool Lymph Node Metastasis Prediction Score For Cutaneous Squamous Cell Carcinoma Of The Head And Neck: Developing A Predictive Scoring System Through A Large-Scale Case-Control Study

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Aim: Although overall rates of lymph node metastasis (LNM) are low in cutaneous squamous cell carcinoma of the head and neck (cSCCHN), several patient and tumour factors likely confer considerably higher risks, which when present may warrant a more proactive elective approach to regional nodal basins. Such factors, however, remain poorly characterised. This large-scale study sought to provide clarity on specifically which factors should be incorporated into LNM risk stratification.

Method: Clinicopathological parameters were studied retrospectively in 1067 cSCCHN patients (170 developed LNM, 897 did not develop LNM). Chi-squared and Mann-Whitney statistics were used to identify predictor variables, and binary logistic regression analysis used to develop a multivariate model. A LNM predictive score was developed iteratively and receiver-operating characteristics used to identify an optimal cut-off score assuming equal weight to sensitivity and specificity.

Results: Eight variables added significantly to the multivariate model: perineural invasion ($p<0.001$); margin status ($p=0.012$); deep margin involvement ($p<0.001$); location (auricular $p=0.002$, non-glabrous lip $p=0.014$); poor differentiation ($p<0.001$); diameter ($p=0.033$); thickness ($p<0.001$); anatomical depth of invasion ($p<0.001$). Using effect size outputs, the Liverpool LNM prediction score was developed iteratively, which was highly predictive of LNM development (AUC = 0.903 [95% CI ± 0.024] $p<0.001$), with a cut-off score of 6 yielding a sensitivity of 92.8% and a specificity of 89.6%.

Conclusion: We have developed a highly accurate predictive score for LNM development in cSCCHN based on routinely reported parameters. We envisage this informing risk stratification and thus patient selection for future clinical trials evaluating elective nodal management strategies in cSCCHN patients.

Designing the Prolabial Flap in Revisional Bilateral Cleft Lip Surgery: Clinical and Quantitative Analysis of Post-Operative Widening/Stretch with Longer-Term Follow-up

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Purpose: A hallmark of primary bilateral cleft lip repair is the emphasis on a narrow prolabial segment. Yet no data exists on the growth and stretch of the prolabial segment after a total secondary bilateral cleft lip revision. This information is critical to design. The aim of this study is to present a consecutive series of patients who underwent secondary bilateral cleft lip revision and quantify/characterize the post-operative prolabial changes with follow-up of at least 2 years.

Methods: nineteen consecutive patients were identified retrospectively. All patients were examined, measured, and photographed preoperatively, intraoperatively, and postoperatively at 1 month, 3 months, 6 months, 1 year, and then yearly. Measurements of prolabial width were made cephalically and caudally. Chart review and data acquisition was achieved.

Results: The age at time of revision ranged from 4 to 18 years (mean 10). Of the 19 patients, 4 were syndromic. The indication for revision were overwhelmingly whistle-tip deformities. From immediately postoperative to 1 month postoperative, the prolabium widened 20% cephalically and 23% caudally. From immediately postoperative to 3 months postoperative, the prolabium widened 35% cephalically/37% caudally. At 6 months postoperative, the widening was 44% cephalically/44% caudally. At 12 months postoperative, the prolabial widening was 40% cephalically/41% caudally. At 2 years postoperative, the prolabial widening was 41% cephalically/48% caudally.

Conclusions: In secondary bilateral cleft lip revision, the prolabial segment stretches significantly in the first 6 months postoperatively and then stabilizes. As in primary repair, this widening should be considered when designing a revisional prolabial flap.

Utilization of a Large Animal Translational Model to Evaluate a Stiffness-Matching Approach to Skeletal Reconstruction Hardware

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Introduction: Current skeletal fixation hardware is predominantly rendered in Ti-6Al-4V (i.e., surgical grade 5 "titanium", Ti64). A biocompatible material, Ti64 was originally developed in the 1950's for aerospace applications (1). Several current Ti64 skeletal reconstructive devices have a high rate of re-operation. For example, up to 39% of mandibular graft fixation hardware has been observed to fail (2). The Young's Modulus, a measure of stiffness, of Ti64 is 115 GPa (gigapascal) versus human bone which is usually 18-20 GPa. Effective modeling of the functional success of fixation hardware requires fixation device material properties, shape, and expected load.

Methods: We used a novel mechanical model of graft fixation during chewing(3). We modulate the fixation device's stiffness through the use of a less stiff and superelastic material, NiTi, and strategic placement and design of porous regions. The NiTi fixation plates are 3D printed via laser powder bed fusion (LPBF)(4) and are used with Ti64 screws to fixate an approximately 17.5 mm bone graft in the diastema region of a sheep mandible. A total of four sheep have been reconstructed to date. Animals are monitored postoperatively until complete healing is observed via 3D CT.

Results: All four animals demonstrated mandibular bone healing. We reduced screw loosening and callus formation through improved planning of screw location and depth. One plate broke without screw loosening. It appears that the graft had healed before the plate broke due to remodeling of the mandible. Our flexible plate moved out of the way of the mandible's remodeling and return to full function. While screw loosening and plate breakage are often associated with fixation failure and reoperation, our device proved adaptive in these situations and continued to facilitate restoration of form and function.

Conclusion: Our stiffness matching approach to mandibular graft fixation hardware has proven effective in a large animal model and thus shows promise for future clinical applications.

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Figure 1: 3D CT Images of Sheep #1 (of 4) at (A) 51 days post-operative and (B) at 203 days postoperative, with fully healed mandible. Note that 2 of 3 screws caudal to the graft's posterior osteotomy site loosened. The additional, unplanned, flexibility resulted in callus formation, but this resolved, and the bone graft fully healed. In subsequent cases, our screw location and depth planning approach improved steadily, where with little to no screw loosening, we observed faster healing.

Characterizing the Domain Rescue of Palatal Length in Patients with a Wide Cleft Palate: A Case for Buccal Flap Reconstruction in Primary Palatoplasty

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Background: Traditional palatoplasty techniques rely on repositioning of soft palate muscle and oral/nasal mucosa reconstruction to restore velopharyngeal closure. In the case of the wide cleft palate (10 mm or greater), we hypothesize that soft palate nasal mucosa is deficient and can compromise velar length. This study characterizes this potential loss of velar length in patients with a wide cleft and rescue of this loss of domain by local flap reconstruction, providing anatomic evidence in support of primary lengthening of the soft palate during palatoplasty.

Methods: A retrospective review was conducted of all patients who underwent a primary cleft palate repair with a buccal flap prior to 18 months of age by a single surgeon over a 2-year period. Inclusion criteria were defined as patients with cleft palate at least 10 mm in width at the posterior nasal spine. All study patients underwent primary palatoplasty with horizontal transection of the nasal mucosa. This transection was performed after nasal mucosa repair, but prior to muscular reconstruction. The resulting palatal lengthening was measured, and the mucosal defect was reconstructed with a buccal flap. Patient demographics, intra-operative palatal measurements, and post-operative outcomes were analyzed.

Results: Twenty-two patients met inclusion criteria. Three patients (13.6 percent) had a history of Pierre Robin sequence, and 5 (22.7 percent) had an associated syndrome. No patients had a Veau I cleft, 7 (31.8 percent) had a Veau II, 12 (54.5 percent) had a Veau III, and 3 (13.6 percent) had a Veau IV cleft. All 22 (100 percent) patients had a right buccal flap during primary palatoplasty. Twenty-one patients (95.5 percent) of patients had concurrent myringotomy and tubes. The mean cleft width or horizontal separation of the palate at the posterior nasal spine was 10.6 ± 2.82 mm. After reconstruction of the nasal lining of the soft palate but prior to reconstruction of the levator sling, horizontal transection of the nasal mucosa at the junction between the soft and hard palate resulted in an average of 10.5 ± 2.23 mm lengthening of the soft palate. Overall, the complication rate was 13.6 percent: two (9.1 percent) fistulas and one (4.5 percent) superficial wound dehiscence, which was successfully treated with observation. There were no bleeding complications and no episodes of airway obstruction. One patient (4.5 percent) had a 30-day readmission for an unrelated condition (RSV bronchiolitis). There were no buccal flap losses, no parotid duct injuries, and no facial nerve injuries.

Conclusions: Patients with a wide cleft palate have a potential loss of 1 cm velar length. Considering that patients with a wide palatal cleft are more predisposed to developing VPI, these data provide supportive evidence that acute palatal lengthening during palatoplasty should be considered for this patient population. The buccal flap can rescue the loss of domain in palatal length, and potentially improve palatal excursion.

Impact of Upper Airway Management in Robin sequence on Rates of Serous Otitis Media: A Prospective Cohort Analysis

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Introduction: Management of neonatal upper airway obstruction (UAO) in patients with Robin sequence (RS) may impact rates of chronic serous otitis media (CSOM), recurrent acute otitis media (AOM), and subsequent need for BMT. The objective of this study was to investigate a potential association between UAO management in patients with RS and the need for BMT.

Methods: We conducted a prospective cohort study at a tertiary free-standing pediatric hospital of RS patients between 1995-2020. Patients were grouped based on prior airway management: conservative, tracheostomy, tongue-lip adhesion (TLA), and mandibular distraction osteogenesis (MDO). Patient demographic data, cleft palate (CP) association, number of ear infections, number of BMTs, and audiogram data including tympanograms were collected. Descriptive statistics were used to describe patient characteristics. ANOVA and Chi-square/Fisher's exact tests were used to analyze continuous and categorical data respectively.

Results: One hundred and forty-nine patients with RS were included with 78% having a CP Study group included: conservative (n=68, 46%), tracheostomy (n=43, 29%), TLA (n=19 ,13%), and MDO (n=18, 12%). One hundred and one (68%) patients had at least one BMT, with 39% having one set of ventilation tubes and 29% requiring two sets or more. The mean number of BMTs in the entire cohort was 1.1. The number of BMTs and ear infections were not statistically significantly different between groups. Patients with overt CP were statistically more likely to have a greater number of BMTs compared to patients who had intact palate or submucous cleft palate (1.36 vs. 0.67/0.58, P=0.002).

Conclusions: The majority of patients with RS require at least 1 set of tympanostomy tubes. Type of UAO management does not have a statistically significant impact on the number of BMTs and ear infections. Patients with RS and overt CP require a statistically higher number of BMTs compared to those with either submucous cleft palate or intact palate.

Feminizing Rhinoplasty: A Review of Techniques and Outcomes

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Purpose: Facial gender-affirming surgery encompasses a myriad of procedures ranging from skeletal to soft tissue maneuvers depending on the manifestation of dysphoria in individual patients. For transfeminine patients, feminizing rhinoplasty is sometimes the most important or only surgery desired for alleviating gender dysphoria. In this work, we reviewed techniques for feminizing rhinoplasty in a single center and performed a systematic review of the literature.

Methods: A systematic literature review was performed in order to survey articles that discussed techniques and clinical considerations when performing rhinoplasty among transgender females and non-binary patients. In addition, a retrospective review of such patients undergoing rhinoplasty by the senior author (JCL) at the University of California Los Angeles was conducted. Variables collected included demographic factors, operative details, and post-operative events.

Results: Initial review yielded fifty-six articles. Title and abstract review followed by standardized application of inclusion and exclusion criteria resulted in a total of twelve studies for analysis. Priorities of feminizing rhinoplasty entail reduction of dorsal hump, as well as tip refinement and deprojection. Sixty-five patients were included for analysis, of whom the majority was of Caucasian race (60.0%). The majority of patients underwent rhinoplasty through an open approach (83.1%). For the dorsum, 89.2% received dorsal reduction and 80.0% required osteotomy to address a widened nasal bridge. For tip work, thirty-seven (56.9%) received a septal caudal extension graft, while a minority of patients required columellar strut (24.6%) or tip graft (8.0%). For functional restoration, septoplasty (70.8%) and spreader grafts (58.5%) were utilized to correct internal valve collapse, while alar rim (8.0%) and alar crural strut (3.3%) grafts were performed to address external valve collapse. Cartilage graft was required in 30.7% of patients. Complications included septal deviation, hypertrophic scar, and contour irregularity. Two patients required revision (3.3%).

Conclusion: Feminizing rhinoplasty presents a unique set of challenges and considerations. The core tenets of the operation lie in the reduction of the nose, tip deprojection and rotation, as well as the creation of harmony with other facial structures. Our multi-pronged analysis presents an updated review of these principles, as well as a longitudinal outlook on outcomes associated with feminizing rhinoplasty.

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Feminizing Genioplasty: A Review of Techniques and Outcomes

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Purpose: Facial feminization procedures can be performed to alleviate gender dysphoria among transfeminine or non-binary patients. Moreover, the chin may play an important role in

immediate identification and recognition of the face as cis-masculine or cis-feminine, and thus, can be addressed via feminizing genioplasty in the transfeminine population. The purpose of this study was multi-fold: 1) perform a systematic literature review to investigate the current methods utilized to feminize the chin, and 2) to study clinical outcomes within an institutional cohort undergoing feminizing genioplasty.

Methods: A systematic literature review was conducted in order to survey articles that discussed techniques and clinical considerations when performing genioplasty among transgender females and non-binary patients. In addition, a retrospective review of such patients undergoing genioplasty by the senior author (JCL) at the University of California - Los Angeles was conducted. Variables collected included demographic factors, operative details, and post-operative outcomes.

Results: Query of the PubMed database resulted in forty articles after removal of duplicates. Eleven studies that discussed surgical technique about genioplasty in facial feminization surgery were selected for analysis and discussion. The analyzed studies encompassed a wide array of authors, institutions, and methodologies, but ultimately aligned on the core objectives for feminization of the chin: 1) reduction of chin height in both vertical and horizontal dimensions; 2) narrowing of the chin for a more rounded, oval appearance, as opposed to square-shape; and 3) ultimate reduction of overall prominence to achieve a feminine facial contour. A retrospective chart review was conducted among eighty-seven patients who underwent feminizing genioplasty. In terms of operative details, all genioplasties were performed through a gingivolabial sulcus incision. Approximately half of the patients underwent two-piece reduction genioplasty, while eight patients had one-piece reduction. Power rasping (re-contouring) was performed in in thirty-six patients. About one-third of patients received osseous augmentation via centralized osteotomy segments and cranial bone grafts.

Conclusions: The core tenets of feminization of the chin lie in the reduction in both horizontal and vertical planes, as well as the creation of harmony with other facial structures. Our analysis presents an updated review of these principles, as well as an in-depth analysis of the senior author's technique in feminization of the chin.

Springs Forces and Parietal Bone Thickness Interact to Predict Changes in Cephalic Index Following Spring-Mediated Cranioplasty for Non-Syndromic Sagittal Craniosynostosis

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Introduction: Variables interacting to predict outcomes following spring mediated cranioplasty (SMC) for non-syndromic craniosynostosis, including springs parameters and calvarial thickness, are incompletely understood. Our previous work confirmed patients with non-syndromic sagittal craniosynostosis have significantly different peri-sagittal suture thickness measurements anteriorly, medially, and posteriorly,1 and we hypothesized that, based on these topographic thickness variations, springs forces interact differently at the anterior, middle, and posterior positions to predict changes in CI. We further hypothesized that these interactions may be influenced by calvarial thickness at certain distances from the sagittal suture, with thickness measurements more proximal to the suture demonstrating more significant interactions with springs parameters.

Methods: Patients undergoing SMC for non-syndromic sagittal craniosynostosis at our institution between 2014 and 2021 were included. Parietal bone thickness was determined from patient preoperative CTs using Materalise Mimics. Anterior, middle, and posterior points along the suture were defined as 10 mm posterior to the coronal suture, the middle of the parietal bone, and 10 mm anterior to the lambdoid suture, respectively, using the "measure" tool in Materialise 3-matics. Using the same tool, points were marked anteriorly, medially, and posteriorly at distances 5 mm, 10 mm, 15 mm, and 20 mm from the suture bilaterally. Thickness at specific points was determined using the "analyze locally" tool in Materialise 3-matics. Linear mixed effects models (LMEMs) in R Studio were used to determine interactions between anterior, middle, and posterior calvarial thickness with anterior, middle, and posterior spring force and length.

Results: Sixty-nine patients were included in this study. LMEMs revealed posterior spring force interacted with posterior parietal bone thickness to predict changes in CI at three months postoperatively ($\beta = -0.22$; 95% confidence = -0.40 – 0.03; $p = 0.022$). When evaluating spring force and calvarial thickness set distances from the sagittal suture, posterior spring force interacted with posterior calvarial thickness 5 mm ($\beta = -0.19$; 95% confidence = -0.37 – 0.01; $p = 0.043$) and 10 mm ($\beta = -0.31$; 95% confidence = -0.06 – 0.01; $p = 0.036$) from the sagittal suture to predict changes in CI. Interactions between springs parameters and parietal bone thickness in the anterior and middle positions did not significantly predict changes in CI (all $p > 0.05$).

Conclusions: Springs forces may interact with parietal bone thickness to predict changes in CI following SMC for non-syndromic sagittal craniosynostosis. Larger posterior spring force may optimally interact with the thicker posterior calvaria to drive changes in CI. These results suggest dynamic interactions between several variables may impact CI following SMC.

Cranioplastic Algorithm for Syndrome of the Trephined- A Case Series and Systematic Review

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Purpose: Syndrome of the Trephined (SoT) is a severe complication following decompressive craniectomy wherein the scalp applies pathologic pressure on brain parenchyma resulting in neurologic decline and even death. Severe neurologic decline can result and may progress to aphasia, catatonia and even death. Cranioplasty can reverse SoT often within days, yet awareness of SoT is poor outside of the neurosurgery community. Decompressive craniectomies have a high rate of complications and require cranioplastic reconstruction, however surgical timing and indications in the setting of SoT have not been well described in the literature.

Materials and Methods: We performed a systematic review of the literature on SoT with focus on reconstructive implications through October, 2021. Full-text review yielded 11 articles discussing SoT and reconstructive techniques or implications with 56 patients undergoing cranial reconstruction.

Results: Patients were 63% male with an average age of 41.8 ± 9.5 years. Craniectomy indications were traumatic brain injury (43%), tumor resection (23%), intracerebral hemorrhage (ICH) (11%) and aneurysmal subarachnoid hemorrhage (SAH) (2%). Patients suffered motor deficits (52%), decreased wakefulness (30%), depression or anxiety (21%), speech deficits (16%), headache (16%). Time from decompression to SoT symptoms was 4.4 ± 8.9 months. Cranioplasty was performed with polyetheretherketone (PEEK) (48%), titanium mesh (21%), split thickness calvarial bone (16%), full thickness calvarial bone (14%), or split thickness rib graft (4%). 8% of patients required free tissue transfer for soft tissue coverage.

Conclusions: SoT can be a neurologically devastating complication of decompressive craniectomy which can resolve following urgent cranioplasty. We present our experience, a systematic review of the literature and a novel, evidence-based cranioplastic algorithm for the plastic surgeon. Familiarity with this syndrome and its reconstructive implications is critical for the plastic surgery provider, who may be called upon to assist with these urgent cases.

A Retrospective Cohort Study of 5-Year Aesthetic Outcomes: Fronto-Orbital Distraction Osteogenesis Versus Fronto-Orbital Advancement & Remodeling

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Introduction: Unicoronal craniosynostosis (UCS) phenotypically presents with ipsilateral frontal and parietal bone flattening, supraorbital rim elevation and recession, temporal retrusion, palpebral fissure widening, and vertical orbital dystopia – known as the "harlequin deformity." Fronto-orbital advancement and remodeling (FOAR) is currently the most common surgical approach for UCS, although outcomes suggest high rates of ocular dysfunction, failure to achieve long-term aesthetic normalcy, and relapse over time. Fronto-orbital distraction osteogenesis (DO) is an alternative treatment for UCS, with literature suggesting improved anterior cranial base deviation, decreased perioperative morbidity, and lower rates of ocular dysmotility. This study compared long-term objective photogrammetric aesthetic and postoperative outcomes of patients with UCS treated with DO and FOAR.

Methods: Patients presenting with non-syndromic UCS between 2007 and 2021 undergoing DO were compared to a matched cohort of patients undergoing FOAR. Clinical photographs and ImageJ were used to quantify palpebral fissure height and width, pupil-to-brow distance (PTB), and margin-reflex distance (MRD1) in pixels. The formula symmetry ratio = - [|(1 - (s/n)| × 100] was used to compare synostosed (s) and nonsynostosed (n) sides, where a symmetry ratio value of "0" indicated perfect symmetry, and lower (more negative) symmetry ratio values indicated increased asymmetry. Positive differences in pre- and post-operative symmetry ratios indicate improved symmetry. The difference in canthal tilt angles was calculated with canthal tilit angle = |(s - n)|. Whitaker classification was assigned in a blinded fashion by two attending craniofacial surgeons. Statistical analysis was performed with unpaired t-tests.

Results: Forty patients (ten males) were included. The average age at surgery for FOAR and DO groups was 9.4 vs. 6.5 months ($p < 0.001$) and average length of follow up was 6.0 vs. 5.1 years ($p = 0.456$), respectively. Photogrammetric analysis and unpaired t-tests demonstrated significantly improved postoperative symmetry in the DO cohort for palpebral width [FOAR: -2.24, DO: 3.07 ($p = 0.020$)], MRD1 [FOAR: -9.92, DO: 12.87, ($p = 0.045$)], and canthal tilt [FOAR: 0.97°, DO: 6.54°, ($p = 0.010$)]. Analysis did not reveal significant symmetry ratio improvement in palpebral height ($p = 0.157$) and PTB ($p = 0.202$) between DO and FOAR cohorts. Unpaired t-tests revealed no significant difference in Whitaker Classification scores between FOAR and DO cohorts, with average scores of 1.97 ± 0.56 and 1.78 ± 0.54, respectively ($p = 0.394$).

Conclusions: Photogrammetric analysis of the periorbital region in UCS patients five years after surgery reveals significant improvement in those treated with both FOAR and DO, with DO patients demonstrating superior results in palpebral width and canthal tilt symmetry. However, patients treated with DO achieve similar Whitaker Classification compared to their FOAR

counterparts. It will be important to continue to follow these cohorts to craniofacial maturity prior to making any definitive conclusions.

Association between The Use of Intraoperative Pressors and Outcomes in Patients Undergoing Free Flap Reconstruction of The Head and Neck Region

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Background: The purpose of this study is to test the association of surgical and medical outcomes with the intraoperative use of pressors in patients who underwent head and neck microsurgical reconstructive surgery.

Methods: All patients who underwent head and neck reconstruction with free tissue transfer from September 2019 to September 2021 in a tertiary center were included in this study. Data were collected from a prospectively held database. The cohort was divided into two groups based on the usage of intraoperative pressors. The study outcomes were surgical or medical complications during hospitalization, total flap loss, and partial flap loss. Medical complications recorded were venous thromboembolism, pneumonia, cardiac event, delirium, and stroke, while the surgical complications included hematoma, neck cellulitis, salivary leak, purulent neck infection, and any donor or recipient site complication.

Results: 290 patients were included. Out of those (n=136, 48.62%) patients received pressors intraoperatively. The mean follow-up was 2.38 ± 3.97 months from the index surgery. The total and partial flap compromise rates were similar between the two groups (n=4, 2.94% vs. n=5, 3.5%, p=1.000) and (n=7, 5.15% vs. n=6, 4.2%, p=0.7), respectively. The medical and surgical complications within hospitalization were also comparable between the two groups (n=23, 17.56% vs. n=25, 17.86%, p=0.94) and (n=35, 25.93% vs. n=34, 23.45%, p=0.63), respectively. The rate of any surgical complication from surgery through follow-up was similar in the pressor group (n=71, 51.08%) compared to others (n=80, 53.69%), p=0.65.

Conclusions: Intraoperative use of pressors during the microsurgical reconstructive surgery of the head and neck had no impact on the overall flap partial compromise, flap total compromise, surgical and medical complications within hospitalization as well as on the overall surgical complication rate.

Twist1 Mutation and Environmental Factors Synergistically Exacerbate Craniosynostosis

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Background/Purpose: Craniosynostosis, the premature closure of calvarial sutures, leads to debilitating neurologic dysfunction. TWIST1 gene mutation leads to Saethre-Chotzen syndrome, characterized by unilateral or bilateral coronal synostosis. Recently, study has shown that in utero exposure to a serotonin selective reuptake inhibitor (SSRI), citalopram, increases the incidence of craniosynostosis in mice coupled with depletion of Gli1+ mesenchymal stem cells (MSCs), suggesting environmental risk factors may interplay with genetic mutations in craniosynostosis etiology. In this study, we sought to determine how Twist1 mutation interacts with maternal usage of citalopram to disrupt cranial suture MSCs, leading to craniosynostosis.

Methods: Twist1+/- mutant mice with or without in utero citalopram exposure (20 mg/kg per day) were generated, including (1) wild type (WT) (n=14), (2) Twist1+/- (n=150), (3) WT + citalopram (n=, (44) Twist1+/- + citalopram (n=30). MicroCT analysis was performed at P14 to examine the extent of calvarial suture fusion, since the coronal suture typically completes fusion at P9-13 in Twist1+/- mice. Histological analysis was completed to confirm suture fusion. RNAscope was also conducted to allow for quantitative molecular analysis.

Results: In utero exposure to citalopram on the background of Twist1+/- led to increased aberrant suture fusion and skull deformation. WT mice had 0% cranial suture fusion. Twist1+/- mice without citalopram had between 70-80% suture fusion. WT mice with citalopram exposure had 36.4% suture fusion or skull dysmorphology. Importantly, Twist1+/- mice with in utero exposure to citalopram had the highest rate of suture fusion, 93.3%. Importantly, there was 77% bilateral fusion and only 17% unilateral fusion in citalopram-exposed Twist1+/- mice. This is in contrast to Twist1+/- mice without citalopram exposure, who demonstrate a 50:50 split of bilateral vs. unilateral fusion. Histological analysis of the craniosynostotic mice treated with citalopram also demonstrated lack of suture patency. In addition, RNAscope gene expression analyses demonstrated that Gli1+ cells were diminished in mice exposed to citalopram in utero.

Conclusions: Exposure to citalopram in utero leads to an increased frequency and severity of craniosynostosis both in WT and Twist1+/- mice. Our preliminary data suggests that there is a combinatorial effect of genetic mutations and environmental factor in the development of craniosynostosis. Developing a fuller understanding of the signaling mechanisms that mediate suture morphogenesis and underlie the gene-environment interactions will provide crucial insight into the pathophysiology of this devastating disease.

Utilization of Computer-Assisted Navigation Technology within Facial Fracture Surgery: A Systematic Review

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Background: Intraoperative Computer-assisted navigation (CAN) is a surgical tool in which its use has been well established in sinus and neurosurgery, but the utility and outcomes have yet to be determined for use in repair of maxillofacial fractures. The goal of our study is to systematically review existing literature to determine outcomes, risks and limitations, and benefits of its use in facial fractures.

Methods: Two authors performed A systematic literature review according to PRISMA guidelines to analyze studies describing using of CAN between 1979-2021. Sources were identified by keywords, then narrowed in three rounds by the abstract's identification of navigation use during facial fractures repairs. The search was performed using PubMed database to search the terms "navigation", "intraoperative", and "facial fractures" used in combination with "Brainlab" and "facial reconstruction". Studies were included/excluded on the basis of their titles and content as related to use for maxillofacial fracture fixation with navigation. Total operative time, anesthesia time, surgical technique, intraoperative accuracy (how precisely aligned fractures were fixated), postoperative discrepancy (measure of postoperative facial symmetry with healing), complication rates, navigation limitations, risks/benefits, and study type were analyzed.

Results: Initial search for publications with selected keywords identified 909 studies. The results were then narrowed to 49 studies based on relation of abstracts to intraoperative use of CAN in craniomaxillofacial procedures; 24 of these were chosen for final use based on relation to operative fixation of facial fractures with CAN. Studies chosen for analysis included 1 retrospective analysis (4.2%), 1 systematic review (4.2%), 5 review articles (20.8%), 9 case series (37.5%), 1 case report (4.2%), 1 randomized control trial (4.2%), 2 case-control studies (8.3%), and 4 comparison studies (16.7%). Amongst these, indications suggested for use of intraoperative CAN were repair or reduction of multiple facial fractures (12.5%), foreign body removal (8.3%), repair of orbital fractures (12.5%) and orthognathic operations involving mandibular fixation (25%). Benefits included intraoperative surgical accuracy (20.8% of sources) and post-operative surgical discrepancy (12.5% of sources) measured by mirroring as well as decrease in total surgical and anesthesia time (8.3% of sources) which ranged between 60-477 minutes, though multiple studies did not mention all these variables. Limitations cited with use of the device included technical difficulty with operating the navigation device (37.5%)

and persistent systematic error during the registration process (20.8%). None of the studies discussed cost analysis or risks compared to conventional methods of facial fracture fixation.

Conclusions: Intraoperative computer-assisted navigation has gained popularity within the field of craniomaxillofacial surgery as a whole and, more specifically, its use in facial fracture fixation is on the rise. Advancements in and increasing familiarity with CAN technology has preliminarily shown favorable surgical outcomes in fixation of facial fractures which include improved operative accuracy, discrepancy, and decreased surgical time. Few studies exist related to this topic; the preliminary results appear promising; however, more data is required to further define the utility of CAN use in facial fracture fixation.

Surgical Techniques for the Repair of Webbed Neck: A Scoping Review

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Purpose: Pteryigium colli, also known as webbed neck, is a rare condition characterized by bilateral subcutaneous bands which extend from approximately the mastoid to the acromion. This condition is associated with multiple genetic diseases, including Turner Syndrome and Noonan Syndrome, among others. (1,2) Given that webbed neck does not resolve spontaneously or with medical therapy, surgical treatment remains the only approach to correct this condition. Despite the fact that webbed neck and its surgical repair have been described in several case reports and series, (3-5) the literature lacks a comprehensive review of the surgical techniques used in the repair of this condition. The purpose of our scoping review is to define and summarize the various surgical techniques that have been used in the treatment of webbed neck, providing a reference guide for plastic and reconstructive surgeons.

Methods & Materials: A scoping review was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. Search terms were developed to capture literature pertaining to topics related to "webbed neck," "pterygium colli," and surgical repair or correction of these conditions. Two databases, PubMed, and Scopus were searched from inception through December 27, 2021. Studies were considered for inclusion if they 1) described the webbed neck condition and 2) reported results of surgical correction of this condition. Exclusion criteria were non-English manuscripts, studies without a DOI, and studies which did not examine surgical outcomes of webbed neck correction. Surgical outcomes and follow up durations were reported as available.

Results: Twenty-two manuscripts met full inclusion criteria and were analyzed in the final scoping review. The patient cohort included 60 patients, the majority (83.6%) of whom were

female. The most common syndrome associated with webbed neck was Turner syndrome, seen in 48 patients. The most frequently documented procedure technique was a Z-Plasty, performed in 38 patients. Other procedures described include butterfly correction (five patients), V-Y Plasty (five patients), posterior cervical lift (five patients), skin excision (three patients), tissue expansion plus skin excision (two patients), M to T rearrangement (one patient), and subcutaneous fascial excision (one patient). Surgical outcomes, such as function and cosmesis, were reported in a heterogenous fashion. Commonly documented complications included hypertrophy of procedure scars and webbed neck recurrence.

Conclusion: Our study presents the first comprehensive review of the literature characterizing the variety of surgical techniques used in the repair of webbed neck. When selecting the surgical technique, function and cosmesis are two important considerations that must be discussed with the patient and their family. We believe our study to be useful in that it provides a surgical reference of the existing literature surrounding the correction of webbed neck, allowing surgeons to assess which previously documented technique may serve as the best option for their patients. Future studies should be designed to collect standardized outcomes data for patients undergoing repair of webbed neck to appropriately assess and compare the described procedures.

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Management of the Inferior Alveolar Nerve in Large Sagittal Split Advancements: To Free or Not?

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Objectives: Traditional teaching for the sagittal split osteotomy (SSO) suggests that the inferior alveolar nerve (IAN) should be dissected free if it is entrapped within the proximal segment

following the split. A recent study found no significant difference in functional sensory recovery (FSR) whether the nerve was freed or left in the proximal segment, but the study was limited to mandibular movements < 10 mm.1 The purpose of the present investigation was to evaluate whether FSR of the IAN is influenced by its location following SSO in patients undergoing large mandibular movements (> 10 mm).

Materials and Methods: This was a prospective, split-mouth study of skeletally mature patients undergoing bilateral split osteotomy (BSSO) for management of skeletal malocclusion. The "low and short" horizontal medial ramus osteotomy was performed as previously described.2-4 Patients were included if they underwent SSO with mandibular movements > 10 mm and, following the splits, IAN was freely entering the distal segment (IANDI) on one side and was contained in the proximal segment (IANPR) on the other. Postoperative neurosensory evaluations were completed at 1 week, 3 weeks, 6 weeks, 3 months, 6 months, and 12 months. The primary outcome variable was time to FSR, evaluated using descriptive, bivariate, and Kaplan-Meier analyses.

Results: The study included 13 subjects (8 female, mean age 18.7 +/- 1.8 years) undergoing 26 SSOs. Eleven subjects underwent bimaxillary surgery; 10 had simultaneous genioplasty. The mean mandibular movement was 12.2 +/- 1.4 mm and was not significantly different between sides ($p = 0.43$). There were no intraoperative nerve injuries within the cohort. All subjects achieved FSR bilaterally within 1 year of surgery (range: 49-249 days). The median time to FSR was 126 days and was not significantly different between sides (IANDI 100 days versus IANPR 126 days, log-rank $p = 0.57$). Subgroup analysis of patients who underwent simultaneous genioplasty similarly demonstrated no difference (log-rank $p = 0.54$) in the median times to FSR between IANDI (median 102.5 days) and IANPR (median 128 days).
Conclusion: In SSOs for mandibular advancement with movements > 10 mm, leaving the IAN within the proximal segment does not appear to influence time to FSR.

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Anterior Ear Reconstruction with the Posterior Pull-Through Flap

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Purpose: Defects of the central ear after skin cancer removal remains a common problem for the reconstructive surgeon. Exposed and missing cartilage often results after the carcinoma extirpation so a resolution beyond simple skin grafting is required. The experience with a one-stage, post-auricular, skin-island flap passed through the cartilage to reconstruct ear defects is reported.

Methods: Patients with an intact ear helix and an anterior full-thickness defect were reconstructed with a skin-island flap based on posterior subcutaneous tissue deep to the flap base. The flap was passed through a generous aperture created in the ear cartilage to ensure adequate perfusion and avoid congestion. The epithelium was incised superficially after the flap was passed-through the cartilage to create a distal skin island. The proximal, epithelial edge was lifted slightly from the subcutaneous tissue and the flap inset to fill the defect (Figure I). All epithelium was secured exteriorly and not buried. The flap was secured at its periphery with absorbable chromic sutures. The post-auricular harvest site was closed primarily with chromic sutures. Minimal dressings and no external stentings were utilized with the reconstructions. Small chromic sutures were occasionally used across the flap to eliminate space beneath the flap. Antibiotics were administered pre-operatively and for 5 days post-operatively.

Results: Twenty-two patients (6 women, 16 men) with anterior ear defects underwent single-stage reconstruction with posterior pull-through flaps over a 9-year period. The defects reconstructed measured in length from 2 cm to up to 4.5 cm. Five patients required a second flap from pre-auricular skin to help close ear canal defects (Figure II). All flaps adequately closed the defects with this one stage reconstruction, added structural support, and prevented ear distortion. Occasionally, venous congestion was observed in the distal flap but it was self-limiting and full thickness necrosis did not occur. The chromic sutures dissolved within a few weeks and removal was facilitated by patient application of antibiotic ointment to the areas and light cleansing. No epithelial cysts developed. Ear position remained normal and ear projection was not observed.

Discussion: Skin cancer extirpation of the anterior ear often exposes cartilage and leaves structural defects within the central ear. A one-stage post-auricular flap can reliably reconstruct defects and add support to the ear. Large defects may be closed without distorting shape or position of the ear. Care is needed to provide a generous aperture through the ear cartilage for passage of the flap base. Healing proceeds predictably and minimal complications are associated with this posteriorly based, pass-through, skin-island flap in ear reconstruction.

Non-Surgical Correction of Ear Deformities in Newborns: A Retrospective Review

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Purpose: Congenital ear abnormalities are present in 25-35% of newborns and present an aesthetic and psychosocial concern for pediatric patients and their parents. Ear anomalies can be categorized as malformations or deformations. Ear reconstruction for such deformities is complex with variable outcomes, and at times a better ear can be achieved with nonsurgical management than with surgical management. Commercial nonsurgical ear molding devices such as the EarWell ear molding system are available to correct malformations and deformations; however, such devices are costly and are only successful if applied within the first six weeks of life. We describe our custom ear molding protocol that has been used in over 350 patients at our institution.

Methods: First, an impression of the deformed ear in infants is taken between 6-10 weeks old. A mold is made in dental stone, from which a prosthesis customized to the deformity is developed. Three types of prostheses are available: the first molds helical deformities and functions via rotation of ear, the second molds conchal deformities, and the third is used when application of pressure is required on both side of the deformity, which is most commonly required for Stahl's ear deformity. We conducted a retrospective review evaluating outcomes of our ear molding protocol for a four-year time period (2014-2018). De-identified photos were graded to assess pre-treatment and post-treatment level of ear deformity, as well as outcomes. Dependent samples t-tests were performed to evaluate differences between pre-treatment severity of ear deformity and post-treatment severity of ear deformity. Spearman's Rho correlation analysis was performed to measure the strength of association between pre-molding ear deformity severity and outcomes of ear molding.

Results: Records were identified for 322 patients, and 258 pre- and post-molding photographs were graded. Sixty-seven percent underwent bilateral ear correction and 33% underwent unilateral ear correction. Mean age at initiation of molding was 6.8±4.1 weeks (range: 1 day-28 weeks); 54.6% initiated molding before 6 weeks of age, and 45.7% of patients-initiated molding between 6-10 weeks. Ear deformities treated included constricted ears (47.2%), helical deformities (22.1%), Stahl's ears (13.5%), prominent or cup ears (7.1%), conchal deformities (5.2%), microtia (4.3%) and cryptotia (0.61%). Mean pre-treatment severity of ear deformity was 3.89 ± 1.29 (0= no deformity, 5=severe deformity), and mean post-treatment severity of ear deformity was 1.52 ± 0.81. Mean outcome grade following ear molding was 4.75 ± 0.59 (0=poor outcome, 5=excellent outcome). Independent samples t-tests demonstrated that there was a statistically significant difference between pre-treatment ear deformity grade and post-treatment ear deformity grade ($p < 0.0001$). There was a statistically significant correlation between severity of ear deformity prior to molding and outcome of ear molding ($p < 0.0005$).

Conclusions: Our protocol for nonsurgical correction of ear deformities is a safe, effective, and inexpensive method for treating ear deformities. There was a significant improvement in degree of ear deformity before and after molding. Ears that were more deformed at baseline were more likely to have a poorer aesthetic outcome after molding.

Venous Thromboembolism Rates Following Free Flap Reconstruction of the Head and Neck Region in a Tertiary Care Hospital

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Background: Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), continues to be a major concern for the postoperative hospitalized patient, especially after long and complex procedures. Cancer itself also contributes to the hypercoagulable state, further complicating the management of patients. Despite prophylaxis, breakthrough events occur. We aimed to assess our institutional VTE and bleeding rates following free flap reconstruction of the head and neck region and the factors associated with these events.

Methods: A retrospective review of the patients who underwent head and neck free flap reconstruction at a tertiary center from 2012 to 2021 was performed from a prospectively maintained database. Data regarding patient demographics, past medical history, surgical details, and overall outcomes were collected. Outcomes studied included postoperative 30-day VTE rates and bleeding events. VTE was defined as documented PE or DVT events. Bleeding events included major events that required an intervention or return to the OR. Patients that had a VTE event were compared with the rest of the cohort to identify factors associated with VTE. Statistical analysis was performed using chi-square and T-tests, and P-value ≤ 0.05 was considered statistically significant.

Results: Free flap reconstruction of the head and neck region was performed in 928 patients. Reconstruction after cancer extirpation was the most common etiology (89%). The most preferred donor site was thigh (50%), followed by fibula (29%). All patients received postoperative VTE chemoprophylaxis, and the most common regimen was enoxaparin 30 mg BID (83%). The VTE and bleeding rates over the 10-year period were 4% (n=35) and 9% (n=82), respectively. Although not statistically significant, there was an improvement in the overall VTE (4% vs 3%, p=0.365) and bleeding (10% vs 8%, p=0.492) rates in the last five

years, compared with the first. This trend was consistent with the institutional changes to control both rates, such as implementation of a TXA protocol. Gender, age, BMI, Caprini score, and tobacco use were not significantly different between the patients that had a VTE event versus those that did not. Pulmonary comorbidities were found to be significantly higher in patients that had a VTE event (57% vs 26%, $p<0.001$). The ischemia duration of the flaps in patients with a VTE event was longer (149±57 vs 126±44, $p=0.005$), despite having similar overall operative duration (712±153 vs 695±152, $p=0.517$). Patients with a VTE event also had higher rates of bleeding events (29% vs 8%, $p<0.001$) and had a prolonged hospital stay of 11 more days (22±19 vs 11±7, $p=0.001$).

Conclusion: Postoperative VTE is a significant complication, associated with increased length of hospitalization in patients undergoing free flap reconstruction of the head and neck region. There is also a relation of VTE with major bleeding events, likely due to the VTE treatment. Institutional measures should be implemented on an individualized basis based on patient comorbidities to improve the postoperative VTE rates, while balancing the bleeding events.

Psychiatric Conditions in Pediatric Facial Fracture Patients: An Overlooked Entity Affecting the Presentation and Management

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Background: Children with chronic health conditions have a higher rate of hospitalizations compared with the general pediatric population. In pediatric trauma patients, psychiatric disorders, in particular, are associated with increased length of stay, higher hospital charges, and a greater risk for mortality. The lack of resources to adequately diagnose and treat psychiatric conditions in the trauma centers create further gaps in the care in populations that require a higher level of care. We aimed to identify the differences in the management and outcomes after facial trauma in the pediatric population with psychiatric comorbidities.

Methods: A retrospective review was performed of patients <18 years of age who were evaluated at a pediatric level I trauma center from 2006 to 2021 for facial fractures. Data collected included patient demographics, mechanism of injury, facial fracture type, associated injuries, reported past psychiatric history, and outcomes. The psychiatric conditions included in the study were previously diagnosed attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), depression and bipolar disorder. Patients with a psychiatric

history were compared with the rest of the cohort (negative history). Chi-square and independent sample T-tests were performed.

Results: Facial fractures were diagnosed in 3334 patients. One hundred ninety-eight patients (6%) had prior diagnoses of ADHD, twenty had ODD (1%), 36 had depression (1%) and 19 had bipolar disorder (1%). Thirty-three patients (1%) had the combination of at least two of these conditions. Mean age in each psychiatric condition (13±4 in ADHD, 14±2 in ODD, 15±2 in depression, 16±1 in bipolar disorder) was greater than the rest of the cohort ($p<0.001$) with more than 60% of the patients in each group being greater than 12 years of age. Violence was the primary cause of injury in each psychiatric condition (ADHD 30% vs 10%, $p<0.001$; ODD 30% vs 12%, $p=0.191$; depression 53% vs 11%, $p<0.001$; dipolar disorder 31% vs 11%, $p=0.069$), whereas sports-related injuries were more common in the remainder of the cohort. Patients with a psychiatric condition were consistently more likely to be admitted (>45% of the patients were admitted), yet less likely to be surgically treated (<40% of the patients were surgically treated). Patients with ADHD and ODD more frequently presented with concussions (12% vs 7%, $p=0.004$ and 20% vs 7%, $p=0.024$, respectively) and more likely to had accompanying injuries with their fracture (76% vs 67%, $p=0.008$ and 90% vs 68%, $p=0.033$). Fracture types didn't significantly differ between those with and without psychiatric comorbidities. Postoperative complications were not significantly different from the rest of the cohort.

Conclusion: Our results highlight the impact of psychiatric conditions on pediatric facial fracture management and outcomes. This overlooked entity, seen more frequently with older children, is associated with violent and severe injuries that require more hospitalization yet less surgical intervention. It is crucial to understand the barriers of care in patients with psychiatric conditions, especially in the pediatric population, and be aware of such comorbidities in trauma cases.

A 12-Year Analysis of Gender Disparity in Craniofacial Research: The Glass Ceiling is Cracking

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Background: Despite the increasing number of women entering plastic surgery, the field remains a male-dominated profession, especially in the realm of academia. The subspecialty of Craniofacial surgery is no exception. We use an individual senior author's inclusivity of women as first authors as a metric to predict gender inequality in Craniofacial publications.

Methods: Between the years 2009 and 2020, publications relating to Craniofacial and Pediatric surgery were extracted from the Journal of Plastic and Reconstructive Surgery and the Cleft Palate-Craniofacial Journal. The title of the publication as well as the senior author and first authors' names were extracted. Gender for first and senior authors was assigned by a gender determination application. If the gender was unknown or if the accuracy of the results were less than 75%, a manual search was conducted. Those publications in which gender could not be determined were excluded from the analysis. The following authorship ratios were calculated: Male: Male, Female: Male, Male: Female, and Female: Female.

Results: Of the 2049 publications in which the first authors' gender could be defined, 39% were female and 61% were male. In the 2035 publications in which the senior authors' gender could be defined, 24% were female and 76% were male. Of the 1994 publications where both first author and senior author genders could be defined, 999 publications were male first author and male senior author; 516 were female first author and male senior author; 222 were male first author and female senior author; 257 were female first author and female senior author. When the senior author is male, there is a higher likelihood of having a male first author (OR, 2.239 [1.82; 2.75]; P<0001). Additionally, numbers of both female first ($p < 0.0003$) and senior authors ($p < 0.0043$) were found to increase over time.

Conclusion: Female representation in authorship positions in craniofacial publications is far from achieving gender parity. By using authorship ratios as a metric to define gender disparity, we propose a new way to advance female representation in craniofacial and plastic surgery academia.

True Incidence of Marginal Mandibular Nerve Palsy Following Neonatal Mandibular Distraction Osteogenesis

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Introduction: In children with Pierre Robin Sequence (PRS), mandibular distraction osteogenesis (MDO) is routinely performed to alleviate tongue-based airway obstruction.1 Though MDO avoids the need to perform a tracheostomy in these patients, the procedure involves risk of injury to the marginal mandibular nerve (MMN), which can cause significant deficits in facial expression, eating, and drinking.2 We hypothesize that the incidence of MMN palsy following MDO, previously reported at 1-15%, is an underestimate due to short follow-up times and small sample sizes.3-5 This study aims to investigate the true incidence of MMN palsy after MDO to better guide follow-up care and improve treatment of this nerve injury after distraction.

Methods: A retrospective single-center review of patients with PRS who underwent MDO at a tertiary pediatric hospital's Cleft-Craniofacial Center between September 2007 and March 2021 was conducted. Patients who underwent MDO at less than one year of age and had postoperative clinical evaluations detailing MMN function were included. Assessment of MMN status was recorded at least one month postoperatively. A logistic regression analysis was performed to investigate predictors of MMN injury.

Results: Of the 93 patients who underwent MDO, 57 patients (61.3%) met inclusion criteria. In this cohort, 56.1% were female, 42.1% were syndromic, and the average age at MDO was 1.51 ± 2.02 months (0.03-9.63 months). The average length of mandibular distraction was 17.5 ± 4.68 mm (10-30 mm), average duration of intubation was 6.58 ± 2.35 days (0-12 days), and average time until hardware removal was 110.8 ± 23.4 days (71-179 days). Seventeen patients (29.8%) presented with permanent MMN dysfunction on postoperative clinical evaluation. Four patients (7.0%) presented with bilateral weakness and 13 (22.8%) with unilateral weakness (8 right-sided, 5 left-sided). Two of the 17 patients (11.8%) presented with chin dimpling. Four patients (7.0%) presented with transient MMN weakness that resolved. The average length of follow-up postoperatively was 5.12 ± 2.87 years (0.26-10.6 years). With logistic regression analysis, there were no significant predictors of nerve injury when considering age at surgery ($p=0.82$), length of distraction ($p=0.38$), time until hardware removal ($p=0.11$), or duration of intubation ($p=0.71$).

Conclusion: In this 14-year review of patients with PRS who underwent MDO at our institution, 36.8% demonstrated evidence of MMN palsy. This incidence is much greater than previously indicated in the literature. Several patients experienced transient nerve injury that resolved spontaneously. The results of this study reveal that MMN palsy is a relatively common finding after MDO. Further research is necessary to examine the factors resulting in MMN injury and delineate efforts to mitigate this patient complication.

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Nasal Reconstruction in Binder Syndrome: A Retrospective Review

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Background: Maxillonasal dysplasia (MD), or Binder's syndrome, is a rare congenital disease characterized by midface retrusion with a concave profile and an extremely flattened nose, with hypoplasia of the nasal spine. The condition may also include elements of the nose and upper jaw. Patients may have Class III malocclusion and lack of bone at the piriform rim. The etiology of the syndrome is skeletal hypoplasia around the piriform aperture and excavations, but there is no shortage of soft tissues. In all patients, nasal reconstruction including nasal lengthening is required for an acceptable aesthetic result. Debate has persisted over whether cartilage or bone grafts should be used for nasal reconstruction in MD. Due to the rarity of MD, there is a paucity of long-term results reported in the literature. Here, we report the long-term outcomes in cases of nasal reconstruction for MD using bone grafts, performed by the senior author (S.A.W.).

Materials/Methods: A retrospective chart review was performed of patients presenting with maxillonasal dysplasia between 1975-2021. Procedural characteristics and post-operative outcomes such as complications and revisions were recorded.

Results: Six patients with MD were identified via retrospective chart review. Four patients had a diagnosis of true Binder syndrome, one patient had a diagnosis of Conradi syndrome, and one patient had a diagnosis of achondroplasia dwarfism. An open rhinoplasty technique utilizing cartilage (usually ear cartilage) for alar cartilage and tip reconstruction was employed. Cranial bone grafts and nasal lengthening for the upper part of the nose was performed in all patients. This was performed most commonly by fixing a long cranial bone graft at the radix with screws. Most patients had a very weak or absent nasal spine, which was augmented by cranial bone graft and/or addition of crushed cartilage at the nasal spine, a diminutive columella and required a columellar strut. One patient underwent a peri-pyriform osteotomy, which has been variably termed a LeFort II minus LeFort I, with advancement of the entire nose, and the use of

interpositional bone graft. For persistent lateral nasal wall contour deformity, crushed rib cartilage inside a pocket of temporalis fascia ("Turkish delight") was used in one patient with Binder syndrome. Additionally, due to the midface hypoplasia observed in these patients, onlay bone grafts were also used when necessary, at the pyriform aperture and the maxilla to increase projection of the midface soft tissues. No patients experienced peri-operative or post-operative complications. Long-term follow-up demonstrates stable results.

Conclusions: Nasal reconstruction is challenging in patients with MD presenting with skeletal deficiencies and severe nasal hypoplasia. Because MD is a rare congenital malformation, long-term results, and clinical guidelines for management of the nose in MD are limited. Nasal reconstruction with cranial bone grafts is a safe and effective technique for nasal reconstruction in patients with MD. Patients with more severe deformities may require bone grafting at a younger age such as 4-5 years, and multiple future nasal bone graft procedures should be expected. Additional midface and radix augmentation procedures should be expected in severe cases with patient growth.

A Comparison of Dental Outcomes following Primary Gingivosupraperiosteoplasty with Secondary Bone Grafting and Isolated Secondary Bone Grafting in Unilateral Cleft Lip and Palate Patients

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Introduction & Objectives: Deficient alveolar bone in cleft lip and palate patients can result in abnormal dental development and can adversely affect permanent maxillary dentition adjacent to the cleft site. Several surgical approaches can be employed to mitigate adverse outcomes, including gingivosupraperiosteoplasty (GSPP), primary alveolar bone grafting, and secondary alveolar bone grafting (SABG). The optimal timing of alveolar bone grafting has yet to be elucidated. The aim of this study is to evaluate dental outcomes of alveolar bone grafting in unilateral cleft lip and palate patients who underwent primary GSPP with SABG or isolated SABG.

Material & Methods: A retrospective chart review was conducted to identify patients who underwent SABG from 1/1/2001-12/31/2018, as performed by the senior author (S.A.W.). Patients were divided into 2 cohorts: Cohort 1 included patients who underwent 5-6 months of presurgical orthopedic molding following unilateral cleft lip repair with GSPP at the time of primary repair, followed by SABG; Cohort 2 consisted of patients who underwent primary cleft lip and palate repairs at external institutions, who did not undergo GPP, GSPP or presurgical molding. Lateral incisor eruption, intraseptal bone quantity following SABG, regrafting rates and

nasoalveolar fistulas were evaluated. Interseptal alveolar bone height and tooth formation at the cleft site were evaluated using panoramic and periapical radiographs in accordance with the Standardized Way to Assess Grafts (SWAG) and Bergland scales.

Results: Twenty-six patients were identified. In Cohort 1, normally shaped and fully erupted lateral incisors were observed in 61.54% of patients. Missing lateral incisors bordering the cleft were observed in 30.77% of patients, and supernumerary lateral incisors were observed in one patient (7.7%). In Cohort 2, normally shaped and fully erupted lateral incisors were encountered in 15.38% of patients. Supernumerary, peg-shaped and missing lateral incisors were observed in 15.38%. One patient in each cohort had a nasoalveolar fistula. In Cohort 1, 61.5% of patients presented with normal septal bone height and were classified as Bergland type I, 30% as Bergland type II (adequate bone amount), and one patient (7.7%) as Bergland type III (SABG considered as a failure, requiring additional SABG). In Cohort 2, normal intraalveolar height was achieved in 53.84% of patients, 38.46% were classified as Bergland type II, and one patient (7.7%) was classified as Bergland type III. In Cohort 1, following SABG, 61.54% of patients were classified as SWAG scale 6 and 30.77% were SWAG 5, (successful alveolar bone grafting). One patient (7.7%) was classified SWAG 4 (average result). In Cohort 2, after SABG, 53.8% of patients were categorized as SWAG scale 6, 23.1% SWAG scale 5, and 23.1% SWAG scale 4.

Conclusion: Performing secondary alveolar bone grafting prior to lateral incisor eruption results in favorable postoperative bone graft quality and quantity, facilitates the eruption of normal lateral incisors, improves maxillary growth, and permits better prosthodontic rehabilitation.

What the Eye Can't See: Correlation of Orthognathic Surgical Movements to Perception of Facial Appearance

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Background: Orthognathic surgery can improve the form and function of the face and jaw for patients with cleft lip and palate (CLP). However, subjective observer-identified improvements in aesthetics and emotional appearance have not been correlated with specific surgical movements in an objective manner. Herein, we aim to identify this relationship better and provide a numerical basis for these subjective observations.

Methods: Repaired CLP patients who underwent orthognathic surgery between 15 and 20 years old were identified at a single institution from 2018 to 2022. Cephalometric scans were compared before and after surgery to assess the degree of correction. Standardized AP and lateral pre- and post-operative photographs of patients were placed into a survey distributed to plastic surgery and orthodontist clinicians to assess non-cognitive domains on a Likert scale (1-10). These included perceived facial attractiveness, friendliness, confidence, recommendation for cleft orthognathic surgery, attractiveness of features, and symmetry. Correlations between skeletal movements and survey outcomes were determined using multivariate regression analysis.

Results: Ten patients, nine male and one female, met inclusion criteria and had comprehensive cephalometric records. Their average age was 18.1 ± 0.8 years at the time of orthognathic surgery. After the procedure, SNA, ANB, and maxillary depth changed an average 5.1 ± 4.3, 6.7 ± 3.6, and 6.2 ± 5.9 degrees ($p < 0.02$), respectively. The convexity and Wits appraisal shift averaged 5.9 ± 3.5 and 7.3 ± 2.9 millimeters ($p < 0.02$). When comparing pre- and post-orthognathic surgical scores assessed by clinicians, multiple domains increased including facial attractiveness (4.1 ± 0.7 vs 7.3 ± 0.7, $p < 0.001$), friendliness (4.5 ± 0.4 vs. 7.3 ± 0.5, $p < 0.001$), confidence (4.1 ± 0.4 vs. 7.1 ± 0.4, $p < 0.001$), and recommendation for further surgery decreased (8.9 ± 0.1 vs. 3.6 ± 0.5, $p < 0.001$). When evaluating attractiveness by anatomic domain, there were increases in the nose (1.8 ± 0.1 vs. 2.9 ± 0.09, $p < 0.001$), cheeks (2.7 ± 0.02 vs. 3.8 ± 0.03, $p < 0.001$), lips (1.9 ± 0.04 vs. 3.3 ± 0.05, $p < 0.001$), and chin (2.6 ± 0.04 vs. 3.6 ± 0.04, $p < 0.001$). Regression analysis showed relationship between clinician ratings and orthognathic movements. Cheek attractiveness ratings increased with increased convexity ($y = 0.09x + 0.8$, $R^2 = 0.44$) while cheek attractiveness and nose symmetry decreased with increased ANB ($y = -0.06x + 1.6$, $R^2 = 0.87$; $y = -0.06x + 1.5$, $R^2 = 0.59$).

Discussion: Orthognathic surgery improves many non-cognitive domains in CLP patients as assessed by clinicians. Post-surgical ratings significantly improved from pre-surgical ratings on all aspects of facial attractiveness, perceived patient friendliness, confidence, and need for surgical intervention. In addition, there is a positive correlation between convexity and attractiveness ratings and predictive power in tracking ANB movement. These findings demonstrate objective bases of skeletal adjustments for perceived improvements in facial appearance and emotion.

Facial Congenital Melanocytic Nevi Surgical Versus Non-Surgical Treatment Patterns: A Systematic Review

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Background: Over the last decade, congenital melanocytic nevi (CMN) treatment approaches have drastically shifted. Today, physicians no longer follow the old principle of 'nevus removal at any cost' and 'as soon as possible,' resulting in more attention to detail when choosing a CMN treatment modality.[1] Therapeutic management for CMN on the face varies in complexity based on extent and proximity to functional organs such as the eyes, nose, mouth, and ears. To date, there has been no study that systematically reviews facial CMN treatment in scholarship. Thus, the purpose of the present study is to elucidate the frequency, variety, and outcomes of treatment modalities for facial CMN of varying complexity.

Methods: Our study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and is available on Prospero (Registration ID: CRD42021285104). Pubmed, EMBASE and Google Scholar databases were searched from 1950-2021 to gather data on the facial CMN treatment approaches and associated complications. Our search strategy utilized boolean operators OR and AND to combine keywords including "congenital melanocytic nevi," "congenital melanocytic nevus," "congenital nevi," "surgery," "treatment," and "therapy." Using COVIDENCE, studies were screened and data was extracted by two independent readers (AK, DM) according to inclusion criteria. A third reader (TI) resolved any conflicting components. Data was tabulated for thematic analysis of facial CMN treatment types, location, outcomes, and severity of complications.

Results: Of the 561 studies retrieved, 23 met inclusion criteria including 8 surgical treatment, 13 non-surgical treatment, and 2 surgical and non-surgical treatment studies, totaling 204 patients. Approximately 11.8% (24/204) of patients experienced an early, late, and/or aesthetic complication. Twenty-one out of one hundred and fifty-two patients experienced at least one complication after undergoing non-surgical treatment (13.8%) and 3 out of 35 patients experienced at least one complication after undergoing surgical treatment (8.57%). CMN locations with the highest complication rates after surgical treatment were the ear (0 to 7.14 percent) and cheek (0 to 4.76 percent), while non-surgical treatment complication rates were highest on the cheek (0 to 60 percent).

Conclusion: This is the first systematic review to assess overall outcome and complication rates when treating facial CMN. However, there is a greater need for standardized nomenclature when treating facial CMN that addresses its pattern, dimensions, anatomical coverage, and quantitative measurement of treatment outcome. Future studies should focus on addressing which CMN anatomic locations are more prone to complications and determine which treatment modality optimizes outcomes.

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Mixed Reality Application of Virtual Surgical Planning (VSP) for Cranial Vault Remodeling

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Background: Mixed Reality (MR) is a form of visual augmentation that superimposes interactive 3D virtual content onto the real environment.1 This technology is revolutionizing the surgical arena for orthopedic, spine, neurosurgery, oncologic and other surgical professionals via improved pre-operative planning and intraoperative support.2 Virtual surgical planning (VSP) has already been shown to increase surgical precision with shorter operative times by the fabrication of patient specific cutting guides and intraoperative templates.3 MR devices in conjunction with VSP have the potential to provide great utility for craniofacial surgeons, which has yet to be demonstrated in current literature.

Objective: This project sought to evaluate the use of Mixed Reality in complex cranial vault remodeling applying guides and principles of Virtual Surgical Planning.

Methods: Imaging processing was completed using a fully "in-house approach" through Mimics-Materialise©. VSP was performed to plan the osteotomies and a patient-specific intraoperative cutting template was produced to be uploaded into the Microsoft HoloLens software. Osteotomies from the Mixed Reality virtual guide and an industry-made counterpart were independently marked on an anatomically accurate skull model of patients with craniosynostosis. Calipers were utilized to determine the precision of the in-house mixed reality guide as compared to industry standard.

Results: We were able to successfully perform pre-operative surgical planning and produce a Mixed Reality patient-specific cutting guide via augmented visualization. The use of Mixed reality guides to 3D printed guides were compared. Mixed Reality template markings demonstrated an overall difference of 1.89mm (SD 1.52) when compared to markings from commercial cutting guides. The total time invested in producing the final MR template was approximately 1.75 hours (45 minutes for segmentation, 45 minutes for VSP/cutting guide configuration, and 15 minutes processing to the HoloLens device) compared to an average two-week industry production time for 3D printed models and guides.

Conclusion: Combining VSP with intraoperative Mixed Reality is a feasible, cost-effective approach to complex cranial vault reconstruction and has the potential to improve patient

outcomes. Key design restraints to improve functionality hinge upon the ability to register augmented reality projections onto the surgical field.

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Characteristics of Pediatric Facial Fractures from Winter Recreational Sports and Activities

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Purpose: Sports-related injuries are one of the most common mechanisms of pediatric facial fractures. Seasonal activities such as skiing, snowboarding, sledding, tubing and ice skating contribute significantly in the winter months, accounting for thousands of Emergency Department visits every year. (1) This study aims to identify characteristics and patterns of pediatric facial fractures resulting from winter recreational sports and activities.

Methods: A retrospective review was conducted of all patients under the age of 18 presenting to a pediatric level I trauma center with facial fractures resulting from winter sports-related injuries in the period from January 2006 to December 2021. Patient demographics and clinical data including physical exam findings, Glasgow Coma Scale (GCS) scores, operative reports and follow-up records were collected. Two-tailed t-test and chi-squared testing were performed, with $p<0.05$ considered statistically significant.

Results: Three thousand three hundred thirty-four patients were analyzed. Forty-eight patients met inclusion criteria – 25 sledding, fourteen skiing, 4 snowboarding, 4 ice skating and 1 tubing. The majority were male (77.3%) and Caucasian (97.7%). Mean age at presentation was 10.75±4.37 years (range 1.84 to 18.04 years). The most common types of fractures were orbital (43.8%) and nasal fractures (43.8%), and the most common mechanisms of injury were collisions with objects (46.7%) and falls (37.8%). Most patients presented by ambulance (56.3%), and 22 were admitted for inpatient care (45.8%) with a mean hospital stay of 2±2 days. Five patients (10.4%) presented with decreased GCS scores. Concomitant fractures and

associated injuries were recorded, revealing a high coincidence of soft tissue injury (62.5%), neurologic abnormality (50%) and dentoalveolar trauma (22.9%). Nineteen patients (39.6%) underwent surgical reduction. There were no fatalities. Additionally, children under 6 years of age were more likely to present with injury from collisions with objects or people (p=0.004) and with soft tissue trauma (p=0.022) compared to older children. Teenagers between the ages of 13 to 18 years were more likely to present from falls (p=0.001) and with musculoskeletal injuries (p=0.045) compared to younger children.

Summary: Patterns of pediatric facial trauma from winter sports and activities are not well studied at the institutional level, and existing studies focus mostly on skiing and snowboarding. (2,3) This study identifies sledding as a significant fracture risk as well. We found that children presenting at different ages have distinct patterns of mechanisms of injury and clinical characteristics compared to older children, which is consistent with the literature. (4) These findings reflect the necessity for greater parental awareness and appropriate protective equipment at all ages to prevent more serious trauma.

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Otoplasty Under Local Anesthesia – A Cost-Effectiveness Analysis

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Purpose: Otoplasty for prominent ear correction is a common procedure in paediatric plastic surgery. Despite studies demonstrating that it can be safely and successfully performed under local anesthesia, this is not standard practice in all centres. The cost benefits of otoplasty under local as opposed to general anesthesia have not been evaluated. The present study aims to quantify these benefits as well as the opportunity-cost associated.

Methods: A cost analysis of all components of otoplasty surgery under local anesthesia in a minor operating facility and general anesthesia in a main operating room (OR) was performed. This included expenses for infrastructure, surgical and anesthetic material, salaries, and fees for

all involved personnel, as well as the cost of failure to tolerate local anesthesia for such cases. Precise costs were obtained from local operating room data for materials, as well as provincial and federal databases for salaries. Infrastructure costs were extrapolated from the literature and adapted to the specific practice at our institution in 2021 Canadian dollars.

Results: Otoplasty in both minor and main ORs had an average duration of 60 minutes and total costs per case were $1,127.86 and $4,705.43, respectively, with a difference of $3,577.57 (317%). The major cost component for surgery under local was personnel costs at 43.8% ($493.67), whereas this accounted for only 14.9% of costs under GA despite fees for anesthesia personnel ($699.73). infrastructure accounted for 61.5% of costs under general anesthesia ($2,893.39) as compared with 4.2% under local ($47.14). Equipment costs were significantly different between settings, with a general anesthesia case costing 379% more in supplies ($206.29 vs $43.08), much of this coming from anesthetic supplies.

Conclusions: Otoplasty under local anesthesia offers significant cost savings of $3,577.57 when compared with the same procedure under general anesthesia. Much of this cost difference is attributable to infrastructure expenses in the main operating room, while anesthetic supplies and personnel costs also play a role. These potential savings could fund three additional surgeries in a minor OR setting.

Buccal Myomucosal Flap Repair for Velopharyngeal Dysfunction

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Background: Velopharyngeal dysfunction is the incomplete separation of the nasal and oral cavities during sound production that can persist following primary palatoplasty. Surgical technique used in management of velopharyngeal dysfunction (palatal re-repair versus pharyngeal flap or sphincter pharyngoplasty) is often dictated by the preoperative velar closing ratio and closure pattern. Recently, buccal flaps have increased in popularity in management of velopharyngeal dysfunction. Here, we investigate the effectiveness of buccal myomucosal flaps in the treatment of velopharyngeal dysfunction.

Methods: A retrospective review was performed of all patients undergoing secondary palatoplasty with buccal flaps at a single center between 2016-2021. Pre- and postoperative speech outcomes were compared. Speech assessments included perceptual examinations, graded

on a four-point scale of hypernasality, and speech video fluoroscopy, from which velar closing ratio was obtained.

Results: A total of twenty-five patients underwent buccal myomucosal flap procedures for velopharyngeal dysfunction at a median of 7.1 years after primary palatoplasty. Patients had significantly increased velar closing postoperatively (50% vs 95%, $p<0.001$) and improved speech scores ($p<0.001$). Three patients (12%) had continued hypernasality postoperatively. There were no occurrences of obstructive sleep apnea.

Conclusions: Treatment of velopharyngeal dysfunction with buccal myomucosal flaps leads to improved speech outcomes without the risk of obstructive sleep apnea. Traditionally, palatal re-repair techniques have been utilized for smaller preoperative velopharyngeal gaps; however, the addition of buccal flaps allows for physiologic velar muscle correction for patients with a larger preoperative velopharyngeal gap.

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Analyzing Outcomes in Dog Bite Lacerations: Does Tightness of Closure Affect Infection Rates in Craniofacial Dog Bites?

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Purpose: Despite dog bites being a common injury managed by plastic surgeons, negative sequelae of dog bite closure types have not been characterized. Contrary to plastic surgery pedagogy, which teaches wound closure using a tight, multilayered approach, the current

treatment of facial dog bites involves washout and loose repair to permit drainage of pus and prevent infection. This study aimed to evaluate outcomes for patients who underwent tight versus loose closure to manage their dog bite.

Methods: We retrospectively analyzed charts from 2010 to 2021 at a Level 1 trauma center. Inclusion criteria were all patients presenting with craniofacial dog bites who received a primary closure in the ED or OR. Patients were excluded if they did not receive a wound closure. The primary outcome of interest was surgical site infection (SSI) which included any soft tissue infection and osteomyelitis. Secondary outcomes included scar revision and secondary reconstruction.

Results: We identified 210 patients that met inclusion criteria [mean 24 years of age, 49% male]. Dog bite locations included 58% lip, 20% nose, 8.6% ear, 7.6% eye, 3.3% scalp, and 27% other. Among our cohort, 52 patients received loose closure and 157 patients received tight closure. With an overall rate of 4.2%, we found no statistical difference in infection by closure type: 5.8% of loose closures compared to 3.1% of tight closures ($p = 0.67$). The cumulative length of loosely closed wounds was 4.1 (±3.2) cm and the length of tightly closed wounds was 4.8 (±4.1) cm ($p=0.2$). The mean number of suture layers was not statistically different between infected injuries 1.78 (±0.97) and uninfected injuries 2.24 (±0.65) ($p=0.12$). Additionally, IV antibiotic (loose= 71% vs. tight= 63%) and PO antibiotic (loose= 100% vs. tight= 97%) prescription rates did not differ significantly between groups (all $p=0.3$).

A higher proportion of poly-injury patients received tight closures ($p=0.028$), and a greater proportion of loosely closed wounds had an associated soft tissue defect (31% vs 18%, $p=0.035$). However, linear, and stellate wound patterns were similar between groups ($p=0.6$). Regarding secondary outcomes, scar revision (loose= 3.8% vs. tight= 1.3%, $p=0.55$) and secondary reconstruction (loose= 11.5% vs. tight= 8.9%, $p=0.7$) were not statistically different between groups.

Conclusion: We present the largest study to date comparing dog bite closure approaches which revealed that infection rates were low overall, regardless of closure type. Though a small difference in infection rate by closure type may exist, the effect size was not significant enough in a population of this size despite capturing 10 years of dog bite encounters. Our findings postulate that closure type may not significantly impact infection in dog bites but may clinically impact revision and reconstruction needs.

Coordinated Single Stage Cranial/Intracranial Tumor Extirpation and Reconstruction: Improving Patient and System Value

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Purpose: In an effort to streamline patient care, and optimize both extirpative and reconstructive outcomes, we have undertaken a protocol for patients with cranial/intracranial tumors, where coordinated resection and reconstruction are performed in a single stage procedure. We present a six-patient series using this treatment method.

Methods: Patients with cranial/intracranial tumors where a cranial defect would result from tumor extirpation, or where bone was deemed inadequate following repeated craniotomies were seen by neurosurgery and craniofacial surgery. Both services attend a virtual surgical planning (VSP) webinar, where extirpation and reconstruction were simultaneously planned. The cranial CT was superimposed with MRI images to register the tumor location with respect to cranial bone anatomy. Virtually planned craniotomy position was transferred to the operating room with a custom cutting guide, registered to the patient's cranial contours. For immediate reconstruction, a custom 3D PEEK implant was planned to the edges of the guided craniotomy.

Results: Six patients presented with age ranging from 29 to 59 (mean age 56). Follow-up time ranged from 2 to 35 months, and a mean of 6 months. None of the patients experienced intraoperative complications. One patient had transient blurry vision when standing at 1 month follow-up. One patient had a past history of 4 craniotomies for removal of meningiomas and resultant recurrent meningiomas. All patients have healed without significant complications.

Discussion: This technique proves to be useful in a range of pathologies such as recurrent and primary meningiomas, granulomas, intraosseous hemangiomas, and Langerhans cell histiocytosis. It is possible to perform both resection and reconstruction of complex cranial lesions in a single-stage operation. Patient care was streamlined, reducing surgeries performed for patients, while improving functional and aesthetic outcomes. Multiple operations inherently increase overall costs, while concurrently increasing the risk of complications. The cost of a craniotomy in the United States has been estimated to be $53,397 ± 811 with autologous bone cranioplasty following at $27,178 ± 2438,1 while a single stage extirpation/reconstruction would inherently reduce the financial burden. Complex patients as described above will often require multiple cranioplasties if performed in multiple stages, which further increases costs. A single-stage operation reduces multi-procedural costs, ICU associated costs, and costs related to complications with prior cranioplasties.

Conclusions: Simultaneous extirpation/reconstruction of cranial/intracranial lesions using coordinated virtual planning streamlines patient care while improving outcomes. Costs associated with care of these conditions are reduced and overall enhance patient and system value.

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Zygomatic Osteotomy and Repositioning: Current Thinking And Use Of Technological Aids

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Purpose: The purpose of this study is to evaluate zygomatic osteotomy and repositioning (ZyOaR) in conjunction with CAD/CAM (computer-aided design and manufacturing) technology in light of various disease entities.

Background: The zygomatic complex is highly three-dimensional, forming the cheek prominence, facial width, while contributing to orbital morphology and volume. Functionally, the zygoma provides support for the soft tissues of the cheek and lower lid and is vital to mastication via its attachment with the masseter muscle. Zygomatic fractures are among the most common type of facial trauma.1 The irregular shape of the zygoma and its articulation with four other bones make surgical correction technically challenging. The zygoma may become malpositioned due to prior trauma, or a variety of distorting congenital or acquired conditions. Secondary surgery, ZyOaR is even more complex due to increased technical considerations. The advent of virtual surgical planning (VSP) has helped address some of these challenges. The advantages of using VSP technology include enhanced operative efficiency, accuracy, and reproducibility. Despite the challenges working with the zygoma, there is still a paucity of literature on ZyOaR. There is no literature discussing ZyOaR with or without the use of technological aids.

Methods: A retrospective chart review was performed, identifying five patients with prior ZyOaR. VSP had been utilized to assist with the procedure. The inclusion criteria were ZyOaR due to any etiology and age older than 18 years. Surgical guides and implants were used to aid in transferring the VSP to the operating room. Variables and outcomes included patient age, gender, mechanism of defect, post-operative infections, facial symmetry, functional defects in mastication, and globe malposition.

Results: Five patients presented with age ranging from 18 to 57 (mean age 37), all with zygomatic malposition. Three patients had congenital deformities (neurofibromatosis and fibrous dysplasia) and two were post-traumatic. Follow-up time ranged from 3 to 48 months, and a mean of 15 months. None of the patients experienced intraoperative complications. No patients had postoperative infection or visual acuity change. No cases required a return to the operating room.

Preoperative VSP was compared to postoperative results using CT, showing a high degree of accuracy.

Conclusions: Secondary reconstruction of the zygoma in the form of ZyOaR is inherently challenging. There are many technical considerations in achieving proper form and subsequently, function for this highly three-dimensional structure. We provide five cases of ZyOaR performed on patients with a range of disease etiologies, resulting in specific technical challenges. The procedures were well tolerated with no postoperative complications and resulted in a high degree of surgical accuracy, using VSP. From our experience, we found keys to ZyOaR included: anatomic considerations of skull base morphology, orbital volume, and planning considerations with specialized surgical transfer guides, custom titanium implants including fixation plates, and patient specific orbital implants.

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Oncoplastic Reconstruction of Maxillary Defects with Palatal Involvement in Children and Adolescents: Lessons Learned from Treating 10 Consecutive Patients

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Background & Purpose: Oncoplastic reconstruction of the maxilla is highly challenging given the aesthetic and functional importance of the bone. When reconstructing post-ablative defects in children, reconstructive surgeons are also tasked with accounting for age-dependent differences in skeletal morphology and future skeletal growth. Presently, there is a paucity of outcomes data for children and adolescents undergoing reconstruction of post-ablative defects of the maxilla that involve the palate. The purpose of this study is to assess the postoperative course of pediatric patients who underwent reconstruction of maxillary defects with palatal involvement at our institution. Additionally, we outline our multidisciplinary head & neck tumor team's approach to reconstructing these difficult defects.

Methods: A retrospective chart review of all patients who underwent oncoplastic reconstruction of the maxilla at our institution from March 2015 to January 2022 was performed. Patients with

post-ablative defects sparing the palate were excluded. Variables analyzed included patient demographics, tumor characteristics, instances of neoadjuvant or adjuvant chemotherapy or radiotherapy, defect characteristics, reconstructive modalities performed, and postoperative complications at the donor and recipient sites.

Results: A total of ten patients with a mean age and follow-up of 118.0 months and 25.1 months, respectively, were included in our study. Of these patients, two had defects isolated to the hard palate. Eight patients had defects involving the maxillary arch and dentition. Primary separation of the oral and sinonasal cavities was achieved using free tissue transfer (FTT) in eight patients with the remainder undergoing reconstruction with buccal myomucosal flaps. Reconstruction of the maxillary arch using a free fibula flap was performed in 2 patients. Two microvascular reconstructions were complicated by total flap loss requiring repeat FTT to correct the defect, and 1 was complicated by the development of an oronasal fistula (ONF) secondary to partial flap necrosis. The ONF healed secondarily following debridement of nonviable tissue. One patient required emergent flap debulking due to compression of the globe secondary to postoperative flap swelling. Lastly, one patient developed an ONF following locoregional reconstruction of the palate which was repaired with flap revision. No complications at the donor site were observed, and all patients achieved satisfactory swallow outcomes following surgery.

Conclusion: Oncoplastic reconstruction of complex maxillary defects with palatal involvement is challenging; however, our clinical experience demonstrates that satisfactory reconstructive outcomes are attainable. We present a treatment algorithm derived from our findings and discuss clinical pearls based on our group's experience.

Predictors of Complications Following Forehead Flaps for Nasal and Periorbital Reconstruction

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Background: Forehead flaps are a workhorse for nasal reconstruction, but complications can occur in up to 30% of patients (1-2). Addressing complications can be challenging, and often necessitates revisionary procedures, which can cause significant burden to patients. Yet, there has been minimal research attempting to identify factors associated with complications and need for revisionary procedures (3). This study aimed to identify risk factors for complications and provide clinicians a risk-stratification tool to facilitate shared decision-making.

Methods: This retrospective study included patients who underwent forehead flaps between 2007-2020. Patient-level and operative risk factors were compared between the cohorts with and without complications, and factors found to be associated with development of a complication with a $p<0.10$ were entered into a multivariate model as candidate variables (4). Multivariable logistic regression was conducted, with stepwise variable elimination to determine inclusion in the final model. Final model was tested with receiver operative characteristic (ROC) curve and validated using an internal bootstrapping approach (5). From the final regression, a risk-stratification scheme was developed, with creation of low, intermediate and high-risk groups.

Results: 197 patients underwent forehead flap reconstruction, with a mean age of 68.5 years. Mean follow-up time was 42 months. There were 50 (25.4%) patients who developed a complication, including impaired nasal function (18.8%), distal flap necrosis (5.1%), infection (2.5%), poor donor site healing (2.5%) wound dehiscence (2.0%), and flap congestion (1.5%). On univariate analysis, female sex, immunosuppression, prior radiotherapy, and larger resection area were associated with complications ($p<0.05$). On multivariable analysis, female sex (OR 3.89, $p<0.001$), hypoalbuminemia (OR 3.70, $p=0.01$), and prior wide local excision (OR 3.62, $p=0.04$) were predictors of complications. A clinical calculator was developed incorporating these risk factors, with a C-statistic of 0.85 after adjusting for optimism, indicating strong predictive value. When stratifying patients, there were 102 (51%) low-risk, 68 (35%) intermediate-risk, and 27 (14%) high-risk patients, corresponding with complication rates of 4.9%, 37%, and 74%, respectively ($p<0.001$) Intermediate-risk and high-risk categories increased the likelihood of any complication by 11-fold and 55-fold, respectively.

Conclusion: We conducted the most comprehensive review of risk factors for development of complications following forehead flap reconstruction. Among 197 patients undergoing forehead flaps, the overall complication rate was 25.4%, most commonly for impaired nasal function and distal flap necrosis. Female sex, preoperative hypoalbuminemia, prior excisions, and concomitant rib cartilage grafting were significant predictors of complications. Weighted variables were incorporated into a novel clinical calculator, which can be instantly implemented in the clinical setting to facilitate shared decision-making and preoperative planning. The present study findings will improve surgical expertise for forehead flap-based reconstruction for patients with facial cutaneous lesions.

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Assessment Of the Multi-Disciplinary And Operative Management Of Robin Sequence At A Single Institution: A Retrospective Review Over 10 Years

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Background: Robin sequence presents with micrognathia and glossoptosis resulting in airway obstruction classically identified upon delivery. The complexity of these patients require care by a multidisciplinary team including neonatology, pulmonology, sleep medicine, otolaryngology, and plastic surgery. The management of these patients is challenging due to the diverse phenotypic presentations and multiple providers. The authors' goal was to assess a quality improvement initiative involving Robin sequence patients at a single institution. Primary outcomes focused on patient characteristics, polysomnography, and any indicated surgical interventions. Secondary outcomes were centered on protocols from an interdisciplinary meeting in January 2018, which helped streamline the involvement of all consulting services. This created an opportunity for comparison of a pre-intervention cohort to a post-intervention cohort.

Methods: A retrospective review of newborns with a diagnosis of Robin sequence at a single pediatric medical center between 2010 and 2020 was performed. Patients were identified by billing data by the ICD-9 code 756.0 and ICD-10 code Q87.0. Patient demographics were collected, as well as other comorbid conditions, timing of the multidiscipline evaluation, polysomnography metrics, and surgical interventions. Lastly, the cohort comparison from before and after the intervention allowed for metrics such as length of stay and timeliness of evaluation to be analyzed.

Results: Robin sequence was identified in thirty-four patients, with 28 requiring admissions to the neonatal intensive care unit (NICU). There were fourteen patients that carried another syndromic diagnosis, and ten patients had an airway anomaly. Ten patients were treated with tongue-lip adhesion (TLA) and four were treated with mandibular distraction osteogenesis (MDO). A total of ten patients were treated with tracheostomy. Pre-intervention patients, prior to the interdisciplinary meeting in January 2018, had a documented nasendoscopy by otolaryngology in 50% of cases. This improved to 100% after the intervention. Between the cohorts, there was no significant change in length of stay, however, the time until inpatient polysomnography decreased from 19 to 8 days.

Discussion: The management of Robin sequence continues to present a clinical challenge to the care of this heterogeneous population of patients. The majority of the patients requiring

tracheostomy had other concomitant diagnoses or syndromic association and or had an additional airway anomaly. TLA or MDO was only used on twelve patients, with 2 patients requiring conversion from TLA to MDO. Although the interdisciplinary meeting failed to show a significant change in length of stay, it did improve the promptness of consultation and evaluation of all teams involved. Additionally, this systems-based approach identified a staffing deficiency for in-house polysomnography. Resolving this issue led to the 50% reduction in time until polysomnography could be obtained. Further investigation is needed to elucidate the role of sleep studies in medical and surgical decision-making.

Pain Management in Cranial Vault Reconstruction: The Effect of ERAS Protocol Implementation

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Background: Craniosynostosis is a congenital cranial malformation characterized by the premature fusion of cranial sutures. Surgical intervention is often required and performed within the first two years of life. Cranial vault reconstruction (CVR) and frontal orbital advancement (FOA) are curative but extensive procedures, requiring long operative times and postoperative admission for pain control. Few studies have investigated postoperative pain management in patients undergoing CVR and FOA. The purpose of this study is to compare analgesic use, measured in median milligram morphine equivalents (MME), and pain scores in patients undergoing open surgical treatment of craniosynostosis before and after the implementation of an Enhanced Recovery After Surgery (ERAS) protocol.

Methods: A retrospective chart review was conducted of all patients with craniosynostosis who underwent CVR or FOA at the University of North Carolina between April 2014 and January 2022. Patient demographics, clinical characteristics, intraoperative and postoperative analgesic use, and post-operative pain scores scaled from 0 to 3 were collected. If a patient had multiple surgeries during the timeframe, only the first surgery was included in analysis. The ERAS pathway was implemented on July 1, 2019; surgeries were classified as pre- and post- ERAS. Statistical analysis was performed using t-tests.

Results: Our study included 53 pre-ERAS patients and thirty-one post-ERAS patients. Patient characteristics including gender, age at time of surgery, and syndromic diagnoses were similar between the two groups. Sagittal craniosynostosis was the most common diagnosis in both pre- and post-ERAS groups, twenty-one patients (39.6%) and sixteen patients (51.6%) respectively. CVR comprised twenty-seven surgeries (50.9%) pre-ERAS and twenty-three surgeries (74.2%) post-ERAS. The average hospital length of stay pre-ERAS was 4.77 and post-ERAS 4.26

(p=0.003). The average number of days in the pediatric ICU was 2.01 days pre-ERAS and 1.65 days post-ERAS (p=0.026).

The median MME for pre- and post-ERAS were 1.2 (IQR 0.84-2.34) and 1.2 (IQR 0.52-2.39) for hospital day 0 (p=0.545), 4.08 (IQR 1.61-5.98) and 3 (IQR 1.1-4.98) for hospital day 1 (p=0.079), 3.59 (IQR 1.44-5.37) and 1.16 (IQR 0-2.85) for hospital day 2 (p=0.011), and 1.77 (IQR 0-4.04) and 0.26 (IQR 0-2.85) for hospital day 3 (0.045), 0 (IQR 0-1.89) and 0 (IQR 0-1.5) for hospital day 4 (p=0.530). Overall, the average total MME was 14.16 pre-ERAS and 10.59 post-ERAS (p=0.271).

The average postoperative pain score for hospital day 0 was 0.81 pre-ERAS and 0.81 post-ERAS (p=0.887), for hospital day 1 was 0.56 pre-ERAS and 0.52 post-ERAS (p=0.772), for hospital day 2 0.47 pre-ERAS and 0.32 post-ERAS (p=0.212), for hospital day 3 0.27 pre-ERAS and 0.07 post-ERAS (p=0.019), and for hospital day 4 0.2 pre-ERAS and 0.22 post-ERAS (0.895).

Conclusion: Implementation of an ERAS protocol was associated with a lower total MME per day and similar postoperative pain scores. Pain scores were significantly lower in the post-ERAS group on hospital day 3. Further studies should investigate how the ERAS protocol affects patient-reported outcomes in patients undergoing cranial vault reconstruction.

Early vs Delayed Reconstruction in Rhino-orbito-cerebral Mucormycosis Due To COVID-19 Disease: A Prospective Comparative Study

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Introduction: Rhino-orbito-cerebral mucormycosis is a rapidly progressive, destructive, angioinvasive fungal disease that often affects people who have contracted COVID-19 disease. A high degree of suspicion is necessary to intervene at the right time to avoid disastrous outcomes. Early debridement is critical to the treatment that leads to complex defects which demands reconstruction, the timing of which has been controversial. This study critically analyses results from cases that were treated either early or delayed depending on various patient associated factors and involvement of skin by the fungus.

Methods: Fifty-six patients with mucormycosis who underwent debridement and needed reconstruction were prospectively enrolled in the study that was conducted from April 2021 to September 2021. Wide local excision was performed in all cases removing all suspected and edematous tissue. Reconstruction was done primarily or secondarily after clear margins were achieved on clinical assessment under a cover of injectable liposomal amphotericin B.

Results: Fifty-six patients were included out of which 22 underwent primary reconstruction and 34 were treated secondarily after the patient was discharged following debridement and readmitted for reconstruction. The average age was 44.5 and 44.6 years in the two groups

respectively. Steroid therapy was implemented for an average 1.9 weeks and 2.7 weeks in the two groups. The history of diabetes and hypertension in the groups was not significant. (p=0.56) 22 patients (100%) had maxillectomy and mucosal lining resection with skin excision in the former group in contrast to 5 patients (14.7%) in the latter. Anterolateral thigh flaps were used to cover defects in all patients except one in patients who were treated primarily while ALT, RAFF and Free Fibula was used for reconstruction in patients who were treated secondarily. All flaps survived. No major or minor complications occurred except one patient in the former group who died due to complications pertaining to pre-existing renal disease. No recurrence of mucormycosis was noted.

Conclusion: The approach presented in this study indicates immediate reconstruction is safe and reliable in cases when appropriate tissue resection is accomplished, and skin resection is mandatory. Delayed reconstruction is preferred when the skin is spared, and the patient's general condition and risk factors preclude immediate reconstruction.

Osteoradionecrosis After Osseous Reconstruction of The Mandible In Head And Neck Cancer: A 22-Year Review At A Cancer Center

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Background: Osteoradionecrosis (ORN) is radiation induced bone death that can lead to bone exposure, chronic draining sinuses, and fractures. Optimal clinical management of ORN remains unclear. The aim of this study is to analyze the rates and management of ORN following osseous free flap reconstruction for mandibular resection at a large cancer center.

Methods: A prospectively maintained database was used to identify patients who developed ORN after mandibulectomy at Memorial Sloan Kettering Cancer Centre. Inclusion criteria were patients who underwent osseous free flap reconstruction of mandibulectomy defects and received adjuvant radiation therapy. Patients who had neoadjuvant radiation were excluded.

Results: Over a 22-year period, 376 patients underwent free flap reconstruction at the time of mandibulectomy, of which 239 patients (63.5%) had osseous reconstruction and 137 patients (36.4%) had soft tissue only reconstruction. Adjuvant radiation was administered to 189 patients (79.07%) patients with osseous reconstruction and 86 patients (62.77%) patients with soft tissue only reconstruction. ORN developed in 20/189 patients (10.6%) in the osseous reconstruction group, compared to 8/86 patients (9.3%) who had soft tissue reconstruction. For ORN after osseous reconstruction, the median time to onset was 10.5 months. Management of ORN in this patient group was variable depending on presenting symptoms. This consisted of non-operative management with antibiotics and local wound care was performed in 6 patients, hardware

removal +/- debridement in 7 patients, local flap in 1 patient, regional pedicled flap in 1 patient and a second free flap in 4 patients. Our algorithm for management of ORN in this setting is presented.

Conclusion: ORN develops in a subset of patients who undergo mandibulectomy and osseous free flap reconstruction with adjuvant radiation. Surgical management is needed for the majority of patients.

Cranial Defect Reconstruction with Custom 3D-printed Hydroxyapatite Scaffolds: A Large Pre-Clinical Model

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Introduction: When considering critical bone defect reconstruction throughout the body, cranial reconstruction via cranioplasty is an attractive target due to the presence of adjacent, reliable well-vascularized tissue and the relative lack of load bearing. This study seeks to demonstrate clinical readiness of a bone tissue engineering (BTE) approach for critical cranial defects in an adult non-human primate model.

Methods: Identical 5-cm vertex guided-craniotomies were created in each of 12 rhesus macaques: 3 to demonstrate critical nature of the defect, and 9 to examine the bony bridging and volumetric bone growth when reconstructed with custom-3D-printed hydroxyapatite scaffolds (KLS Martin). Three treatment groups were tested to examine the contributions of osteogenic factor addition to scaffolds on study outcomes: naked scaffold (n=3), 2.8 mL (Infuse® Medtronic) rhBMP-2 (n=3) and 1000 µM dipyridamole (n=3). Serial CT scans (Q2 months) were obtained until scaffold harvest at 12 months following implantation, at which time micro-CT scan, histology and nano-indentation testing were performed.

Results: No new bone formation was identified on serial CT-scans in subjects whose craniectomies were left unrepaired. Bridging analysis demonstrated circumferential fusion of the BMP-2-treated scaffolds at the earliest time point examined (100% at the 2-month CT scan). The dipyridamole and naked scaffold groups had significantly less circumferential bridging at the 2-month time point (78.4% and 64.6%, respectively), however this gradually increased to become statistically similar by the 12-month time-point (93.0% and 92.9%, respectively). Micro-CT analysis of harvested scaffolds demonstrated a significantly greater volume of bone formation in the BMP-2-treated scaffolds (7621 ± 145) compared with the dipyridamole- (6466 ± 693) and naked scaffold (6348 ± 663) groups.

Conclusions: Ingrowth of native tissue into large 3D-printed hydroxyapatite cranioplasty implants as demonstrated by peripheral bony bridging exceeding 90% in all treatment groups within 12 months of implantation. Scaffolds pre-treated with BMP-2 had complete and rapid fusion with the surrounding bone and had the most robust bone formation within scaffold interstices. These findings demonstrate successful incorporation of large hydroxyapatite cranial scaffolds and suggest an alternative approach to alloplastic materials for surgical cranioplasty.

Hemifacial Microsomia Reconstruction Alters Layperson Visual Attention: A Prospective Study with Eye-Tracking Technology

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Introduction: Craniofacial and plastic surgery aim to reconstruct facial anomalies to approach "ideal normal" appearance. However, facial areas attracting the most visual attention in a variety of craniofacial pathologies are poorly understood, with a limited number of studies employing eye-tracking technology to successfully characterize these areas of interest. Hemifacial microsomia (HFM) is ideal for studying gaze patterns due to its predilection for specific facial regions, most commonly the jaws and ear. This study aimed to determine layperson visual attention toward pre- and post- jaw reconstruction of HFM patients using eye-tracking technology.

Methods: Publicly available images of seventeen patients with HFM pre- and post-jaw reconstructive procedures were used in this study. Four discrete areas of interest (AOIs) were defined on the anomalous side of each face as the forehead and orbit region, cheek and ear region, nose and lip region, and mandible and chin region. The Tobii Pro Nano eye-tracking system was used to register participant visual fixations (the maintenance of visual gaze on a single location).

Each participant completed two consecutive trials consisting of sixty-eight total images for five seconds each (34 in normal orientation and thirty-four in mirrored orientation to account for left

gaze bias). A power analysis computed with 1,000 Monte Carlo simulations suggested a sample of 60 participants would provide sufficient power to detect the effects of interest ($1-\beta > 0.8$). A secondary power analysis, using the same procedure but informed by pilot data acquired in five volunteers, also indicated sixty participants would provide adequate statistical power. Linear mixed effect models (LMEMs) in R Studio tested whether locations of participant fixations were affected by surgical correction of HFM.

Results: 47,354 visual fixations were captured over 120 trials from 60 participants. LMEMs revealed significantly decreased postoperative visual fixations in the mandible and chin region [716 (54.8%) pre-reconstruction, 591 (45.2%) post reconstruction; $\beta = -0.198$, SE = 0.056, $z = -3.550$, $p < 0.001$]. Analysis also revealed significantly increased postoperative visual fixations in the forehead and orbit region [11350 (48.6%) pre-reconstruction, 12000 (51.4%) post-reconstruction; $\beta = 0.086$, SE = 0.015, $z = 5.664$, $p < 0.00001$].

Surgical reconstruction did not significantly influence visual attention to the nose and lips region [8,460 (49.7%) pre-reconstruction, 8571 (50.3%) post reconstruction] with superior fit to the null model [$\beta = 0.015$, SE = 0.017, $z = 0.868$, $p = 0.385$] and cheek and ears region [2841 (49.9%) pre-reconstruction, 2825 (51.1%) post reconstruction] with superior fit to the null model [$\beta = -0.007$, SE = 0.028, $z = -0.263$, $p = 0.793$].

Conclusions: Following corrective jaw surgery for HFM, laypersons demonstrated significantly less visual attention to the mandible and chin and increased visual attention to the forehead and orbit. These findings suggest postoperative improvement towards aesthetic normalcy may reduce visual attention toward previously anomalous anatomy.

Layperson Bias and Empathy Influence Visual Attention Toward Patients with Hemifacial Microsomia: A Prospective Eye-Tracking Study

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Introduction: Facial attractiveness influences our perceptions of others, with beautiful faces reaping societal rewards and anomalous faces encountering penalties. Previous work with functional magnetic resonance imaging (fMRI) has demonstrate implication of certain neuroanatomic structures in visual pathways when viewing others with facial anomalies. For example, laypersons with high levels of implicit bias toward those with facial anomalies demonstrated increased amygdala reactivity. This study aimed to characterize associations between visual attention patterns and implicit biases (attitudes toward groups of people without conscious awareness), explicit biases (attitudes toward groups of people with conscious awareness), and social dispositions toward people with facial anomalies.

Methods: Participants completed an implicit bias association test (IAT), an explicit bias questionnaire (EBQ), and several social disposition tests (e.g., empathic concern and perspective taking) prior to viewing publicly available images of pre- and postoperative patients with hemifacial microsomia (HFM). Eye-tracking was used to register visual fixations. Four areas of interest (AOIs) were defined on each face: cheek and ear, forehead and orbit, mandible and chin, and nose and lips. Linear mixed effects models (LMEMs) in R Studio tested whether locations of participant fixations were affected by surgical correction of HFM and influenced by IAT, EBQ, or social disposition scores.

Results: Sixty participants (38 women) were prospectively enrolled. LMEMs revealed participants with higher IAT scores fixated significantly less on the cheek and ear region preoperatively compared to postoperatively ($\beta = 0.115$, SE = 0.040, $z = 2.855$, $p = 0.004$). Participants with higher scores on empathic concern fixated more on the forehead and orbit preoperatively compared to postoperatively ($\beta = -0.107$, SE = 0.053, $z = -2.007$, $p = 0.045$) and participants with higher scores in perspective taking fixated more on the nose and lips ($\beta = -0.085$, SE = 0.038, $z = -2.215$, $p = 0.027$) preoperatively compared to postoperatively. EBQ scores and other social disposition scores did not significantly influence visual fixations in any AOIs based on better fit to the null models.

Conclusions: Levels of biases, empathic concern, and other social dispositions may influence visual attention toward people with facial anomalies. Those with higher levels of implicit bias may avoid looking at anomalous anatomy, while those with higher levels of empathic concern and perspective taking do not show similar avoidance behaviors. These findings may have neural underpinnings with amygdala reactivity modulating visual activity in response to facial anomalies. This study has implications for the experience of patients with craniofacial anomalies and for characterizing neurologic mechanisms of the "beauty-is-good" and "anomalous-is-bad" biases.

A Surgical Algorithm Based on Skeletal Maturity to Stratify Treatment of Binder Syndrome

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Purpose: Nasomaxillary hypoplasia, or Binder syndrome, is a rare congenital disorder involving the central face, characterized by a distinctive nasal appearance due to nasal spine, tip, root, and columellar hypoplasia. In treating these complex cases, our institution has employed a stratified treatment algorithm, with mild-to-moderate severity patients undergoing initial rhinoplasty at skeletal maturity (SKM) and severe patients undergoing serial nasal implants prior to definitive rhinoplasty. The purpose of this study is to evaluate the treatment patterns and outcomes of Binder syndrome using this stratified pathway.

Materials and Methods: We screened 848 patients using ICD-9-CM, ICD-10-CM, and CPT codes capturing congenital malformations of the nose, facial bones, and subsequent reconstruction treated at our institution between 2006 and 2020. Thirteen cases of nasomaxillary hypoplasia were identified, of which six were excluded due to records predating electronic medical record integration. Patients were sorted into the pre-SKM (n = 5) and SKM (n = 2) cohorts based on timing of initial rhinoplasty Photo morphometric analyses were conducted on basal, frontal, and lateral photographs using ImageJ. Goode's ratio (nasal height/nasal length) was used to assess change in projection and pronasale to ala was measured bilaterally as a proxy of symmetry (nasal symmetry index). Change in symmetry was calculated using bilateral nasal width ratio with right-side over left side.

Results: All patients (Table 1: 3 males, 4 females) in our sample had Binder syndrome with characteristic nasal and midface hypoplasia. Five patients (71.4%) had initial rhinoplasty prior to SKM, undergoing serial expansion with silastic implants or banked rib cartilage grafts. Average age at initial rhinoplasty was 9.5 years (7.1 years for the pre-SKM group and 15.6 years for the post-SKM group). Isolating patients post definitive rhinoplasty (n=5), the SKM group (n=2) had an average of 1.5 rhinoplasties and pre-SKM patients had an average of 2.3 rhinoplasties (n=3).

The average change in Goode's ratio was 0.081 for both cohorts combined, reflecting larger changes in dorsal length compared to alar-facial crease to paranasal distance (mean = 36.7 pixels versus 24.3 pixels). Between the SKM and pre-SKM groups, there was no significant difference in the change in nasolabial angle, Goode's ratio, or change in nasal symmetry index. Significantly more patients (n=5, 85.7%) received L-strut grafts compared to columellar strut graft with dorsal onlay (n =2, p = 0.038); however, there was no significant difference in Goode's ratio or nasal symmetry index between these groups (p > 0.05).

Conclusion: In our cohort of patients with Binder syndrome, treatment pathway did not significantly impact nasal projection, dorsal length, or nasal symmetry indices. Implementation of a surgical treatment pathway resulted in successful short- and long-term improvements in

nasal projection and symmetry indices. Future studies are needed to explore the reproducibility of these findings in a larger cohort and with prospective surgical stratification.

The Impact of Socioeconomic Status on Treatment Timeline for Non-Syndromic Craniosynostosis: A 30-Year Retrospective Review

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Purpose: Patients with non-syndromic craniosynostosis (NSC) often undergo surgical correction before 12 months of age, as delayed treatment is associated with greater surgical complexity and risk of complications. Though a minority of NSC patients undergo primary surgical repair after one year, this cohort, as well as the challenges they face in accessing optimal care, are not well-characterized in literature. This study aims to identify potential contributors to gaps in care for NSC patients associated with treatment delay (>12 months of age at primary surgery).

Methods: A retrospective review of patients who underwent primary surgery for NSC between 1992 and 2022 at a single institution was conducted. All patients whose primary repair occurred after 12 months of age were identified and matched with control patients whose primary repair was conducted before 12 months of age. Control patients were matched based on date of surgery. Data including ages at diagnosis and surgery, clinical features, and sociodemographic variables such as race, ethnicity, household caregiver status, and home zip code median household income (MHI) were analyzed for all delayed-care patients and standard-care controls.

Results: A total of 125 patients with delayed care and an equal number of standard-care controls were included in analysis. The median age at surgery was 674 days in delayed-care patients (range: 370 days–14.9 years) and 182 days in standard-care patients (41–356 days). There were no significant differences in suture involvement between these groups. Conversely, statistically significant associations were found between care groups and insurance provider, race, caregiver status, and adoption history. Though a majority of patients in both groups were covered by private insurance, this was significantly less common in delayed-care patients (55.8% vs 80.5% of standard-care patients, $p < 0.001$), for whom Medicaid-affiliated and military insurers were relatively more prevalent. Additionally, as compared to standard-care controls, a greater proportion of patients who underwent delayed treatment were of non-White race (38.4% vs

16.8%, $p < 0.001$), lived in single-caregiver households (23.6% vs 7.6%, $p < 0.05$), and had a history of adoption (7.8% vs 0.9% $p = 0.02$). Indeed, odds of having delayed care were 2.7 times greater in Black patients ($p = 0.01$) as compared to White patients, and 5.4 times greater in patients from single-caregiver households ($p = 0.036$) as compared to dual-caregiver households. MHI was also significantly associated with treatment group (median $77816 for delayed-care patients vs $91954 in controls, $p < 0.001$); multivariate regression found that odds of delayed treatment increased by 1% for every $1000 decrease in MHI, when adjusted for other demographic variables ($p = 0.0033$).

Conclusion: The association between surgical delay and demographic markers including race and household income suggest that socioeconomic disparities contribute to care gaps in late presenting NSC patients. Similarly, the impact of household caregiver status on treatment delay may indicate the impact of resource disparities on opportunities to access optimal care. Anticipation of these disparities can help surgeons in the identification and management of this complex group.

Can Frailty Indices Predict Surgical Risk in Open Reduction and Fixation of Facial Fractures?

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Purpose: Facial fractures, often resulting from high impact trauma, necessitate surgical fixation with postoperative complications occurring in 3-30% of patients.1 Thus, risk prediction of unfavorable postoperative complications is essential for preoperative planning and postoperative management. Existing literature has linked smoking, alcohol use, age, BMI, and comorbidities to increased risk of adverse postoperative outcomes following facial fracture repair.1 More recently, frailty indices, including the Modified Five-Item Frailty Index (mFI-5) and the Modified Charlson Comorbidity Index (mCCI), have emerged as potentially more accurate predictors of surgical risk and 30-day postsurgical complications than their historical counterparts.2,3 The authors aimed to evaluate whether the mFI-5 and mCCI are stronger predictors of 30-day postoperative complications after open facial fracture reduction, versus historic risk proxies.

Methods: A retrospective review of the National Surgical Quality Improvement Program (NSQIP) database was performed of patients undergoing open facial fracture reduction from 2013-2019. Age, smoking, BMI, comorbidities, and American Society of Anesthesiologists (ASA) class were extracted, and mFI-5 and mCCI scores were calculated using this data. Univariate logistic regressions were performed ($p<0.05$).

Results: A total of 2,667 patients were analyzed, of which 2,131 (80%) were male. Most patients were nonfrail across both indices, with 86% (n=2,292) having an mFI-5 of 0, and 75% (n=1,994) having a mCCI of 0. Both mCCl score ≥2 (OR=2.19, $p<0.001$) and mFI-5 =1 (OR=1.96, $p<0.001$) were strong independent predictors of overall 30-day complication rate and complication severity. However, ASA class ≥3 was the strongest predictor (OR=3.60, $p<0.001$). Age was statically significant, but a low-impact, predictor of complications and complication severity (OR= 1.02, $p<0.001$). The only significant predictors of surgical site infections (SSI) were smoking (OR=1.56, p=0.042) and ASA class ≥3 (OR=2.37, p=0.013). An mFI-5 of 1 was also found to be a significant predictor of hospital readmission rates (7% vs 3% $p<0.001$). BMI was not associated with any increased risk.

Conclusions: The mCCI and mFI-5 are significant independent predicators of total complications and complication severity following facial fracture repair. ASA class ≥3 was the strongest predictor of postoperative complications, attributable to concurrent multi-organ system trauma and its global impact on risk in facial fracture injury. An mFI-5 ≥1 was additionally predictive of increased readmission rates. Smoking increased risk of surgical site infections specifically but not overall complications. Newer frailty indices (mFI-5 and mCCI) predicted adverse postsurgical events more strongly than several historic risk proxies, offering potential utility as risk predictors during surgical planning. Further research should continue to clarify their predictive value.

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A Dose-Dependent Relationship Between Periorbital Steroid Use and Infectious Complications in Fronto-Orbital Advancement

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Purpose: Steroid infiltration has been advocated in craniofacial surgery to reduce postoperative facial swelling and shorten convalescence following fronto-orbital advancement (FOA) [1]. However, there is no consensus on the dosage or method of administration due to conflicting evidence regarding their efficacy and the complications associated with their use [1]. This study aims to evaluate the outcomes associated with two different techniques of periorbital steroid administration in fronto-orbital advancement at two high volume craniofacial centers.

Materials and Methods: A multi-institutional retrospective chart review of patients who underwent their index FOA between 2012 and 2021 was completed. All procedures were performed by one of five senior surgeons (R.A.H., C.B.B., J.A.T, S.P.B, J.W.S) in conjunction with a pediatric neurosurgeon. Patients were divided into three cohorts based on method of periorbital steroid administration. Groups GEL and INJ represent those who received steroids in the form of gelfoam saturated with triamcinolone (10 mg/mL) applied directly to the frontal bandeau prior to skin closure or direct injection of a dilute solution of triamcinolone (120 micrograms/mL) into the frontal/periorbital region prior to surgery respectively. Included infections involved the wound site and required return to clinic, hospital readmission for antibiotics, and/or return to the operating room for washout. Group NON represents patients who did not receive any periorbital steroids. Statistical outliers were excluded from analyses. Significance between outcome measures was determined using one-way ANOVA or chi-square test, with appropriate post-hoc testing. Variables predictive of infectious complications were explored using multiple logistic regression.

Results: Four hundred and twelve patients were included in our sample, of whom 249 (60.4%) belonged to the INJ group, 87 (21.1%) belonged to the GEL group, and 76 (18.4%) belonged to the NON group. There was no significant difference between cohorts in age or weight at surgery. Patients in the INJ group had a significantly higher ASA class (2.4 vs. 2.1 vs. 2.1, $p < .001$). Furthermore, patients in the NON group were significantly more likely to be syndromic ($p < .001$) and multisuture ($p < .001$). Patients in the INJ group had a significantly shorter operative time than both the GEL and NON groups, as well as less blood loss, and less total volume transfused ($p < .001$ for all). The infectious rates for each cohort were NON: 2.6%, INJ: 4.4%, and GEL: 10.3%. There was no significant difference between groups in hospital length of stay ($p = .654$) or rate of postoperative infectious complications, although the latter trended towards significance ($p = .061$). Regression revealed increased ASA class (adjusted OR = 2.995, $p = .016$) and increased length of stay (adjusted OR = 1.015, $p = .011$) as independent predictors of increased infectious complications.

Conclusions: Controlling for between-groups differences, ASA class and hospital length of stay were independent predictors of infectious complications. Furthermore, a dose dependent relationship between periorbital triamcinolone and rate of infectious complications emerged.

Careful consideration of the value of periorbital steroids in FOA is indicated given the lack of evident benefit and potential risk of infectious complications.

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The Impact of elevated BMI on Outcomes in Patients Undergoing Free Flap Reconstruction of The Head and Neck Region

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Background: The purpose of this study is to explore the association of surgical and medical outcomes with the elevated BMI (BMI ≥ 25)

Methods: All patients who underwent head and neck reconstruction with free tissue transfer from September 2019 to September 2021 in a tertiary center were included in this study. Data were collected from a prospectively held database. The cohort was divided into two groups based on BMI cut-off point twenty-five. The study outcomes were surgical or medical complications during hospitalization, total flap compromise, and partial flap compromise. Surgical complications and quality of life on follow-up after discharge were also compared. Medical complications recorded were venous thromboembolism, pneumonia, cardiac event, delirium, and stroke, while the surgical complication included hematoma, neck cellulitis, salivary leak, purulent neck infection, and any donor or recipient site complication.

Results: 304 patients were included. Out of those (n=175, 57.57%) patients had a BMI ≥ 25. The mean follow-up was 2.38 ± 3.97 months from the index surgery. The total and partial flap compromise rates were similar between the two groups (n=5, 2.94% vs. n=4, 3.25%, p=1.000) and (n=7, 4.12% vs. n=6, 4.88%, p=0.75), respectively. The medical complications within hospitalization were significantly higher in those with BMI ≥ 25 (n=37, 22.56% vs. n=15, 12.4%, p=0.028), however, the surgical complications within hospitalization were similar between the two groups (n=42, 24.85% vs. n=30, 24%, p=0.86). Interestingly, patients with BMI

< 25 showed significantly higher rates of transfusion intraoperatively (n=11, 6.43% vs. n=21, 17.36%, p=0.003).

Conclusions: The association between elevated BMI (≥25) and developing medical complications was significant. However, overall flap partial compromise, flap total compromise, surgical complication rates within hospitalization were similar. Patients with BMI < 25 had increased rates of intraoperative transfusion.

A Comprehensive Review of Orthognathic Surgery: Fixation, Relapse, and Complications

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Purpose: This study aims to investigate all available papers on orthognathic fixation to better understand changes in operative techniques and fixation materials and to better compare relapse and complication rates.

Materials and Methods: A PubMed search was conducted of "orthognathic" AND "fixation" in the title or abstract between 1989 and 2020. Reviewers extracted only objective variables explicitly discussed in each study to minimize risk of bias. Absent data was noted for each study. Two fixed-effects meta-analyses were conducted: mean difference for the continuous variable of relapse, and risk ratio for the binary variable of infection.

Results: Study Selection and Characteristics: Three reviewers independently screened 439 papers and extracted data from 166 included papers. The number of papers published has increased over time: 30 papers between 1989-2000, 39 papers between 2001-2010, and 97 papers between 2011-2020. Most papers included a retrospective cohort study (n = 86; 51.8%), followed by prospective cohort (54; 32.5%), randomized clinical trial (n = 12; 7.2%), retrospective case series (n = 8; 4.8%), and prospective case series (6; 3.6%). Sample size information was included in 163 (98.2%) studies; median n was 43 (IQR 25-98).

Operations: LeFort I operations were described in 96 (57.8%) studies, SSRO in 118 (71.1%), IVRO in 21 (12.7%), and genioplasty in 25 (15.1%). The skeletal deformity treated was Class III in 52 (31.3%) papers, Class II in 28 (16.9%).

Fixation Materials: Among papers discussing maxillary fixation, titanium miniplates and screws were most commonly used (n = 65; 39.2%), followed by resorbable plates and screws (n = 10; 6.0%) papers, and CAD/CAM fixation materials (n = 9; 5.4%). Among papers discussing mandibular fixation, titanium miniplates and screws were most commonly used (n = 67; 40.3%), followed by bicortical screws (49; 29.5%), resorbable miniplates and screws (n = 10; 6.0%), hybrid miniplate and bicortical screws (n = 9; 5.4%), CAD/CAM fixation materials (4; 2.4%), and resorbable miniplates with monocortical and bicortical screws (n = 3; 1.8%).

Relapse: Detailed relapse information was recorded in 30 papers, across LeFort, SSRO, and IVRO operations and multiple fixation materials. Of these studies, skeletal relapse was measured until 1-year follow-up in 12 (40%) studies, followed by 8 at 6-months (26.7%), 2 at 2-years (6.7%), and 8 with a range of "latest follow-up" (26.7%).

Complications: Detailed complication information was reported in 33 papers. Data for reference is available for overall infection rates, as well as comparisons in titanium vs. resorbable, LeFort vs. SSRO, and miniplates vs. PSI for multiple complications including infection, plate removal, hardware loosening/breakage, plate exposure, malocclusion, temporomandibular joint (TMJ) dysfunction, nerve dysfunction, re-operation, and sinusitis. Meta-analysis revealed a significantly higher infection rate in SSRO vs. LeFort (p = 0.003).

Conclusion: This review represents the most comprehensive dataset on global fixation methods to date. This study finds a prominent mandibular focus in the literature, the dominance of titanium fixation, and the growing contingent of CAD/CAM academic interest. Meta-analysis of 1815 patients across five studies finds significantly higher complication rates in SSRO compared to LeFort operations.

Life After Facial Injury: Establishing the Need for Comprehensive Multidisciplinary Facial Trauma Management

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Objective: Comprehensive facial trauma care includes treatment for acquired appearance-related differences, functional deficits, and psychosocial support. The aim of this study was to analyze the patient-reported need for longitudinal multidisciplinary care, to establish a quantitative metric

of patient-reported outcomes for comparison, and to formulate a blueprint for a team-based medical home for the facial trauma patient.

Methods: A prospective IRB-approved analysis of an institutional trauma database was conducted. Inclusion criteria were age ≥ 18 at the time of injury and either admission for facial injuries or an injury that required surgical correction between January 2018 - July 2020 (prior to the inception of the Life After Facial Injury program). Patients were surveyed using the "Life After Facial Injury" Outcome Measure (LAFIOM) which combined components of the FACE-Q instrument. The LAFIOM consists of 8 independently functioning scales divided into 3 broader assessment categories: appearance related, functional and psychosocial. Utilizing the published conversion tables, the raw scores were transformed to scales of 0-100, summed and scaled per category, and combined to make an overall score from 0-300, with higher scores indicating better patient outcomes. Patient reported needs assessment for multidisciplinary evaluation was also queried. LAFIOM scores and patient-reported needs assessment were correlated with gender, age (<65 vs □65), injury mechanism (violent vs nonviolent), and Facial Abbreviated Injury Scale. Descriptive and inferential statistics were run, including Shapiro-Wilk test of normality and □2 analysis.

Results: Ninety-two subjects completed the survey (from a database of five hundred, after exclusion and loss to follow-up). Fifty-four percent reported need for ongoing multidisciplinary care. Of these, 78.6% had a scaled functional score as their lowest category in the LAFIOM. 14.3% had appearance as their lowest scored category and 7.1% had scored lowest in the psychosocial category. The LAFIOM was found to have a normal distribution, with a p-value of 0.74 on a Shapiro-Wilk test of normality. LAFIOM and patient reported needs assessment were found to be independent of gender (p = 0.41, 0.9, respectively), age (p = 0.40, 0.54), mechanism (p = 0.4, 0.11) and severity of injury bias (p = 0.4, 0.08). Based on survey results, a multidisciplinary team comprising of CMF surgery, neurosurgery, oculoplastic, ophthalmology, psychiatry, neuropsychology/concussion medicine, dentistry/ orthodontics, social work, and a patient-peer provider was established. The LAFIOM is used at all patient encounters for prospective comparison with traditional care controls.

Conclusions: Facial trauma is not an acute disease but a chronic disease of acute onset. Patients report a need for longitudinal multidisciplinary care. The concept of a Life After Facial Injury Program is to provide comprehensive multidisciplinary patient management that combines acute trauma care with secondary management of established facial deformities and unites patients with psychosocial care and support services. A robust patient-reported measurement tool, the LAFIOM, described herein, is pivotal to establishing this as a new standard compared to traditional management.

A Meta-Analysis of Surgery Versus Corticosteroids for the Treatment of Traumatic Optic Nerve Compression

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Purpose: Evidence-based guidelines in the management of traumatic optic nerve compression (TONC) are lacking. This study aims to evaluate the literature on clinical outcomes following the management of TONC with observation, systemic corticosteroid therapy, and surgical intervention.

Methods and Materials: A systematic review and meta-analysis were performed to test the null hypothesis of no difference in clinical outcomes in surgical decompression versus corticosteroids versus observation for the treatment of TONC. The primary outcome variables encompassed improvement in visual acuity. Additionally, early (within 7 days) versus delayed treatment (7 days <) were compared when utilizing the combination of surgery with corticosteroids. The PubMed, EMBASE, Cochrane Library, Elsevier text mining tool database, and clinicaltrials.gov trial registries were accessed until 2016. The quality of evidence was determined using Grading of Recommendations Assessment, Development, and Evaluation (GRADE) methodology. The quality of evidence was downgraded due to risk of bias and imprecision in specific outcomes in observational studies.

Results: In total, fifty-one articles met inclusion criteria, including 4 meta-analyses, 1 systematic review, 3 randomized controlled trials (RCTs), 1 controlled International Optic Nerve Trauma Study, and 42 case series publications. Corticosteroid therapy significantly improved visual acuity compared to observation (Peto OR 2.7 (1.5;4.9) NNT 4(2;9)) (95% CI). Similarly, surgical decompression was more likely to improve visual acuity compared to observation (Peto OR 4.1 (1.4;12.6)) (95% CI). Early treatment (within 7 days) with surgical decompression and corticosteroids improved visual acuity compared to delayed treatment (Peto OR 6.0 (1.9;19.4) NNT 2 (5;1)) (95% CI). With regard to surgical decompression versus corticosteroid treatment, no difference was seen in clinical outcomes (Peto OR 1.4 (0.9;2.1)) (95% CI).

Conclusion: Meta-analysis of high-level and low-level evidence suggests surgical decompression and corticosteroid therapy both significantly improve visual acuity compared to observation alone. However, there was no difference seen in effect on visual acuity between corticosteroids and surgery. Early treatment (within 7 days) with the combination of these modalities is significantly more likely to yield optimal clinical outcomes compared with delayed treatment. Of course, each treatment modality is patient specific. Future high evidence studies may further reflect differences in objective clinical outcomes between specific surgical techniques.

A Novel Tool in the Craniofacial Surgeon Armamentarium for Ectropion Correction in Syndromic Patients: Micro-Mitek Assisted Lateral Canthopexy

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Introduction: Eyelids are affected in up to 96% of patients with Treacher Collins Syndrome (TCS). Surgical techniques have been reported to address the associated antimongoloid palpebral fissure, coloboma combined with ectropion and canthal dystopia. The results of such techniques have been historically poor. The senior author operates in an adult Level I Trauma Center and a pediatric craniofacial center. Subsequently, the senior author has considerable experience using anchored Mitek sutures for hand trauma for many years and in craniofacial trauma as well as craniofacial oncologic reconstruction. In our series, anchored Mitek sutures have been used in 198 such cases (Micro-Mitek: 159 cases and Mini-Mitek: 39 cases) between 2010 and 2021 in the above-mentioned centers based on a review of our database. According to an in-depth literature review, we are among the first to utilize this technique for TCS syndromic patients. We herein present this novel application of Micro-Mitek in craniofacial surgery with 6 canthopexies, on 3 patients with abnormal syndromic lower eyelids classic anomalies: colobomas, ectropion and bony defect (cleft 5-6-7 Tessier Classification).

Methods: Three cases of Micro-Mitek (micro Quickanchor Plus©) assisted lateral canthopexy in the TCS population are presented along with an in depth description of our craniofacial surgical technique.

Results: No short or long-term complications were noted in any of our three cases– 6 canthopexies. Pre- and Post-operative radiological and photographic documentation will be presented (Plain radiograph, CT-Scan, and 3D reconstructions) to describe the technical details of the use of Micro-Mitek even with the usual Treacher Collins syndromic bony cleft. In regards to the patient with the longest follow-up (8 years), the procedure has removed the visual periorbital stigmata of the TCS, and the result has since been stable. The patient is very satisfied, and with an improved self-esteem of his appearance to have become a professional singer.

Conclusion: According to our in-depth literature review, this is the first clinical report of assisted Micro-Mitek canthopexies solution for this difficult problem of congenital ectropion/eyelid deformity in Treacher Collins patients in the craniofacial surgery/plastic surgery literature. We hope that it will benefit other patients in the future as an improved new surgical technique in the less than satisfactory other surgical options for syndromic ectropion.

Coverage Gaps and Inconsistencies: The Landscape of Insurance Coverage for Orthognathic Surgery in the US

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Background: Orthognathic surgery is routinely performed for a number of indications, including malocclusion, skeletal facial deformities, masticatory or speech dysfunction, temporomandibular joint dysfunction (TMJD), sleep apnea and airway defects, congenital or developmental abnormalities, and psychological or aesthetic reasons. However, insurance coverage of orthognathic surgery is historically highly inconsistent from an internal coverage criteria perspective and carries significant documentation and appeals process burden. No literature exists that examines the insurance coverage landscape of orthognathic surgery within the US.

Methods: The top fifty health insurance providers in the US were selected using the National Association of Insurance Commissioners (NAIC) 2020 Market Share Report. The top 3 health insurance providers per state were included, to ensure appropriate geographic coverage. Coverage policies for orthognathic surgery were obtained from insurers' websites. When policies were unavailable, the insurer was contacted via phone and email for additional information. Insurers were categorized into three groups: "covered with preauthorization", "covered on a case-by-case basis", and "explicitly excluded". Coverage policies and relevant indications and criteria were compared to the American Association of Oral and Maxillofacial Surgeons (AAOMF) "Criteria for Orthognathic Surgery" recommendations.

Results: Of the sixty-five insurance providers identified, 33 were classed as "covered with preauthorization", 24 as "case-by-case", and 8 explicitly excluded orthognathic surgery. Five insurers refused to furnish coverage criteria without a member ID. One insurer's coverage information was internally inconsistent, stating that orthognathic surgery was always excluded regardless of indication or criteria, but was covered for certain criteria.

For the insurers reviewed, five covered orthognathic surgery regardless of indication or criteria, and 4 guaranteed coverage by CPT code. With regard to malocclusion criteria by defined measurement, 20 insurers used at least 75% of the AAOMF malocclusion measurements, only 8 insurers used the exact set as coverage criteria, 4 used a set of looser requirements, and 4 used stricter measurements. Fifteen insurers covered orthognathic surgery for the indication of temporomandibular joint disorder (TMJD), while fourteen insurers excluded coverage for TMJD. While eleven insurers covered orthognathic surgery for "any congenital or syndromic condition", thirteen insurers covered orthognathic surgery when related to cleft lip or palate-associated abnormalities, and eight insurers only covered orthognathic surgery for specific named congenital disorders. Surgery for speech abnormalities was covered by twenty-one insurers and

excluded by four insurers. Although sleep apnea was covered by eighteen insurers, five different criteria existed; 3 insurers excluded sleep apnea. No insurance insurer covered orthognathic surgery for aesthetic or psychological reasons.

Conclusions: Orthognathic surgery coverage by US insurance companies is highly variable. Access to information is difficult, with significant differences across insurance providers regarding coverage, strictness of coverage criteria, covered indications, and exclusions. Coverage indications and criteria frequently do not match the AAOMF recommendations. The authors encourage surgeons to advocate for consistent coverage indications and criteria across insurance providers.

Hand Abstracts

Refining Treatment Strategies in Patients with Fingertip Wounds and End-Stage Renal Disease

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Purpose: Individuals with End-Stage Renal Disease (ESRD) and fingertip wounds are at high risk for poor wound healing, ultimately requiring amputations. Current paradigms reserve amputation as a last resort for those who fail medical and nonoperative measures. However, minimal guidelines exist in best management of ESRD patients. Optimal performance of upper extremity amputation (UEA) in ESRD patients is important to decrease complications and minimize the number of operative procedures needed. This study evaluated outcomes of UEA in patients with ESRD and described risk factors predisposing patients to complications.

Methods: A 5-year retrospective analysis was conducted of 132 patients receiving UEA for non-traumatic fingertip wounds between February 2017 and February 2021. Acutely infected or purulent wounds were excluded. Of these, 26 patients had ESRD, and 106 were nonrenal disease controls. Patient characteristics and clinical endpoints were analyzed between groups. Postoperative complications collected included wound dehiscence, infection, need for additional amputation, and all-cause mortality. Sub-analysis of ESRD patients was conducted to characterize operative course and predictors of complications.

Results: ESRD patients were older than controls (63 SD13 vs 51 SD16) and had higher rates of

comorbid vascular disease (81% vs 21%) and diabetes (92% vs 18%). There was no difference in prior smoking history between ESRD patients (53%) and controls (51%), or other comorbidities collected. Arterial calcification was radiographically apparent in 73% of ESRD patient's vs 5.2% of controls. Subgroup analysis demonstrated patients with age greater than 65 did not have significantly higher complication rates (48% vs 42%, p= 0.5). Compared to controls, ESRD patients required more amputations (1.81 vs 1.34, p<0.001) and total operations (5.19 vs 3.04, p<0.001) to achieve wound healing. ESRD patients experienced higher rates of postoperative complications (85% vs 31%, p<0.001). ESRD patients had higher rates of amputation at, or proximal to, the MCPJ (66% vs 9.4%) to achieve a healed wound. Within ESRD patients, average time from first mention of a wound to operative intervention was 77 days SD70 days. Predictors for complications among ESRD patients were comorbid diabetes (OR 45 [1.7-1226.9]), vascular disease (OR 30 [2-441.8]), arterial calcification (OR 18 [1.56-207.5]) and having a hemodialysis shunt in the affected arm (OR 18 [1.56-207.5]). Within ESRD patients, initial amputation at, or proximal to, the MCPJ led to fewer amputations (1.2 vs 2.19, p=0.04) and fewer total operative procedures (4.1 vs 6.6, p=0.03), compared to those who underwent an initial amputation distal to the MCPJ.

Conclusion: ESRD UEA patients had higher complication rates, requiring a greater number of, and more proximal amputations, as compared to controls. Conservative treatment gives time for progression of ischemia. The healing ability for patients in the ESRD population with fingertip wounds is significantly different from patients with normal vascular supply. ESRD patients with comorbid vascular disease, diabetes, or a long smoking history should receive prompt surgical consult and vascular exams. If poor perfusion, arterial calcification, or vascular steal are demonstrated, early operative intervention in the form of a single well-planned amputation may allow for more expedient wound healing.

Targeted Muscle Reinnervation and Regenerative Peripheral Nerve Interfaces versus Standard Management in the Treatment of Limb Amputation: A Systematic Review and Meta-Analysis

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Introduction: Painful neuromas are a common postoperative complication of limb amputation often treated with secondary reinnervation. Surgical reinnervation includes Targeted Muscle Reinnervation (TMR) and Regenerative Peripheral Nerve Interface (RPNI), and can be primary or secondary. The aim of this review is to assess the effects of primary TMR/RPNI at the time of limb amputation on the incidence and intensity of post-operative neuroma and pain.

Methods: This review was registered a priori on PROSPERO (CRD42021264360). A search of the following databases was performed in June 2021: Medline, EMBASE, and CENTRAL. Unpublished trials were searched using clinicaltrials.gov. All randomized and non-randomized studies assessing amputation with a reinnervation strategy (TMR, RPNI) were included. Outcomes evaluated included the incidences of painful neuroma, phantom limb pain (PLP), residual limb pain (RLP), as well as severity of pain, and Pain intensity, behavior, and interference (PROMIS).

Results: Eleven studies were included in this systematic review, and five observational studies for quantitative synthesis. Observational study evidence suggests that TMR/RPNI results in a statistically significant reduction in incidence, pain scores, and PROMIS scores of PLP and RLP. Decreased incidence of neuromas favored primary TMR/RPNI, but this did not achieve statistical significance (p=0.07). Included studies had moderate to critical risk of bias.

Conclusion: The observational data suggests that primary TMR/RPNI reduces incidence, pain scores, and PROMIS scores of PLP and RLP. Going forward, randomized trials are warranted to evaluate this research question, particularly to improve the certainty of evidence.

Tailored Skin Flaps for Hand Reconstruction

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Introduction: Soft tissue defects can be a result of different types of traumas, infections, tumor resection, or burns. The evolution of the design and types of flaps have optimized the reconstruction and nowadays is important to not only achieve functional but also aesthetic results. Different from the dorsal skin, which is thin, pliable, and designed for mobility, the palmar surface has a specialized glabrous skin that is firmly tethered to the underlying fibrous framework, which makes it relatively immobile, which explains the use of other flaps than local ones. Based on our flaps experience, the goal of this study is to provide a model for treating a wide variety of skin defects in the hands.

Materials and Methods: We conducted a retrospective study from February 2019 until December 2021 which included all patients who had undergone a skin flap to hand reconstruction from the senior author L.T. as a surgeon. There were no exclusion criteria. Patients' medical records were reviewed and included patients' demographics, smoking status, presence of risk factors, type of trauma, flap reconstruction, its dimensions, reoperations, operative time, ischemia time, and long-term complications.

Results: A total of 99 patients underwent skin flaps reconstruction for hand trauma. The mean age was 43,9 (range 38,3 – 49,5) with 87,9% of male patients, follow-up was range 1 – 30

months, 90,9% were free flaps and the rest were pedicle flaps (3% being propeller flap). The preferred choice was the great toe pulp flap (44%), proximal ulnar perforator flap (PUPF) 10,1%, anterolateral flap (ALT) 7,1% the superficial circumflex iliac artery perforator flap (SCIP) 6,1%; medial sural artery perforator flap (MSAP) 5,1% and medial plantar flap 5,1%. Trauma was the most common reason for hand reconstruction (88.9%), followed by infection. The median surface area of the defects was 101,2 cm2 (± 92 SD). The surgical time mean of the intervention was 257,8 minutes (± 95,2 ED) with a mean of 62,1 minutes (± 22,7 SD) for ischemia time. The successful flap rate was 98,9%, with 7% of minor complications.

Conclusions: When planning a hand reconstruction, it is vital to ensure that the outcomes are not only functional but also aesthetic, with minimum donor site morbidity. In this research, we showed that a variety of flaps can be applied to achieve the goal of replacing like with like, but the final decision should be made after comprehending the defect and the patient's preferences.

The Importance of the "Like with Like" Dogma: Reconstruction of Fingertips (Defects) With Great Toe Pulp Flap

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Objectives: Since its description, the great toe pulp flap has been a viable option for hand reconstruction, following the primary reconstructive principle of replacing like with like. This study shows the clinical outcomes of great toe pulp flaps performed without nerve suture, mainly for fingertips defects reconstruction.

Materials and Methods: We conducted a retrospective study from May 2019 until October 2021 including all patients who undergone great toe pulp flap fingertips reconstruction from a single surgeon L.T. in the Reconstructive Microsurgery Service, University Department of Hand Surgery and Rehabilitation in Multimedica Hospital Milan, Italy. From a surgical standpoint, all flaps were harvested using dorsal incisions, avoiding the sole of the foot, and no nerve suture was performed at the recipient site. During a minimum 3-months follow-up period, functional and aesthetic outcomes were retrospectively assessed by analyzing both subjective (PROMs such as the Mitchigan Hand Outcome Questionnaire, the pain Visual Analog Score, and the Cold Intolerance Severity Score) and objective parameters (static 2-point discrimination test and active and passive range of motion). Donor site morbidity was also assessed.

Results: The great toe pulp flap was used to reconstruct all of the fingers, particularly the dominant hand's first two fingers. All the 37 flaps survived completely. Due to COVID restriction, tests and PROMs could not be performed and submitted to all patients, but only to 27 of them. The injured finger's average static two-point discrimination score was 9.41 mm (4.14 mm in the opposite finger). In our series, partial recovery of sensitivity was achieved only in the

case of extensive finger traumas (average 2pd score 11.5 mm). The recovery of discriminative sensitivity in solely soft tissue injuries, on the other hand, was clearly better (average 2pd score 6.41 mm) and comparable to the results obtained with the nerve suture documented in the literature. In every section of the Mitchigan Hand Outcome Questionnaire, all patients expressed high level of satisfaction with the reconstruction's function and aesthetics.

Conclusions: This study shows that the great toe pulp flap is the optimal choice for fingertips reconstruction, providing excellent functional and aesthetic results, with durable and glabrous skin, satisfactory pulp contour and sensory restoration, and no need for nerve suture.

Effectiveness of Local Anesthetics for Postoperative Pain Management in Elective Hand Surgery: A Systematic Review

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Background: In light of the narcotic abuse epidemic, recent studies champion the benefits of local anesthetics as an effective, non-opioid post-operative pain management strategy in elective hand surgery. Lidocaine with epinephrine remains the most commonly used but more studies are exploring postoperative pain levels between differing local anesthetics. This systematic review compares the effectiveness of various local anesthetics and adjuvants in post-operative pain management following elective hand surgery.

Methods: Two independent reviewers conducted a systematic review of PubMed/MEDLINE, EMBASE and Web of Science from 2001 to 2021. Studies using regional nerve blocks and intravenous opioid anesthesia were excluded from this study. Studies using local anesthesia with documented postoperative pain scores using the Visual Analogue Scale (VAS) . Mean morphine equivalents (MME) were averaged based on reported values in the respective study. Results were analyzed using descriptive statistics.

Results: Twenty-one studies, 1455 patients, were analyzed. The most used compounds among patients were lidocaine epinephrine (73.1%), lidocaine epinephrine augmented with bicarbonate (12.8%), and bupivacaine (11.5%). Other anesthetics used were liposomal bupivacaine (1.73%) and ropivacaine (0.6 %). The combination of lidocaine or bupivacaine with topical thrombin yielded better pain control immediately post-operatively (VAS 0.25 and 0.57, respectively) compared to each anesthetic alone (VAS 3.03 and 3.8, respectively). The addition of thrombin to

local anesthesia was similarly more effective at 2 hours post-operatively. At 12 hours, ropivacaine showed the best pain control with an average VAS of 1.84, compared to lidocaine (VAS 4.27) or bupivacaine (VAS 2.6).On post-operative days 1 and 3, lidocaine-based anesthetics showed the most effective pain control (VAS 2.94, VAS 2.02 respectively) compared to bupivacaine (VAS 5.1, VAS 3.6) and liposomal bupivacaine (VAS 6.1, VAS 2.8).However, use of bupivacaine had the lower post-operative opioid consumption with an average of 45.91mg compared to lidocaine (79.92mg).

Conclusion: Local anesthesia provides good pain management in patients receiving elective hand surgery. The use of bupivacaine showed reduced post-operative opioid consumption. The addition of topical thrombin to lidocaine or bupivacaine was the most effective for immediate post-operative pain control. Local anesthetics show good promise in optimizing post-operative pain control and further research is warranted into adjuncts that may augment their analgesic effects.

Times Have Changed: The Rapid Evolution of Hand Trauma Since the 1980s and the Peculiar Influence of a Global Pandemic on the Nature of Hand Injuries and Subsequent Care

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Purpose: Hand injuries are amongst the most common injuries seen in emergency departments each year. The purpose of this study is to determine if/how hand trauma has evolved in the past three decades and in the setting of COVID-19. We hypothesize that improved consumer safety regulations, decreased labor-intensive occupations, changes in access to care, and the impact of a global pandemic amongst other variables have significantly influenced the mechanisms and treatment of hand injuries between the 1980s,2010s(pre-COVID) and 2020s(post-COVID).1-3

Methods: A retrospective review was performed at the only Level I trauma center in Mississippi, identifying all hand trauma consultations between 2014-2016 and 2020-2021 compared to aggregated prospective data from the same institution in 1989 including mechanism/type of injury, surgery rate, referral route, presentation time, and follow-up.

Results: Significantly fewer hand consultations presented in 2014-2016 and 2020-2021 compared to 1989 (285&207 versus 979,p=0.001). Car accidents and gunshots increased in 2014-2016 and 2020-2021 vs 1989(p<0.001); industrial injuries decreased (p<0.001). The spectrum of bites and recreational injuries remained constant (p=0.13-0.71). Crush injuries were increased in recent cohorts (p<0.001), correlating with increased bony injuries and operative fixation and amputations (10.3%,39%,28%,p<0.001). Referrals are more frequently presenting from the ER versus other settings (37%,85%,99%,p=<0.001). Follow-up has improved (53%,54%,79%,p<0.001).

Pre-Covid versus post-Covid, there were increases in car accidents, gunshots, falls, and crush injuries (p<0.001). Post-COVID patients experienced fewer delays in treatment and improved post-hospital follow-up (p=<0.001).

Summary: The nature of hand trauma has changed significantly over the past three decades as well as between the pre-Covid/post-Covid periods raising interesting questions about the impact of consumer protection, workforce safety/demands, and a global pandemic and resultant economic strain on the specialty. Increased numbers of cars and greater access to firearms might have increased rates of high energy trauma whereas burn and industrial injuries have decreased potentially secondary to improved safety efforts and decreased factory labor. Significant increases in soft-tissue loss injuries coupled with fewer required OR interventions likely reflect present OR capacity limitations favoring bedside procedures. Hand surgery consultations are almost exclusively via ER now, where these previously accounted for only 37% of referrals, raising interesting questions about the influence of insurance coverage and access to primary vs tertiary care. Despite increases in tertiary trauma observed post-COVID, time to treatment and follow-up has improved. Highlighting the evolution of hand trauma over time and significant global circumstances helps us to better characterize the nature and presentation of hand injuries and care in our field.

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Procedural Success and Patient Satisfaction after Brachial Plexus Block for Hand and Upper Extremity Procedure in Obese Population: Secondary Analysis of a Randomized Controlled Trial

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Background: Brachial plexus block for hand and upper extremity procedures in the obese presents a unique set of technical challenges. The authors examined how obesity determines procedural success and quality of anesthesia, and patient satisfaction.

Methods: Secondary analysis of a randomized control trial comparing the retro clavicular versus supraclavicular brachial plexus block for distal upper extremity surgery was conducted. Patients were randomized to supraclavicular or retro clavicular brachial plexus block groups in the original trial. The authors dichotomized patients by obesity and performed a stratified analysis of procedural success, quality of anesthesia, complication, opioid requirement, and patient satisfaction.

Results: Sixteen of one hundred and seventeen patients were obese, 13.7%. The groups were statistically well balanced in terms of baseline and operative variables. Obese patients had increased imaging time 2.7 minutes 95% confidence interval, CI (1.44-3.92) versus 1.9 minutes 95% CI (1.64-2.16), p value=0.05, needling time 6.6 minutes 95% CI (5.17-7.95) versus 5.8 minutes 95% CI (5.04-5.74), p=0.02, and procedure time 9.3 minutes 95% CI (7.04-11.46) versus 7.3 minutes 95% CI (6.79-7.79), p=0.01. Block success and complications were not statistically significant. The visual analog scores during the block, at 2 hours, and 24 hours after were not statistically different. Patient satisfaction score among obese patients was 9.1, 95% CI (8.6-9.6) versus 9.2, 95% CI (9.1-9.4), p=0.63.

Conclusions: Despite an increased procedure difficulty, the use of brachial plexus blocks is associated with equivalent quality of anesthesia, similar complication profile, equal opioid requirements, and similar patient satisfaction in the obese.

Implementation of Fast-Track Hand Surgery to Improve Efficiency and Patient Satisfaction

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Purpose: A quality issue identified was frequent cancellations or postponements of smaller hand surgical cases to accommodate larger/more emergent cases in a resource limited operating schedule. The challenge was to develop a multidisciplinary system highlighting the efficiency and safety of performing a high volume of minor hand surgeries in a public hospital setting.

Methods: A committee comprising faculty, residents, nursing, anesthesia, environmental services, and hospital administration was charged with a plan to implement an additional operating room to be used one day per week solely for "fast-track" hand surgery. The criteria include that the surgery is appropriate for regional peripheral nerve block prior to entering the operating room, tourniquet time under 45 minutes, efficient, safe, and protocoled room turnover, and significantly reduced time for recovery from anesthesia.
Forty patients underwent hand surgery through the new "fast-track" process at a public hospital from March to September 2021. Surgeries included but were not limited to carpal tunnel release, trigger finger release, ganglion cyst excision, and de Quervain's release.

Results: Average in-OR time per case and room turnover was one hour and five minutes as compared to two hours and fifteen minutes before the implementation of "fast-track" protocol and oversight. This marks a significant reduction in case time of 52%.
40 cases were successfully done during the seven-month period using the "fast-track" room as compared to 23 cases prior to "fast-track" during a similar period of time. This marks a significant increase in case volume of 74%.
There were no complications seen in the "fast-track" patients.

Conclusions: Justification for an additional weekly operating room and staffing was presented to hospital administration and enacted. Efficient utilization of resources was achieved resulting in a higher volume of appropriate cases brought to the operating room, fewer cancellations, and increased patient satisfaction. An operating room systems approach based on efficiency and safety ensures cooperation between nursing, anesthesia, environmental services, and hospital administration to implement a "fast-track" process.

Illuminating the Proximal Phalanx: Revisiting Osseous Perfusion by Micro-Computed Tomography

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Purpose: This study sought to characterize the intraosseous and extraosseous arterial perfusion of the proximal phalanx using micro-computed tomography angiography (micro-CTA).

Methods: Eight cadaveric upper extremities were injected with a barium sulfate/gelatin suspension. Proximal phalanges were dissected and imaged at 30 μm per voxel using micro-

CTA. Specimens were analyzed with a focus on osseous vascular anatomy and distribution. Endosteal and periosteal blood supply were characterized by length, anatomic course, and caliber.

Results: The base of the phalanx had a significantly greater number (8.0±3.5) of periosteal vessels than the shaft (4.1±1.6) and head (1.3±1.1, $p<0.001$) (Figures 1 and 2), with 34% (11/32) demonstrating an absence of periosteal vessels to the head. A nutrient endosteal vessel was noted in 100% of specimens. Entering at the junction of the middle and distal third of the bone, this nutrient vessel branched into proximal and distal extensions towards the diaphysis and phalangeal head respectively. The index finger nutrient vessel consistently entered P1 along its ulnar aspect (8/8 specimens). In the middle finger it more commonly entered the digit along its radial aspect (6 of 8) while the ring finger more commonly demonstrated an ulnar nutrient vessel (5 of 8). The small finger nutrient vessel was more often found along its radial aspect (7 of 8).

Conclusions: Periosteal contributions to the perfusion of the proximal phalanx gradually diminish distally. The endosteal vascular anatomy is consistent, with a single diaphyseal nutrient vessel entering with reliable laterality on each digit. This vessel is often the only vessel supplying the head of the proximal phalanx, making this area particularly susceptible to vascular disruption. An understanding of the perfusion of the proximal phalanx can inform several pathologies as well as guide treatment and prognostication.

Demystifying Targeted Muscle Reinnervation: A Systematic Review of Recommended Nerve Transfers

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Introduction/Background: Despite inspiring improvements in post-amputation pain and prosthetic control, targeted muscle reinnervation (TMR) continues to be underutilized.1 While some consistency exists for recommended nerve transfers, there is no well-defined consensus and can thus lead to confusion for the reconstructive surgeon seeking to provide optimal amputation and neuroma care. This review explores the target muscle options for nerve transfers in TMR, clarifies reasoning for specific transfer options, and assists the surgeon in selecting convenient nerve transfers based on location and situation.

Methods: A systematic review of the literature was performed to collect all reports describing nerve transfers in the upper extremity. The Medical Subject Headings terms included the following keywords and phrases: [("targeted reinnervation" or "nerve transfer") and ("amputation" or "amputee" or "neuroma" or "phantom")]. The preference was directed towards original studies presenting surgical techniques and coaptations utilized in TMR. Original reports

of new cases were selected for full review. Anatomic studies with recommendations for ideal target muscles were also included for full review. The authors' experience was systematized and incorporated into the analysis.

Results: A total of 507 articles were collected in the literature search. Abstract review identified 195 discussing TMR. Further refinement resulted in 34 original reports of TMR at one or more amputation levels meeting criteria for inclusion. A comprehensive list of transfers reported for all peripheral nerves at each amputation level were included in tables specific to anatomic region: glenohumeral, transhumeral, transradial, transfemoral and transtibial. Ideal nerve transfers were suggested based on convenience of location and the frequency with which certain coaptations were reported. Cross-sectional schematics of each amputation level depicting the recommended nerve transfers were also created.

Conclusion: TMR is a novel surgical technique that has revolutionized management of amputation-related pain and myoelectric prostheses. It should be considered by all surgeons performing an amputation, given these benefits. The present study explores the numerous options available but reminds the surgeon that essentially any functionless muscle can be considered an adequate recipient target for nerves in a residual limb. In the patient with neuroma pain and an intact extremity, the chosen target must have a redundant function to justify its denervation. Numerous transfers have been successfully performed at all levels, but specific recipient motor branch recipients are favored in each region. The improvement in pain is consistent among recipient muscles, but more superficial options are favorable for greater cutaneous electrode detection for powering myoelectric prostheses.

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Syndactyly Recurrence after Surgical Release in Harlequin Ichthyosis

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Purpose: To present a recurrence of syndactyly after surgical release in a patient with Harlequins Ichthyosis.

Introduction: Harlequins Ichthyosis (HI) is a rare congenital skin disorder resulting from a mutation in the ABCA12 gene which is integral in epidermal differentiation1. The irregular

differentiation results in rapid epidermal turnover and the phenotypic presentation of HI which includes perinatal digital necrosis and syndactyly. The disease was historically lethal; however, improved neonatal care and oral retinoids now extend patients' lives into adulthood.2 There is a paucity of data on the surgical management of Syndactyly in the HI population.

Methods (Case Report): A 3-year-old right hand dominant female with HI presented with bilateral incomplete, simple syndactyly of all webspace's, hyperkeratotic skin and ulnar deviation of the hand resulting in limited hand function. The patient had a history of digital, wrist and ankle escharotomies on her first day of life for digital ischemia, which preserved all digits. A release of the 2nd and 4thwebspace with adjacent tissue transfer and dermal substitute placement was performed. A non-adherent dressing was fashioned to bolster the skin substitute and was removed within 5 days of surgery to allow the patient to resume her normal skin care regimen. Reforming of syndactyly was apparent at 6-weeks postoperatively with full recurrence of syndactyly at the 4-month postoperative visit.

Conclusions: Surgical management of the extremities in the HI population seems to include two timepoints – early fasciotomies to release constricting bands and a later operation to address syndactyly. The recurrence is likely due to the nature of HI rather than the surgical technique. A potential revision to the operative technique may include use of skin grafts, which has shown longer term success without recurrence, albeit among limited cases and with donor site complications.3,4 Recent studies have shown that synthetic skin substitutes yield comparable outcomes to skin grafting among pediatric syndactyly repairs, which we adopted to minimize donor site morbidity.5 Additional options include using the patient's predilection for skin growth to close the wound by secondary intention. Non-operative alternatives consist of occupational therapy and continuation of retinoids to reduce joint contracture, however non-surgical management will be unlikely to reduce the syndactyly.

Our case suggests a high likelihood of recurrence may be observed and thus should be readily discussed with caregivers prior to attempting surgical release of syndactyly in patients with HI.

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Is Time Truly of the Essence? Outcomes of Open Distal Radius Fracture Management

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Background: The standard of care of open distal radius fractures is urgent irrigation and debridement along with operative fixation. Herein, we investigate if open distal radius fractures (ODRF) treated after 24 hours from time of injury have an increased risk of infection or overall complication profile compared to open distal radius fractures treated urgently.

Methods: An IRB-approved retrospective chart review was performed of all patients treated for ODRF over a 6-year period at an academic institution in a large metropolitan city. Post-operative complications included: surgical site infections, need for revision irrigation and debridement, delayed soft tissue healing, loss of reduction, non-union, and malunion. For statistical analyses, nominal data were compared for distributional equality between complication dichotomy via Pearson chi-square or Fisher's exact test depending on sample size distribution. Ordinal data were tested for ordinal association via exact Kendall's tau test. Rank equivalency between complication dichotomy was determined for numeric data via Mann-Whitney U tests. All statistical tests were two-sided with $p<0.05$ considered statistically significant.

Results: Ninety-four patients were treated for ODRF with 62% female and 38% male patients included in the cohort. The mean (SD) age at time of injury was 58.6 (17.41) years. Notably, 28% of patients had a history of smoking. Overall, there were 16 patients (16.8%) with post-operative complications: 2 infections, 8 re-operations, 4 wound healing complications, 2 loss of reductions, 7 non-unions, and 1 malunion. Regarding energy and mechanism of injury, 74.4% had a low energy injury and 26.6% had a high energy injury, and this was not statistically significant for any post-operative complications (0.352). Likewise, age ($p = 0.197$) and fracture grade ($p = 0.068$) were not statistically significant factors for any surgical complications. The overwhelming majority of patients were treated with irrigation, debridement, and ORIF with volar locking plates. The mean (SD) open wound size was 1.6 (1.66) cm, ulnar sided, and did not correlate with any post-operative complications ($p = 0.093$). The mean (SD) time from injury presentation to the ER to the first dose of intravenous antibiotics was 4.7 (14.88) hours, and was not statistically significant for any post-operative complications ($p = 0.186$). The mean (SD) time from presentation to the ER to operative treatment was 19.1 (30.57) hours, and was not statistically significant for the presence of any post-operative complications ($p = 0.092$). There were 11 patients (11.7%) treated greater than 24 hours after presentation to the ER, which was not significantly distinct from those treated prior to 24 hours ($p=1.000$).

Conclusion: Patients with open distal radius fractures treated after 24 hours did not have a greater risk of post-operative complications, including surgical site infections and non-union. Regarding factors that may influence urgent treatment, age, energy and mechanism of injury, and fracture grade were all not statistically significant for any post-operative complications in ODRF management.

Unscheduled Healthcare Contact after Outpatient Surgical Fixation of Distal Radius Fractures: Does the Treatment Facility Matter?

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Purpose: Rates of unscheduled healthcare contact (UHC) following surgical treatment of distal radius fractures vary widely, ranging from 1.75% to 20%.1-3 We hypothesize that UHC after distal radius fracture surgery is more common in patients who are treated at a safety net hospital versus those who have surgery in a university-affiliated facility.

Methods: An IRB-approved retrospective chart review was conducted of all patients who underwent outpatient surgical management of distal radius fractures at a high-volume university-based academic practice from January 2017 to May 2021. Treatment facility was either 1) a local safety net hospital or 2) a university-affiliated hospital or ambulatory surgery center. Patients were included for analysis if they 1) had surgery for a distal radius fracture within 60 days of injury, 2) underwent outpatient surgery, 3) and had no other associated injuries. UHC included telephone calls documented in the electronic medical record (EMR), emergency department (ED) visits, and hospital readmissions within 30 days of surgery. Demographics, comorbidities, injury mechanism, fracture pattern, anesthetic technique, and surgical technique were recorded. Standard univariate analysis was performed to determine any risk factors for UHC.

Results: 438 patients met inclusion criteria. 255 patients (58.2%) were treated at a university-affiliated facility while 183 patients (41.8%) had surgery at a safety net hospital. The overall rate of UHC within thirty days was 13.7% (60/438 patients). The rate of emergency room visits was 5.3% while 10.7% of patients called the nursing help line (there was overlap between groups). There was one readmission. The most common cause of UHC was uncontrolled pain (50/60 patients, 83.3%). UHC occurred more frequently in patients who underwent surgery at a safety net hospital versus those who were treated at a university-affiliated facility (26.2% vs. 4.7%, $p<0.05$). On subgroup analysis of the safety net hospital population, UHC was found to be associated with a history of chronic pain, having any form of medical insurance, and non-Hispanic ethnicity ($p<0.05$). There were no significant associations with UHC in those patients treated at a university-affiliated facility.

Conclusion: Patients who underwent outpatient distal radius fracture surgery at a safety net hospital were five times more likely to have UHC when compared to patients treated at a university-affiliated facility. Safety net hospitals often serve vulnerable populations with limited

healthcare funding. UHC adds additional cost to the healthcare system and may lead to decreased patient satisfaction. Further research is needed to identify risk factors and reduce UHC in this setting.

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Tendon Tensioning in Hand Allotransplantation: Lessons Learned from the First Successful Full Face and Bilateral Hand Transplant

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Purpose: Hand transplantation can restore form and function when conventional reconstruction falls short, but few technical details on tendon tensioning are reported in the literature and improper tensioning may lead to postoperative functional limitations. We report our approach for tendon tensioning at the distal forearm level and present some emerging principles to expand the current understanding of tendon tensioning in hand transplantation.

Methods: The recipient, a 22-year-old right hand-dominant male, sustained an 80% total body surface area burn injury in a motor vehicle accident. Prior to presentation, he underwent more than 30 surgeries including distal digital amputation in both hands, severely limiting his independence and quality of life. Checklists of key steps for the procedure were created, informed by a systematic review of the existing literature. The operative technique was then refined over a series of 11 high-fidelity cadaveric rehearsals. Checklists were revised throughout and finalized prior to transplantation.

Results: Donor and recipient preparation occurred simultaneously, with 21 tendons individually tagged and divided in each hand. The right hand was transplanted first, and after confirmation of adequate perfusion, the left hand. The overall sequence of repairs was wrist extensors, wrist flexors, digital flexors, and digital extensors. A prefabricated positional splint maintained the wrist in 30° extension for wrist extensor repairs. Only superficial digital flexors and extensors were repaired en masse. Two-weave Pulvertaft technique was preferred throughout for its strength. Our approach for individual repairs was to set tension, place a clamp, and suture in the ensuing position. Upon clamp release, tension was assessed via tenodesis and if adequate, the second weave was performed in the usual fashion, but if the repair was loose, we tightened the second weave. Six-month post-transplant functional outcomes reflect substantial improvements, including range of motion, grip strength, Carroll's test (right, 61 vs. 20 pre-transplant; left, 58 vs. 13 pre-transplant), and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire (37 vs. 90 pre-transplant). One-year post-transplant functional outcomes are forthcoming.

Conclusions: Hand transplantation is an evolving practice, but there remains a lack of consensus on tendon tensioning, which is critical to optimize patient outcomes. We describe our approach, its development, and accompanying rationale. It was successfully executed in the context of a full face and bilateral hand transplant. The initial wrist extensor repairs are foundational, and sequential repair of opposing tendon groups facilitates balanced tensioning. Finishing with the digital extensors, which have the shortest excursion, is recommended.

Imaging Modalities for Perinatal Brachial Plexus Palsy: A Systematic Review

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Background: Perinatal brachial plexus palsy (PBPP) has a wide spectrum of clinical symptoms that can range from incomplete paresis to flaccid arm paralysis accompanied by Horner's syndrome and hemidiaphragm paralysis. Despite a high rate of spontaneous recovery within the first two years of life, it remains challenging to determine which patients will benefit most from surgical intervention. The diagnostic and predictive use of imaging modalities such as ultrasound, x-ray myelography (XRM), computed tomography myelography (CTM), and magnetic resonance imaging (MRI) has been described in the literature, but there is little consensus on approach or algorithm. The anatomic, pathophysiological, and neuro-developmental characteristics of the neonatal and infant patient population affected by PBPP necessitate thoughtful consideration prior to selecting an imaging modality.

Methods: A systematic review of English articles published before October 2021 was conducted using PubMed, Embase, Cochrane, Web of Science, Scopus and Clinicaltrials.gov. Search terms included "brachial plexus," "infant," and "diagnostic imaging." Inclusion criteria were: (1) Infants diagnosed with PBPP that underwent radiographic imaging, (2) comparisons of imaging findings against another standard (e.g., surgical findings), and (3) infants managed with either conservative or surgical management. Studies involving infants with brachial plexus injury secondary to cancer, genetic conditions, infection, or non-birth-related trauma were excluded. Two authors independently screened titles, abstracts, and full-text content of articles, and controversies were resolved by discussion or a third reviewer. Primary outcomes included imaging modality, comparator against imaging, and imaging findings. Imaging findings were organized according to pre-ganglionic (e.g., pseudo meningocele, root avulsion) and post-ganglionic nerve injuries (e.g., neuroma, nerve rupture). Ratings of quality of evidence were assigned by two independent raters using GRADE.

Results: Literature search produced 10,329 publications, and 20 articles were included in the final analysis. These studies included 470 patients (51.5% female). Mean age at time of imaging ranged from 2.1 to 12.8 months. Imaging outcomes were compared against surgical findings (16 studies) or clinical examination (4 studies), and 88.3% of patients underwent surgery. US-focused studies (n=4) found post-ganglionic imaging to be consistent with extraforaminal surgical findings (sensitivity 84-89%) but were less reliable for imaging the lower trunk (sensitivity 68%; specificity 40%). One XRM-focused study reported good detection of root avulsion (sensitivity 78%, specificity 40%), although indicators of avulsion on imaging were poorly defined. Among four CTM-focused studies, presence of a pseudo meningocele had a 63-73% sensitivity and 85-96% specificity but may differ depending on level of avulsion. MRI was represented in 16 studies and had a high sensitivity for root avulsion (63-92%) and neuroma (80-100%), and a high specificity for post-ganglionic rupture (99%).

Conclusion: This systematic review addresses the relative strengths and challenges of common radiologic imaging options. MRI is the most sensitive and specific for identifying pre-ganglionic nerve injuries such as pseudo meningoceles and rootlet avulsion, the latter of which has the poorest prognosis and often dictates the need for surgical intervention. However, future prospective work examining the role of early imaging, surgical intervention, and long-term recovery is needed to identify the best course of action for this complex patient population.

Cancer Metastases to the Hand: A Systematic Review and Meta-Analysis

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Background: Metastases to hand or wrist is an unusual presentation and such involvement most often represents advanced disease carrying a sinister prognosis. The purpose of this study is to examine all known cases of acrometastasis to the hand or wrist available in the literature and to analyze demographic trends, metastasis characteristics and clinical course, and provide recommendations for management.

Methods: An online systematic review of MEDLINE, EMBASE, PubMed and The Cochrane Library from inception to January 7, 2021, was completed. Studies outlining the care of a patient with acrometastases of the hand were included. Data extracted included age, sex, site of primary tumor and metastasis, presence of other metastases, time from primary diagnosis to acrometastasis diagnosis, misdiagnosis, treatment, and survival.

Results: Four hundred seventy-seven articles published between 1889 and present met the inclusion criteria. These described 676 cases of acrometastasis to the hand or wrist. The mean age among patients was 59.4 +/- 11.9 years and men were twice as likely to develop an acrometastasis (408:215). The most common primary cancer source was the lung (245, 36.2%), followed by the kidney (77, 11.4%). The distal phalanx of the thumb was the most frequently cited tumor location (80). The most common form of treatment was amputation. Mean survival following diagnosis of acrometastasis was 7.3 +/- 11.5 months.

Conclusion: Acrometastasis remains an uncommon presentation of metastatic disease with poor prognosis. Treatment currently focuses on pain management and optimizing functional outcomes. Our review led to the development of six treatment recommendations.
1. Patients with a history of cancer, particularly of the lung, kidney, breast, colon, or esophagus presenting with a new painful digit should undergo initial imaging with an x-ray +/- a biopsy to rule out acrometastasis.
2. If infection is suspected in a patient with a history of cancer, particularly those listed above, consider obtaining a biopsy of what you culture and culturing what you biopsy.
3. Acrometastasis should be a on the differential diagnosis for patients diagnosed with infection who are unresponsive to treatment, particularly if the patient has significant risk factors for malignancy.
4. In a significant portion of patients with lung metastasis to the hand (58.7%), acrometastasis was the first sign of an occult malignancy. Therefore, patients with risk factors for lung cancer, should be screened for lung cancer if they present with a suspicious finger lesion.
5. The timeline from initial diagnosis of primary to presentation of acrometastasis may benefit clinical decision-making. Acrometastasis of lung, kidney, breast, colorectal and esophageal origin presented a median of 16.5, 55.2, 64.7, 34, and 15 months, respectively, after diagnosis of primary. Many patients are symptomatic far sooner.
6. Treatment of acrometastasis should serve as an adjunct to systematic therapy directed by the primary malignancy. The former should focus on symptom relief and functional status and involve an informed discussion with the patient to decide between amputation, radiation, combination therapy, or conservative management.
7. There has been no superiority shown between aggressive amputation versus amputation to the nearest uninvolved joint. Shared clinical decision-making is prudent.

8. Despite improvements in median survival, acrometastasis carries a grim prognosis and patients should be educated regarding this.

The Unappreciated Morbidity of Brachial Plexus Injuries Following Low Energy Shoulder Trauma: Understanding the Incidence, Risk Factors and Natural History

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Background: Brachial plexus injury (BPI) following low energy shoulder trauma is rare but complicated. The scant literature on this topic has identified these injuries to occur more commonly in older and female patients. This study seeks to determine the incidence of BPI following isolated shoulder trauma, demographics of patients most susceptible to BPIs, and finally to better understand the natural history.

Methods: Following IRB approval, 74 patients with BPI following isolated shoulder trauma were identified. A randomly selected control group of 100 patients who sustained isolated shoulder trauma without BPI was obtained and used for statistical comparison. Basic demographics and injury details were recorded from medical records. Severity of BPI was categorized based on physical exam findings. Descriptive statistics and a student's t-test were used ($p<0.05$).

Results: Incidence of BPI following shoulder trauma was calculated to be 1.2%. The majority of patients who developed a BPI were female (n=40). The mean age was 50.9 years. High energy injuries were noted in 11 patients while low energy injuries were noted in 63 patients. Eleven patients had isolated fractures, 35 patients had isolated dislocations, and 28 patients had concurrent fracture-dislocations. When compared to the control group, patients who sustained a BPI following shoulder trauma did not significantly vary based on age, sex, comorbidities, BMI, smoking status, or energy of injury. The BPI group had significantly more fracture-dislocations than controls (<0.0001) [Table 1]. BPI symptoms were diagnosed approximately one month following shoulder trauma. 47.3% of patients had multiple affected nerves. Regarding the severity of BPI injury, 50% of patients sustained a minimal injury (one partially affected nerve), 19% sustained a moderate injury (two partially affected or one non-functional nerve) and 31% sustained a severe injury (three or more partially affected or two non-functional nerves) [Table 2]. Average time from initial to final evaluation was 10.2 months (range 1.1 - 47.9). Eight patients were lost to follow-up. Five patients underwent surgical intervention for their BPI. Among patients treated non-operatively for their BPI, only 39% of patients fully recovered after an average of 6.7 months (range 1.2 - 27.8). Recovery rate dropped to 28% among severely injured patients.

Conclusion: Incidence of BPI following isolated shoulder trauma is 1.2%. A fracture dislocation of the proximal humerus is more commonly associated with BPI than isolated shoulder dislocations or proximal humerus fractures. About one-third of patients sustain a severe injury and only less than half of patients fully recover.

Phalangeal Fractures: Epidemiology and Gender Differences in Fracture Patterns

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Purpose: Despite the relatively high incidence of phalangeal fractures, there is a limited understanding of the epidemiology and anatomical distribution of these fractures. We aim to describe the patient characteristics, anatomic distribution, and detailed fracture patterns of American adults sustaining phalangeal fractures.

Methods: A retrospective study was performed among patients with phalangeal fractures at two level I trauma centers in the United States (US) between January 2010 and January 2015. Included patients were ≥18 years old and had a diagnosis of a phalangeal fracture, while exclusion criteria were non-traumatic fractures, digital amputations proximal to the distal interphalangeal joint, and the absence of radiographs. A total of 2,140 phalangeal fractures in 1,747 patients were included and a manual chart review was performed to collect epidemiological and radiographic information. Fractures were classified based on location and fracture pattern.

Results: The median age at the time of injury was 45 years (interquartile range: 30-57), and 65% of patients were male. Males sustained a greater proportion of fractures at a younger age and females sustained a greater proportion at an older age. Males suffered sharp injuries, open fractures, and comminuted fractures more frequently than females ($p<0.001$). The small finger had the highest incidence of fractures (26%), followed by the ring finger (24%). Distal and proximal phalanges demonstrated the highest incidence of fractures at 39% each. Shaft fractures were the most common (36%), followed by base fractures (32%), with volar and dorsal base fractures being twice as common as radial or ulnar base fractures. Oblique, transverse, and tuft fractures were the most common fracture types (19%). The dominant hand was affected in 44% of cases. Eighteen percent of fractures were due to a work-related traumatic mechanism, 47% of

fractures were intraarticular, and the most common mechanism of injury was blunt trauma (46%).

Conclusions: This study provides an anatomical distribution of phalangeal fractures and the demographics of patients affected in an adult US population. The peak incidence of phalangeal fractures occurs at different ages in males and females. Males also sustained sharp injuries, open fractures, and comminuted fractures more frequently.

Ultrasound- Guided Collagenase Injection for the Treatment of Refractory Dupuytren Disease: An Accurate and Safe Approach

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Background: Collagenase Clostridium Histolyticum (CCH) injection has gained popularity as a promising non-surgical treatment for Dupuytren contractures (DC). Injection of CCH into pathologic cords decreases tensile strength allowing them be broken during subsequent manipulation 1-3 days following the injection. Although this treatment modality is relatively safe, CCH injection may be associated with adverse outcomes including tendon rupture and compromise of adjacent neurovascular structures. Previous studies have demonstrated clinical benefits of office-based ultrasonography for hand and upper extremity evaluation as well as financial return on investment. In DC, the use of ultrasonography may enhance visualization of cords and nearby neurovascular structures, allowing surgeons an added level of safety. The present study aims to establish the feasibility and outcomes of ultrasound guidance for CCH injection.

Methods: This prospective, observational feasibility study was approved by the University of California San Diego Institutional Review Board and all subjects provided written informed consent. Participants underwent ultrasound-guided CCH injection for the treatment of DC at a single institution between the years 2020-2021. Primary outcomes of interest included reduction in pain, improved functionality, post-procedural complications, and recurrence at most recent follow up.

Results: 9 participants scheduled to receive CCH injection for DC were recruited and underwent ultrasound-guided injection between 2020-2021. The majority (67%) were male with a mean age of 63.5. Two-thirds (6/9) of the subjects had a duration of symptoms of 2 years or less. 67% (6/9) previously attempted treatment, with fasciectomy being the most common (4/6 who previously received treatment). One-third of the subjects (3/9) were on daily pain medications and 56% reported severe pre-procedural functional impairment. The average largest degree of contracture was 58 degrees.

During the procedure, pathologic cords and neuroanatomical structures including ulnar and median nerve branches were visualized in 100% of participants and the mean length of time for procedure was 39 minutes. When subjects returned to clinic 2 days later for manipulation, there were no reported adverse events of side effects aside from small skin tears in 3 patients. The mean follow-up time was 4.6 months and all subjects reported significant improvements in pain and functionality. Only 1/9 reporting any recurrence of symptoms.

Conclusion: CCH injection under ultrasound guidance represents a safe and feasible option to augment treatment of DC in the clinic. Adjunctive utilization of ultrasonography may allow for more precise delivery of CCH treatment while providing the practitioner with valuable information on the neuroanatomical structures and extent of cord fibrosis. Further research in the form of randomized trials appears indicated to quantify the benefit of ultrasound guidance for CCH injection in DC patients.

T Cell Repertoire Diversity in Lymphedema: Investigating the Antigens Driving the T Cell Response

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Background: Lymphedema (LE) is a progressive condition that is estimated to affect as many as 1 in 1000 Americans. The disease is a major cause of decreased quality of life and is characterized by swelling, fibrosis, and recurrent infections. Activation of T-helper (Th) inflammatory responses plays a key role in lymphedema development and has been correlated with disease severity. This activation requires interaction with antigen-presenting cells (APCs), suggesting that the T-cell responses occur in response to antigens that are present in tissues after lymphatic injury. Clonal analysis of these T cell responses is significant due to its potential to uncover a common clonal architecture between patients with the disease. Identification of antigen-responsive T cell clones that are selectively expanded has important implications for developing therapies aimed at a common antigen driving the disease process.

Methods: High throughput sequencing (HTS) of clinical lymphedema and normal tissue DNA was utilized to identify unique T cell clones in lymphedematous tissue. Briefly, genomic DNA (gDNA) was isolated from lymphedematous, and control matched upper limb biopsies of six patients. Deep sequencing of the TCR repertoire was conducted by using a two-step biased controlled multiplex PCR to amplify genes of abundant T cell populations. These clones were quantified and characterized by CDR3 sequence length and TCRB Variable (V) gene usage. Predictive analysis of T cell antigen specificity was performed using the Basic Local Alignment Search Tool (BLAST) of the TCR epitope sequences and the activation of antigen-responsive clones was assessed by Flow cytometry.

Results: Our analysis demonstrated that the T cell responses in lymphedema are oligoclonal. TCR sequencing of the top five abundant clones in lymphedematous and normal tissue biopsies revealed six conserved amino acid sequences at the CDR3 region unique to the lymphedema group, however, no overlap of T cell repertoires was seen between patients with the disease. BLAST analysis of the corresponding TCRB epitope sequence revealed a list of probable antigens corresponding to each unique clonotype. Of the epitope sequences, unique to LE, staphylococcal enterotoxin represented the highest affinity bacterial antigen, pro-insulin corresponded to the representative self-antigen, and gluten peptide corresponded to plant antigen.

Conclusion: Our results show that the T cell response in lymphedema is oligoclonal in nature, similar to what is seen in other inflammatory skin diseases such as atopic dermatitis and cutaneous psoriasis. In addition, clonality infers common antigen specificity of a population of T cells. Here we present representative antigens using BLAST analysis of the unique TCRB sequences of clones detected in lymphedematous tissue. Identification of these T cell populations that are selectively expanded in LE may provide a targeted approach for identifying antigenic stimuli or similarly eliminating pathogenic T cell clones as a means of treating the disease.

The Effects of Obesity and Bariatric Surgery on Rates of Upper Extremity Compression Neuropathies

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Objectives: To estimate the effects of obesity on all types of upper extremity compression neuropathies (UECN) (carpal tunnel syndrome and other median nerve, and ulnar nerve compression neuropathies) and to assess whether bariatric surgery modifies these effects.

Background: UECN are increasingly prevalent and decrease the quality of life of affected individuals. Studies suggest obesity as a risk factor for carpal tunnel syndrome, the most common type of UECN.

Methods: A retrospective cohort study was conducted using the PearlDiver Mariner Database, an all-payor claims database containing claims for over 53 million patients from 2010 to 2019 in all 50 US states. Rates and odds of all types of UECN were compared between 1:1:1 exact matched cohorts of obese patients who were medically managed, obese patients who underwent bariatric surgery, and nonobese patients (111,967 patients in each cohort).

Results: Compared with nonobese patients, patients with obesity were significantly more likely to develop any UECN (odds ratio [OR], 1.13; 95% confidence interval [CI], 1.09-1.18), carpal tunnel syndrome (OR, 1.15; 95% CI 1.10-1.30), and 2 or more UECN (OR, 1.34; 95% CI, 1.20-1.48). Compared with obese patients who were managed medically, obese patients who

underwent bariatric surgery were significantly less likely to develop any UECN (OR, 0.87; 95% CI, 0.84-0.91) and carpal tunnel syndrome (OR, 0.85; 95% CI, 0.81-0.89).

Conclusions: Obese patients have higher odds of both single and concomitant UECN, specifically carpal tunnel syndrome, compared with nonobese patients. Bariatric surgery decreased the odds of developing UECN compared with obese patients not undergoing surgical intervention.

Steroid Injection Quantity and Risk of Surgical Trigger Finger Release: A Dose-Response Relationship

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Hypothesis: This study compares the rates and risk of conversion to surgical intervention in patients with trigger finger treated by 1, 2, or 3 or more steroid injections.

Methods: PearlDiver's all-payor claims database, Mariner-30, was queried to identify patients diagnosed with trigger finger between 2010 and 2019. Multivariate logistic regression models were created, and significant variables were utilized as match criterion to mitigate potential confounding factors. One-to-one exact matching was used to stratify trigger finger patients into four identical groups: 1) patients not receiving steroid injections, 2) those treated with 1 steroid injection, 3) those treated with 2 steroid injections, 4) those treated with 3 or more steroid injections. The primary aim of this study was to assess the rate and risk of conversion to subsequent surgical release within 5-years.

Results: The matched population analyzed in this study consisted of 146,932 patients with trigger finger that were equally represented in 4 cohorts: no steroid injections (n=36,733, 25.00%), 1 steroid injection (n=36,733, 25.00%), 2 steroid injections (n=36,733, 25.00%), and 3 or more steroid injections (n=36,733, 25.00%). A total of 40,591 patients underwent surgical release within our 5-year follow-up period. Rates of surgical intervention were highest in the 3 or more steroid injection (n=13,598, 37.02%) and lowest in the no steroid injection (n=7,339, 19.98%) cohorts. Cox proportional hazard models revealed a dose-response relationship with the risk of conversion to surgical intervention increasing from the 1 injection cohort (hazard ratio (HR) 0.93, 95% confidence interval (CI) 0.90-0.98), no injection cohort (HR 0.96, 95% CI 0.92-0.99), 2 injections (HR 1.08, 95% CI 1.05-1.12), and 3 or more injections (HR 1.44, 95% CI 1.39-1.48).

Conclusion: Patients with trigger finger treated with a single steroid injection had the lowest rate and risk of conversion to surgical release compared to those not receiving steroids and those receiving 2 or more injections. Furthermore, the rates and risk of undergoing surgical release follows a dose-response relationship as the number of steroid injections increases.

Socioeconomic And Demographic Factors Are Associated With Increased Time To Surgery In Outpatient Distal Radius Fracture Surgery

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Purpose: Socioeconomic disparities impact a patient's access to adequate healthcare. The purpose of this study is to investigate the effect of socioeconomic and demographic factors on time to surgery in the treatment of outpatient operative distal radius fractures.

Materials and Methods: Consecutive patients from January 2017 through June 2021 who underwent outpatient fixation of distal radius fracture within a large multi-site academic healthcare system including a county hospital were retrospectively reviewed. Patients undergoing inpatient surgery, patients undergoing surgery >45 days after injury were excluded. Time from injury to surgery was recorded for each patient. The US Census Bureau was used to determine median household income (MHI) for a patient's zip code; patients were stratified into three groups based on MHI ($0 - $49,999, $50,000 - $74,999 and $75,000+). Demographic variables including patient sex, race and insurance status were collected and analyzed.

Results: 413 patients met inclusion criteria. Patients were mostly female (63.2%), and identified as either White (42.6%), African American (38.8%), Hispanic (5.0%), Asian (3.1%), or declined (9.6%). Patients' insurance status included private insurance (47.9%), Medicare (12.2%), Medicaid (9.0%), or uninsured (30.9%). MHI ranged from $20,908 to $194,272. Socioeconomic status was found to be significantly associated with time to surgery (14.7 days in low-SES group, 14.0 days in mid-SES group, and 11.1 days in high-SES group, $p=0.00063$). Time to surgery within the county hospital system was found to be significantly longer than in the university system (16.2 days vs 10.9 days, $p<0.0001$). Insurance status was found to be an additional risk factor for increased time to surgery: 11.7 days for insured vs. 16.3 days for medicaid/uninsured ($p<0.0001$). Self-identified race was found to be significantly associated with time to surgery (non-white group: 15.2 days vs white group: 10.9 days, $p<0.0001$).

Points:

- Lower socioeconomic status, Medicaid or uninsured status, non-white race, and treatment at a county hospital system were significantly associated with increased time to surgery.
- Delay in surgical care of distal radius fractures may lead to increased complexity of treatment and associated cost. Furthermore, increased time to surgery prolongs patient recovery time and increases societal cost due to lost productivity.
- Interventions aimed at reducing healthcare disparity based on demographic, socioeconomic, and insurance factors should be further investigated.

The Effect of Early Active Range of Motion Following Tendon Transfers on Disability and Health Status: A Retrospective Cohort Study

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Purpose: The study aim was to compare the changes in patient-reported disability and health status between patients who underwent Early Active Range of Motion (EAROM) compared to patients who had delayed mobilization.

Methods: A retrospective cohort study design was used to evaluate adult patients treated with a tendon transfer from January 2004 to December 2019. Exclusion criteria were a prior tendon transfer, pediatric patients, upper motor neuron lesions, and a major psychiatric diagnosis. Cohorts were dichotomized based on the start of therapy within 21 days (EAROM) or after 21 days postoperatively. The primary outcome measures were the change in patient-reported disability, measured by the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire, and health status, measured by Short-Form 36 (SF-36). Patients were assessed at baseline, six months, one year and two years following surgery. A Generalized Estimating Equation (GEE) model was used to estimate the effect at the population level after adjusting for age, sex and medical comorbidities.

Results: A total of 141 patients were reviewed for eligibility, and 49 patients completed both the DASH and SF-36 questionnaires. There were 37 (75.5%) participants in the EAROM cohort and 12 (24.5%) participants in the delayed mobilization cohort. The mean age of the participants was 40 years (SD= 16.6), and 18 patients (72%) were males. The majority of the study participants were employed (n=16, 64.0%). EAROM was found to be associated with a slight improvement in disability (beta= -4.5, 95% CI: -15.1 to 6.1, P=0.40). EAROM improved the bodily pain domain by 15.3 points, on average (95% CI: 2.1 to 28.6, P=0.02).

Conclusion: EAROM was associated with an overall improvement in patient-reported health status and the bodily pain domain of SF-36 compared to delayed mobilization following tendon transfers. Economic evaluation studies should compare the two rehabilitation strategies.

The Novel Use of A Nanofiber Hydrogel Composite for Perineural Adhesion Prevention in a Rodent Model

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Introduction: Perineural adhesions can form after any surgical intervention involving peripheral nerves. Adhesion formation may then lead to nerve entrapment and compressive neuropathy, which can result in a wide variety of symptoms ranging from sensory deficits to motor weakness. Previously, we created a novel poly(ε-caprolactone) (PCL) nanofiber/ hyaluronic acid hydrogel composite that was shown to mimic the microarchitecture and mechanical properties of soft tissue extracellular matrix.1 We hypothesize that the use of this novel nanofiber hydrogel composite (NHC) will reduce perineural adhesion formation in a rodent hindlimb model.

Methods: This study was performed with Institutional Animal Care and Use Committee approval. Male Lewis rats underwent bilateral circumferential mechanical irritation of the sciatic nerve to induce adhesion formation with subsequent primary closure. Animals then underwent a secondary neurolysis 8 weeks post-operatively. At the time of neurolysis, the experimental group (n=6) were treated with circumferentially application of NHC around the sciatic nerve before closure and the control group were closed without treatment (n=6). Both groups were sacrificed 8 weeks after their secondary surgery. At the time of euthanasia, all rodents underwent unilateral biomechanical force testing to assess the breaking point of the perineural adhesions surrounding the sciatic nerve (measured in Newtons). In the contralateral limb, the sciatic nerve, surrounding muscle, and NHC in experimental animals was harvested to assess perineural collagen deposition using hematoxylin and eosin (H&E) and Masson's Trichrome staining.

Results: Significant perineural adhesions were visually apparent after sciatic nerve irritation in the control group. In the experimental group, the sciatic nerve was grossly encapsulated by the NHC which closely resembled subcutaneous fat with visible neovascularization. Biomechanical testing demonstrated the average force required to remove the nerve from the wound bed in the experimental group was 2.02±0.43 N. In the control group, the sciatic nerve could not be removed from the wound bed and the average force prior to failure was 2.77±0.18 N. Collagen deposition, a measure of scar formation around the sciatic nerve, was assessed via H&E and MT staining. Minimal collagen deposition was seen in the experimental group compared to control, indicating a decrease in scar formation in the animals treated with perineural application of the NHC.

Conclusion: We found that the use of a novel PCL nanofiber/hyaluronic acid hydrogel composite resulted in a decrease in perineural adhesion and scar formation in a rat model.

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Soong Classification Using X-Rays Only Moderately Correlates with Distal Radius Plate Position on Computed Tomography

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Hypothesis: The Soong classification grades the prominence of volar locking plates used to treat distal radius fractures in relation to the volar rim. The basis of the classification scheme was that increasing plate prominence over the volar rim and distal radius watershed zone would be associated with injuries of the flexor tendons and increased need for plate removal. Recent studies, however, report mixed results on the predictive value of the Soong classification for these outcomes. We hypothesized this misclassification is secondary to a suboptimal correlation between the Soong classification on radiographs (XR) and computed tomography (CT).

Methods: Fifty distal radius fractures treated by volar locking plate, collected from the international collaborative, publicly available ICUC database, were reviewed. All cases with a postoperative XR and CT were included. Soong classification of the volar locking plate to the volar ulnar rim was determined on both modalities by two independent, fellowship-trained hand surgeons, using CT imaging as the gold standard. The distribution of Soong grades on XR and CT was compared using Pearson's chi-square test, and correlation was calculated using the Matthews' correlation coefficient (MCC). A multi-class confusion matrix was used to calculate each grade's positive predictive value (PPV).

Results: The distribution of Soong grades was significantly different when using XR versus CT ($p<0.001$). We found an MCC of 0.65 indicating only moderate correlation between the two modalities. Per individual Soong grade, the PPV was the highest for grade 2 (0.96), with lower PPVs for grade 0 (0.63) and grade 1 (0.60).

Summary Points:

• The Soong classification demonstrates only moderate correlation between grades based on radiograph and CT.
• Although grade 2 was reliably established on both modalities, grades 1 and 0 have a lower positive predictive value when graded using radiographs.
• Radiographs may be less suitable to distinguish between Soong grades 1 and 0, and thus the subsequent risks of volar plate prominence may be underestimated on radiographs compared to CT.
• Further study of the value of postoperative CT imaging in predicting plate-related complications is needed.

Modified Brunelli Pull-Out Technique For Reconstruction Of Flexor Tendons In Zone II

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Background: Reconstructing the continuity of long fingers flexor tendons in zones II and III still raises problems from operative point of view. One of the surgical methods with great success rate for zone II lesions is the pull-out technique described by Brunelli, which moves the tension from the level of the tendon disruption to the finger pulp over the tendon insertion. In this paper we will present the modifications proposed by us for this technique, in the attempt to provide sufficient strength and the importance of early mobilization in obtaining a functional range of motion.

Material and method: The study refers to 91 flexor tendon lesions in zone II operated in 78 patients in our service since the year 2000 until now. In 5 patients more than one finger was affected. Lacking the very long and highly curved needles used by Brunelli, we modified the initial technique by starting from the proximal towards the distal area and used 2 straight needles continuous threads. In addition we incised the digital skin until near the insertion area of flexor digitorum profundus and the suture thread was passed through the tendon in one or more steps to reach the distal end of the tendon. In 62 cases we used non-absorbable sutures that were removed after 21 days, and in 23 cases absorbable sutures, that were only cut after 21 days. In 57 cases the surgical procedure took place under regional anesthesia that allowed the reinforcement of patient's psychological motivation, seeing the favorable results during surgery. The recovery started from the first post-operative day with passive fingers mobilization, and 48 hours after the surgery we initiated the active against-resistance mobilization.

Results: The patients were followed for 3-24 months after the surgery. We obtained a complete flexion in 43 patients; in 16 patients we had a flexion deficit of 5-10 degrees, in 19 patients we had a 10-20 degrees flexion deficit. All the patients were able to resume social life and work in the same place after maximum 45 days. We had one rupture and tenolysis was necessary in only 5 cases (patients with complex traumas).

Conclusions: We consider that the Brunelli' technique is a very good method for zone II lesions and that the modifications proposed by us allow a broadening of its indication's field.

Mini-Propeller Flaps in Fingers Reconstruction

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Purpose: The possibility of harvesting flaps based on digital perforators located at DIPJ was described by Koshima, for covering very distal finger defects. We will demonstrate that it is possible to harvest such flap also more proximal. More, in those cases when the direct closure of the donor site is not possible, a bilobed flap blood supplied by the same perforator vessels can be used.

Methods: We will present the advantages of using these mini flaps based on perforators emerging from the digital arteries, at any level of the fingers, including the thumb. In our service were practiced 45 transposition island perforator flaps for covering tissue defects in fingers, from which 4 were for the thumb. In 2 cases we used the perforator flap as a cross-finger flap, to cover a defect on an adjacent finger. The transposition flaps have an oval shape, are harvested from one side of the finger, without sacrificing the digital artery. After the subfascial undermining of the flap on its entire surface and identification of the vascular pedicle represented only by the perforator, the flap can be rotated 90-180° and can cover dorsal and volar finger defects. The flap's donor site is generally directly closed; if its direct suture is not possible, a free skin graft from the forearm can be used. In the attempt to avoid this disadvantage, we developed a bilobed pedicled flap blood supplied by the same perforator vessels, which allows the donor site closure without any morbidity. This flap was used in 13 cases.

Results: These transposition flaps had an uneventful evolution, with complete integration of the flap and good quality functional recovery. In 2 cases we registered a minute partial superficial necrosis, which spontaneously healed. The bilobed flaps had also an uneventful evolution. The recovery for all the patients was between 14-21 days.

Conclusion: We consider that the perforator island transposition flaps have the advantages of using similar tissues in reconstruction, not damaging another area, they do not require main vessels sacrifice, can be sensate, and the donor site can be generally directly closed. When the direct closure of the donor site cannot be realized; this one can be achieved by using a free skin graft or the bilobed flap as a variant of the perforator flap.

Initial Surgical Management of Phalangeal Fractures: Predictors of Unplanned Reoperation in 904 Fractures

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Purpose: Phalangeal fracture treatment is guided by fracture characteristics; patient needs and surgeon judgment. Surgeons may use knowledge of the risk of post-operative complications, specifically the need for reoperation, to guide clinical decision-making. This study aims to compare characteristics of phalangeal fractures treated with closed reduction and percutaneous pinning (CRPP) with those treated with open reduction and internal fixation (ORIF) and identify risk factors associated with unplanned reoperation.

Methods: A retrospective study was performed among patients with phalangeal fractures at two level I trauma centers between January 2010 and January 2015 to form a cohort of 2,140 phalangeal fractures in 1,747 patients. Demographics, surgical management, and complication details were collected. Bivariate and multivariable statistical analyses were performed to stratify risk associations and identify independent predictors of unplanned reoperation.

Results: A total of 904 fractures were treated with either CRPP (751 fractures, 83%) or ORIF (153 fractures, 17%). Unplanned reoperation occurred in 133 fractures (15%, Table 1). In multivariate analysis, fractures initially treated with ORIF (OR = 1.76, p = 0.035); fractures in the thumb (compared to the index finger, OR = 0.41, p = 0.037); fractures of the proximal phalanx (compared to the middle phalanx, OR = 2.00, p = 0.011), comminuted fractures (OR = 1.69, p = 0.033), and work-related fractures (OR = 1.96, p = 0.031) were found to be independently associated with unplanned reoperation (Table 2).

Conclusion: The use of ORIF as the initial method of repair was independently associated with unplanned reoperation, even after correcting for injury characteristics such as open fractures, comminution, trauma mechanism, and fracture location. The risk of unplanned reoperation also differed between digits and phalanx, with fracture to the thumb being independently associated with decreased risk of reoperation, and fractures to the proximal phalanx being independently associated with an increased risk of unplanned reoperation.

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Patient-Reported and Clinical Outcomes Of Single Vs. Two-Stage Digital Mohs Reconstructions

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Introduction: The management of extensive soft-tissue defects following Mohs resection for skin cancer of the digits remains a challenging task. Two-stage reconstruction with skin substitute and delayed skin grafting may improve post-operative outcomes, but literature comparing these techniques to single-stage reconstruction is lacking. We present a retrospective review of digital reconstruction utilizing these two techniques following Mohs resection at our institution.

Methods: A retrospective review of patients at our institution who received digital reconstruction following Mohs surgery for squamous cell carcinoma, melanoma, and melanonychia between January 2014 to September 2021 was conducted. Patient demographic information, cancer information, peri- and post-operative complications, and re-operations were collected and analyzed. Complications included infection, seroma, hematoma, dehiscence, cyst formation, nail spicule, contracture, necrosis, graft failure, and need for secondary amputation. Patients were contacted to complete the PROMIS Upper Extremity patient-reported outcome instrument post-operatively. An intention-to-treat paradigm was used for analysis.

Results: Forty-nine patients with 50 reconstructions met inclusion criteria. Twenty-three reconstructions were single-stage (46%), and 27 reconstructions were two-stage (54%). There were no differences in preoperative demographics or comorbidities between those who had single or two-stage reconstructions. On presentation, those with disrupted periosteum were more likely to have two-stage reconstruction ($p < 0.05$). Those with two-stage reconstruction also had greater variance in their post-Mohs defect size at presentation ($p < 0.05$). Overall, there was no difference in postoperative complications or reoperations between patients who received single-stage reconstruction or two-stage reconstruction (22.7% vs. 16.7%). Analyzing patient-level factors, patients who were current smokers had a greater risk of postoperative contracture than non-smokers or former smokers ($p<0.05$). 32 patients completed a post-operative PROMIS

Upper Extremity survey (single-stage = 15, two-stage = 17). There was no difference in mean PROMIS T-scores between those who had single-stage vs. two-stage reconstructions. Patients with hypertension had worse postoperative PROMIS T-scores compared to those who did not ($p < 0.05$).

Conclusion: Treatment with either single-stage reconstruction with skin graft or two-stage reconstruction using skin substitute appear to be equivalent in terms of complications, reoperations, and quality-of-life outcomes. However, two-stage reconstruction is used for more complicated defects. Patient-specific factors need to be taken into account, as current smokers and those with hypertension have poorer outcomes following reconstruction.

Sustained Agrin Nanoparticle Delivery Ameliorates Effects of Denervation and Preserves Neuromuscular Junction Morphology After Peripheral Nerve Injury

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Purpose: One of the most critical factors contributing to poor outcomes after peripheral nerve injury is the prolonged period of latency prior to reinnervation. Acetylcholine receptors (AChRs) within denervated muscle rapidly destabilize and consequently degrade neuromuscular junctions (NMJs); thereby limiting meaningful functional motor recovery. Agrin, a proteoglycan essential to NMJ formation and AChR aggregation, may have an essential role in preserving NMJ receptivity to reinnervation. This study aimed to (1) assess the efficacy of nanoparticle (NP) encapsulated agrin in preserving denervated NMJs over free agrin and (2) establish the optimal dosage schedule for sustained release.

Methods: (1) The effects of locally delivered agrin-NPs on denervated muscle were assessed in a rat tibial nerve transection-without-repair model. Lewis-Norway rats were injected with low,

medium, or high doses of agrin-NPs incorporated into a nanofiber-hyaluronic acid hydrogel composite (NHC) gel, empty-NPs within NHC, free agrin, or saline. After 6 weeks, animals were sacrificed and the soleus, lateral and medial gastrocnemius muscles were harvested for analysis. (2) Using the same model, Lewis-Norway rats were injected with the medium dose agrin-NPs within NHC, free agrin, empty-NPs within NHC, or saline at the time of denervation. Animals were then sacrificed at 3, 6, 9, and 12 weeks.

Results: (1) Agrin-NP treated animals retained significantly greater NMJ pretzel-like morphology after 6 weeks of denervation compared to free agrin and empty-NP groups with optimal benefit achieved by the medium dose (35.0% vs 23.1% free agrin, 35.0% vs 7.1% empty-NP; $p<0.0001$). Furthermore, both medium and high dose Agrin-NP treated animals demonstrated significantly lower NMJ plaque-like morphology than free agrin treated animals ($p<0.0001$). NMJ morphology of medium dose Agrin-NP treated animals were not significantly different than sham animals, suggesting optimal benefit was achieved at the medium dose. All Agrin-NP treated animals retained greater agrin levels in the soleus muscle as compared to free agrin-treated animals and endogenous agrin levels in sham animals at 6 weeks ($p<0.001$). Agrin levels were undetectable in serum at all Agrin-NP doses. No significant differences were seen in myofibril cross-sectional area between Agrin-NP, free agrin, and empty-NP groups. No foreign body response was detected in empty-NP or Agrin-NP treated animals. (2) Agrin-NP treated animals retained greater agrin levels in the soleus muscle as compared to free agrin-treated animals at all endpoints. Agrin levels in muscle remained above the EC50 in the 6-week endpoint Agrin-NP treated animals whereas 9-week endpoint Agrin-NP treated animals fell below the EC50, suggesting an optimal dosage schedule of 6 weeks. Furthermore, NMJ morphology of Agrin-NP treated animals were not significantly different than sham animals at 6 weeks while a decline in pretzel-like NMJ morphology was seen at the 9-week endpoint.

Conclusion: Encapsulation of bioactive agrin with sustained release for over 70 days was achieved. Agrin-NP treatment in vivo limits neuromuscular junction degradation during denervation and thereby has potential as a therapeutic target to improve motor functional recovery.

Money Talks: A Discrete Choice Experiment on Patient Preference for Wrist Fracture

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Background: Value-based care is described as providing optimal patient health outcomes at the lowest possible cost. Examples of associated indirect costs include time off from work, loss of pay, caregiver expenses, cost to society, and physical functional limitations. The aims of this study are to develop and evaluate a DCE designed to evaluate patient willingness-to-pay (WTP) more to decrease the length of cast immobilization, time to return to work, and the number of follow-up clinic visits for treatment of a hypothetical wrist fracture.

Methods: A DCE was designed to ask participants to choose between two treatment options for a theoretical wrist fracture which would result in the same final outcomes based on their personal preferences. Each choice set contained one of the following 3 levels for 4 attributes.

- Cost: $250, $1000, or $2500
- Length of Cast Immobilization: 2, 4, or 8 weeks
- Time to Return to Work: 2, 4, or 8 weeks
- Number of Follow-Up Clinic Visits: 2, 4 or 6 visits

A total of 16 choice sets, 15 unique sets with one repeated set to test response variation, was generated using the SAS JMP Pro "Choice Design" tool to optimize experimental design efficiency. A Qualtrics survey was designed to include the choice sets in random order, as well as questions to evaluate possible explanatory variables. A total of 250 participants were recruited to complete the survey using Amazon Mechanical Turk (MTurk), an online crowdsourcing platform.

Analyses involved calculating normalized change in preference and normalized relative importance to individual attributes. To compare cost to non-monetary attributes, monetary values were calculated using a conditional logit model which assigned a value per incremental value of each attribute.

Results: Findings from the 244 included participants showed cost as the primary factor driving patient decision making (n=244). Normalized relative importance value was highest for cost 10.00 (n=244). Cost was followed by 1.92 for return to work (n=244), 1.41 for duration of cast immobilization (n=244), and 0.08 for follow-up visits (n=244). Monetary conversion of non-monetary attributes indicated length of cast immobilization with the lowest value ($-89.48, $p<0.004$).

Conclusions: When presented alongside the following treatment factors-cast duration, return to work time, and follow-up visits participants tend to primarily choose the lower cost option. Participant data suggested return to work time as the next most important factor. Apart from cost, the lowest calculated monetary value was length of cast immobilization, indicating it as the most unfavorable non-monetary choice with each incremental increase.

Does Trapeziectomy Reduce the Risk of Carpal Tunnel Syndrome?

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Hypothesis: Because a trapeziectomy partially releases the transverse carpal ligament, it was hypothesized that patients undergoing unilateral trapeziectomy will be less likely to develop subsequent carpal tunnel syndrome (CTS) in the operative hand than the non-operative hand.

Methods: A retrospective chart review of patients undergoing unilateral trapeziectomy, regardless of technique, over a 20-year period at an academic medical center was conducted to identify patients who subsequently received a CTS diagnosis or underwent carpal tunnel release (CTR) following trapeziectomy in their operative hand compared to their non-operative hand as a control. Patients with a history of prior CTR were excluded. A follow-up questionnaire was distributed to help identify those with undiagnosed CTS symptoms or CTR performed elsewhere. Chi-square tests were performed.

Results: 298 patients meeting inclusion criteria underwent trapeziectomy with or without suspensionplasty (Table 1 and 2) during the study period. Based on chart review and the follow-up questionnaire, 21 patients (7%) subsequently developed CTS in their operative hand and 33 (11.1%) in their non-operative hand ($p = 0.087$). Four patients (1.3%) underwent subsequent CTR on their operative hand compared to 8 (2.7%) on their nonoperative hand (0.239). Of 40 patients reporting CTS symptoms preoperatively, 35 (87.5%) reported improvement post-operatively.

Conclusions: Trapeziectomy may improve pre-existing carpal tunnel symptoms but does not significantly reduce the risk of subsequently developing carpal tunnel syndrome (CTS). Higher rates of diabetes, thyroid disorders, and obesity in the study group, all of which have been associated with increased rates of CTS,1 may have impacted the rates of post-trapeziectomy CTS. Patients with thumb carpometacarpal arthritis may have a predilection for carpal tunnel syndrome compared to the general population,2 even after trapeziectomy, and should be counseled accordingly.

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Management and Outcomes of Thoracic Outlet Syndrome in The Pediatric Population

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Background: Thoracic Outlet Syndrome (TOS) in the pediatric population has only recently been recognized. Given the lack of accepted diagnostic criteria and consensus regarding the optimal management of pediatric patients with TOS, we aim to assess the outcomes from both operative and non-operative treatment of pediatric patients.

Methods: A retrospective chart review of patients diagnosed with TOS who were seen between January 2010 and January 2022 was conducted. Data collected include demographics, classification of TOS, surgical information, imaging records, and therapy reports. Pre- and postoperative evaluation of TOS include symptoms, provocative testing (i.e. Roos', Wright's, and Adson's tests), participation in sport or upper extremity activities, need for additional surgery, and any surgical complications.

Results: Ninety-eight patients (71 females and 27 males) with an average age at onset of 15.435 years were seen between January 2010 and January 2022 with signs and symptoms consistent with TOS. TOS etiology was determined as 31 neurogenic, 28 neurogenic and vasculogenic, 22 vasculogenic, and 17 Paget-Schroetter Syndrome. 88.77% (87/91) patients received diagnostic advanced imaging (Chest MR Angiogram or CT scan). 37 patients were excluded due to less than 6 months of follow up.

Of the remaining patients, 5 (4 bilateral TOS, 1 unilateral TOS) underwent nonoperative management with activity modification and physical therapy only while 56 patients (39 bilateral TOS, 17 unilateral TOS) underwent operative management. A total of 88 operations were performed. Of these, 30 patients had a double crush injury and required pectoralis minor release in addition to first rib resection/scalenectomy while 3 patients had a triple crush injury and required additional release of the cubital tunnel.

Average length of postoperative care was 436.04 days (14.53 months). Operative complications include lymphoceles (2), lymphatic leak (1), thermal lung injury (1), pleural tear (3), pneumonia (1), subclavian vein injury (2). Two patients required chest tube placement.

Positive preoperative provocative maneuvers were found to be 76.08% (35/46 patients) for Roos', 84.78% (39/46 patients) for Wright's, and 59.52% (25/42) for Adson's. Positive postoperative provocative maneuvers were found to be 21.42% (9/42 patients) for Roos', 0% (0/46 patients) for Wright's, and 0% (0/41) for Adson's. For patients with 6 months follow up, return to preoperative activity was seen in 81.57% (31/38 patients).

Conclusions: TOS is most likely to affect young athletes and individuals-especially females-who perform repetitive overhead movements. Few patients in this cohort were successfully managed with nonoperative interventions including activity modification and physical therapy. In pediatric patients requiring surgical intervention, first or cervical rib resection with scalenectomy via supraclavicular approach provided resolution of symptoms with 81.57% of patients able to return to pre-symptom activity level. Operative complications and subsequent operations are rare but possible and we recommend that this surgery should only be performed by experienced surgeons.

Analysis of Complications in the Setting of Corticosteroid Injection for Patients with Carpometacarpal Joint Arthritis

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Hypothesis: We hypothesize that rates of preprocedural complications are increased in patients with the following medical comorbidities: diabetes, hyperlipidemia, hypertension, osteoarthritis, and male gender, following a corticosteroid injection (CSI) for the treatment of carpometacarpal (CMC) joint arthritis.

Methods: The commercially available database, PearlDiverTM, was queried for all patients with a CMC joint arthritis diagnosis between 2010 and 2020 using the International Classification of Diseases (ICD) 9 and 10 codes. The study population was determined by isolating patients who had received a CSI after their CMC arthritis diagnosis and they were tracked for 3 months post-injection. Patients were further categorized based on the following preprocedural risk factors: diabetes, hyperlipidemia, hypertension, osteoarthritis, and male gender. A logistic regression was performed to identify an association between the comorbidities and postoperative complications.

Results: 88,253 patients with CMC joint arthritis received a CSI and were tracked for 3 months post-injection. Overall, the rates of each complication (infection, cellulitis, osteomyelitis, and debridement) were less than 1%. Of those, patients with diabetes (OR 1.45, 95% CI: 1.39-1.51), hyperlipidemia (OR 1.16, 95% CI: 1.1-1.22), hypertension (OR 1.62, 95% CI: 1.53-1.72), osteoarthritis (OR 1.59, 95% CI: 1.47-1.71), and male gender (OR 1.06, 95% CI: 1.02-1.11) were associated with an increased risk for post-injection cellulitis and abscess ($p = 0.003$). When evaluating for preprocedural risk factors leading to debridement following CSI, patients with pre-existing hypertension (OR 2.04, 95% CI: 1.8-2.31) and osteoarthritis (OR 2.07, 95% CI:

1.77-2.45) were two times more likely to have a subsequent debridement compared to those without these comorbidities ($p < 0.0001$).

Conclusion: CSIs are commonly used in conjunction with other non-operative treatments, such as splinting and hand therapy, for patients with CMC joint arthritis. Patients with underlying comorbidities, most notably diabetes and hypertension, were associated with an increased risk of developing a post-injection complication in our study. However, this significant association must be clinically correlated in the setting of generally minimal rates of post-injection complications. Potential benefits of symptomatic relief may outweigh the increased risk of subsequent complications. Our study highlights the increased risk for developing cellulitis or need for debridement in patients with an underlying comorbidity following a CSI in treating CMC joint arthritis, in the setting of low overall complication rates, which can be used to guide clinical practice recommendations.

Characterizing the Impact of the COVID-19 Pandemic on Flexor Tendon Repair Incidence and Acute Surgical Outcomes: A NSQIP Study

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Purpose: Flexor tendon rupture is a common hand injury requiring surgical repair. Possible delay to surgical care and worse patient outcomes are presumed consequences of the COVID-19 pandemic. The aim of our study was to compare the incidence of flexor tendon repair and subsequent outcomes during the COVID-19 pandemic compared to pre-pandemic years. We hypothesize that there were no differences in complications for patients undergoing repair during the COVID-19 pandemic compared to pre-pandemic.

Methods: A retrospective study of flexor tendon repair patients from 2016-2020 was conducted using the National Surgical Quality Improvement Project (NSQIP) database. Patients were grouped into COVID-19 pandemic (2nd to 4th quarter of 2020) and pre-pandemic (2016 - 1st quarter of 2020) cohorts. Adjusted multivariable regressions were used to compare delayed repair, operation duration, days to discharge, and wound complications (superficial and deep surgical site infection and dehiscence) during the COVID-19 pandemic period compared to pre-pandemic years. Flexor tendon repair incidence per 100,000 people was calculated by year.

Results: A total of 5,016 patients met inclusion. Of these patients, 61.0% (n=3,061) were male, ,59.8% (n=3,002) were white, and the median age was 44.0 (IQR=29.0 - 59.0). Of the total cohort, 13.7% (n=690) were in the COVID-19 pandemic group. The median length of operation for each group was 70.0 and 76.0 minutes for the pre-pandemic and pandemic groups,

respectively. There was a 10% increase in operation duration in the COVID-19 pandemic group compared to the pre-pandemic cohort (exp(β)=1.10, 95% CI=[1.04 1.17], p=0.002). There was a greater incidence of flexor tendon repairs in 2020 (107.0 per 100,000) compared with preceding years. There was no significant difference after adjustment for confounding in delayed repair (Odds Ratio (OR)=0.86, 95% CI=[0.52 1.12], p=0.163), related return to operating room (β=3.12 days, CI=[-2.70 8.95], p=0.286), wound complications (OR=1.21, CI = [0.56 2.62], p=0.636), or days to superficial infection (β=4.61, CI=[-6.70 15.92], p=0.400).

Conclusion: There was an increased incidence of flexor tendon repairs during the pandemic period compared to the preceding three years. Repairs taking place during the early part of the COVID-19 pandemic were notable for markedly longer length of operation. Despite the pandemic and longer operation time, there were no differences discovered in clinical outcome between pre-pandemic and pandemic groups.

Neurogenic Thoracic Outlet Syndrome: A Systematic Review and Meta-Analysis of Surgical Outcomes

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Background: To date, no surgical approach has been standardized for the management of neurogenic thoracic outlet syndrome (nTOS). While previous investigations have systematically assessed treatments for nTOS, none have done so using well-validated functional and pain outcomes. Thus, it remains unclear whether first rib resection (FRR), done via a supraclavicular (SCFRR) or transaxillary (TAFRR) approach, is necessary for patients with nTOS. Moreover, we hypothesize that rib sparing scalenectomy (RSS) is sufficient for the management of nTOS, without the added morbidity of FRR.

Methods: A systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Data were extracted based on procedure type, and all well-validated outcomes such as Disabilities of the Arm, Shoulder, and Hand (DASH) scores and Cervical Brachial Symptom Questionnaire (CBSQ) scores were analyzed in separate time intervals. Random-effects meta-analysis was then used to combine results from different studies, and Derkash's scores were analyzed separately. Descriptive statistics were also calculated where appropriate.

Results: Our literature search identified 2,009 potential citations published between 1985 and 2021. After duplicate removal, abstract screening, and full-text review, 23 studies remained

meeting inclusion criteria, with 12 discussing SCFRR (N=820), 6 discussing TAFRR (N=485), and 5 discussing RSS (N=720). Preoperative DASH scores were 58.69 [95% confidence interval (CI): 56.68-60.69] for SCFRR (N=722), 56.94 (95% CI: 31.54-82.34) for TAFRR (N=323), and 53.94 (95% CI: 45.04-62.84) for RSS (N=458)-there were no significant differences between these scores. Postoperative DASH scores were similar in RSS at 0-12 months (N=442, 25.2, range: 0-76) when compared to SCFRR (N=467 , 23.04, 95% CI: 5.13-40.95), and less than in TAFRR at 12-24 (N=49, 34.5, SD 21), but not statistically significant due to the limited number of studies that reported these outcomes. CBSQ score was lower in SCFRR at 6 months [22.02 (95% CI: -18.93-62.97)] than in TAFRR at 24+ months [30.96 (95% CI: -10.00-71.92)], but was not statistically significant. Overall, SCFRR had a combined success rate of 100% based on Derkash's score, followed by RSS (97.4%) and TAFRR (87.9%).

Conclusions: Patients undergoing RSS for nTOS may have more favorable outcomes within the first year after surgery than those undergoing TAFRR based on Derkash and DASH scores. However, RSS outcomes are not substantially different from those observed after SCFRR. The treatment for neurogenic thoracic outlet syndrome remains controversial due to the heterogeneity of reported outcome measures in currently published literature.

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Eye Tracking Analysis as A Means Of Evaluating Aesthetic Result Following Ray Amputation: A Pilot Study

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Purpose/Goal: Reconstructive hand surgery has traditionally been focused on restoring function. Hands are noticeable features that can make patients cognizant of their appearance. Despite the significance of hand aesthetics, little is known about observer's subjective perception to ray hand amputation. Current assessment methods evaluate the functional, psychological, and aesthetic outcomes, yet few standardized methods permit an objective evaluation. 1 Eye tracking technology has been employed in prior studies to measure the impact of observer cultural background on gaze patterns for various facial deformities. 3 We used this technology to examine observers' visual attention to ray amputations.

Materials and Methods: We obtained 24 photographs (7) and illustrations (17) of the hand with various ray amputations of the hand. 16 images are bilateral hand side by side with one side ray amputation. In addition, we have 12 images of completely normal hands as control. 40 lay people observers (Average age 41.39, 14-65 y.o., 18 males, 22 females) blinded to the procedure were asked to evaluate each image for symmetry between the hands. An infrared eye-tracking camera continuously recorded their eye movements. Participants were allowed to evaluate each image for 6 seconds. Data was evaluated to determine the percent of time that was devoted to evaluating each portion of the photograph.

Results: In the bilateral hand, the hand with the ray amputation attracts 49.4% (SD 21.87) of the attention, while the missing digit area of the ray attracts 12.9% (SD 15.9). The contralateral hand attracts 19.8% (SD 17.7), and the normal digit attracts 2.6% (SD 6.37). The missing space from the amputation attracts 6.8 times the attention paid to the normal digit ($p<0.01$).
In the normal bilateral control, each hand attracts average 38.2% (SD 20.3) of the attention. For the unilateral hand, the hand attracts 81% (SD 20.17) of the attention, similar to control hand of 80.5% (SD 21.7). The missing ray attracts 14% (SD 15.78) of the attention. The missing index attracts 12.6% % (SD 16.42) of the attention, vs 1.23% (SD 3.9) of the normal index.
The missing long, ring and small attracts 14.07% (SD 14.86%), 13.9% (SD 16.96) and 11.4% (SD 15.5) of the attention, respectively. The normal long, ring and small attracts 1.23% (SD 6.7), 3.03 (SD 7.22), and 3.03 (SD 7.65), respectively.

Summary: We illustrated that the hand with missing digits attracts almost double the attention paid to the contralateral side. The missing ray attracts more than four times the normal digit. There appear to be no significant differences between which digit was involved in the ray amputation. We hope that the utilization of this contemporary tool could serve to achieve more satisfactory and consistent outcomes for all patients.

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Acute Limb Ischemia in COVID-19 Infection: Management and Patient Outcomes

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Introduction: SARS-COVID-19 is classically known as a respiratory illness, however, there is mounting evidence that it is a multi-organ system disease. While the exact mechanisms are unknown, vascular involvement has been clearly described in the literature. Acute limb ischemia has emerged as a significant and debilitating corollary of severe COVID-19 disease. In this study we aimed to delineate the characteristics, management, and clinical outcomes of patients with acute limb ischemia in the setting of COVID-19 infection.

Methods: An IRB approved retrospective chart review evaluated patients admitted to a single institution with lab documented COVID-19 who developed upper extremity ischemia in a 1.5-year period. Chi Square and T-tests were used as appropriate.

Results: 17 participants and 20 extremities were included in this study. 11.8% of patients had no comorbidities, 70.6% of participants had 3 or more. 47.1% of patients died in this study, compared to the institutional COVID-19 mortality rate of 8.3%. Ischemia was more commonly unilateral (82.3%) than bilateral and was associated with an arterial line (88.2%). Of the extremities evaluated with doppler, 15% had signals to all fingers, 30% had absent dopplers in at least one finger, 25% experienced loss of signals in all fingers, and 10% lacked arch signals. All 17 participants were recommended for heat therapy and anticoagulation. 17.6% were not candidates for systemic anticoagulation while 17.6% were already being systemically anticoagulated. Despite intervention, 40% of limbs worsened.

Participants who died were compared to those who survived. Individuals who died were less likely to have digital capillary refill on time of consultation ($p=0.046$). 60% of individuals who died had worsening of their clinical exams, while 100% of individuals who survived improved. Individuals who expired were more likely to have a further loss or lack of improvement of doppler signals ($p=0.01$). Gangrene was more likely in participants who died ($p=0.02$). Individuals who died were more likely to have loss of signals in the arch or all fingers, while those who survived had more distal ischemia ($p=0.034$). Patients who expired had higher D-dimer levels ($p < .001$).

Conclusion: Patients with limb ischemia in this series had a 5.7x higher death rate than the institutional average for all COVID-19. Participants who died were less likely to improve after intervention, have capillary refill, or doppler signals. They were more likely to progress to gangrene and had worse D-Dimer levels than individuals who survived. In this series, acute limb ischemia was an unfavorable prognostic indicator for patients with COVID-19.

Case Series of MRI Neurography Used As A Diagnostic Tool For Neurogenic Thoracic Outlet Syndrome

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Summary: Thoracic outlet syndrome (TOS) refers to a sum of signs and symptoms that arise from compression of the neurovascular bundle that sits within the confined space between the first rib and behind the clavicle, also known as the thoracic outlet space1. Neurogenic TOS (nTOS) is most prevalent (90–98% cases) and the nerve impingement frequently occurs in the interscalene triangle or the costoclavicular space1,2. Often, it is a diagnosis of exclusion in which physicians rely on typical sensory and/or motor symptoms as well as nerve studies such as electromyography (EMG) tests that are sensitive but not specific1.
The purpose of this case series report is to demonstrate that MRI neurography is a useful diagnostic tool to confirm the presence of neurogenic TOS in patients whose nerve studies failed to detect abnormalities in the brachial plexus and surrounding anatomy.

We present a case series of a total of seven patients presenting to the plastic surgery clinic with symptoms suggestive of nTOS in the span of one year. Upon initial encounter with the patients, a thorough history was taken, and a focused physical examination was performed. The underlying cause of each patient's nTOS varied in nature. However, the symptoms they described were almost identical. The patients had persistent upper extremity symptoms such as paresthesias, burning sensation and arm and neck pain. The vast majority had previously been examined and evaluated by other specialists (neurologists, orthopedic surgeons, vascular surgeons etc) prior to being referred to our clinic. In all these seven cases, results in EMG were normal or inconclusive for nTOS, denoting abnormal nerve conduction in the distal upper extremity neural distribution such as mild cubital or Guyon's canal alterations but failed to detect abnormalities in the brachial plexus pathway. MRI neurography radiologic findings proved the presence of nTOS. Surgery was then performed for brachial plexus decompression and/or neurolysis with occasional first rib resection, scalenectomy, pectoralis minor release and targeted muscle reinnervation, relieving most patients from the burden of their disease.

Most patients with nTOS present with pain as the predominant symptom, often without objective physical examination findings and negative or non-conclusive EMG. MRI neurography is an emerging diagnostic tool for high resolution imaging of peripheral nerves. This case series highlights the utility of MRI neurography in evaluating the nTOS with surgical confirmation of the preoperative imaging findings.

Reports in literature support the common diagnosis pathway utilizing EMG, ultrasound, angiography, CT and MRI with or without contrast3. Nonetheless, these diagnostic tools are often insufficient in detecting muscle denervation changes and subtle nerve enlargement or edema4. Our case series demonstrates the power of MRI neurography in confirming the diagnosis of nTOS, allowing for appropriate management of this disease.

Conclusion: In conclusion, patients suffering from symptoms suggestive of nTOS would benefit from MRI neurography as a diagnostic tool. The diagnosis and management of nTOS remains a

clinical challenge which future must emphasize the improvement of available diagnostic and treatment techniques, and the development of a consensus gold standard for diagnosis.

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Outcomes of Functional Muscle Transfer After Oncologic Extremity Resection

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Background: Functional muscle transfer (FMT) can provide wound closure and restore adequate muscle function for patients with oncologic extremity defects. Herein we describe our institutional experience with FMT after oncological resection and provide a systematic review and meta-analysis of the available literature on this uncommon procedure.

Methods: A single-institution retrospective review was performed, including all patients who received FMT after oncological resection from 1990 to 2021. For the systematic review and meta-analysis, PubMed, Cochrane, Medline, and Embase libraries were queried according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines; results were pooled, weighted by study size, and analyzed.

Results: The meta-analysis consisted of seven studies with 70 patients overall, demonstrating a mean MRC score of 3.78 (95% CI, 2.97-4.56; $p < 0.01$). The systematic review included 28 studies with 103 patients. Receipt of adjuvant chemotherapy was associated with significantly lower mean MRC score (3.00 ± 1.35 vs. 3.90 ± 1.36; $p = 0.019$). Seventy-four percent of the patients underwent free FMT, with the most common donor muscle being the latissimus dorsi (55%). The flap loss rate was 0.8%. Neoadjuvant chemotherapy ($p = 0.03$), radiotherapy ($p = 0.05$), pedicled FMTs ($p = 0.01$), and a recipient femoral nerve ($p = 0.02$) were associated with significantly higher complication rates. The institutional retrospective review identified 13 patients who underwent FMT after oncological resection with a median follow-up time of 21

months (range, 6-74 months). The most common tumor necessitating FMT was undifferentiated pleomorphic sarcoma (77%), and the most common donor muscle was the latissimus dorsi (62%). A high body mass index was associated with prolonged neuromuscular recovery ($R = 0.87$, $p = 0.002$).

Conclusion: FMT after oncological resection may contribute to improved extremity function. Careful consideration of risk factors and preoperative planning is imperative for successful FMT outcomes.

Pain and Functional Outcomes Following Targeted Muscle Re-innervation: A Systematic Review

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Introduction: It is estimated that by 2050, a total of 3.6 million patients will be living with an amputation in the United States. Amputees continue to live with multiple difficulties, including chronic pain and limited functions of daily living. Multiple therapeutic strategies have been suggested but most have proven either unsustainable or ineffective. The objective of this systematic review is to evaluate the effect of Targeted Muscle Reinnervation (TMR) on pain and physical functioning in amputees.

Methods: A literature search was performed on PubMed, EMBASE, and Medline from inception and up to the 28th of November 2021. Clinical studies assessing the outcomes of TMR (pain, prosthesis control, life quality, limb function, and disability) were included.

Results: Thirty-nine articles were included. Total patients that underwent TMR were 449 while 716 were controls. Mean follow-up was 25 months. A total of 309 (66%) lower limb and 159 (34%) upper limb amputations took place in the TMR group; the most common being below-knee (39%). The control group included a total of 557 (84%) lower limb and 108 (16%) upper limb amputations; the greatest proportion being below knee amputations in this group as well (54%). Trauma was the most common indication for amputation in both groups. Phantom Limb Pain scores were lower in patients who underwent TMR as compared to control by 10.2 points for intensity (p value .01), 4.67 points for behavior (p value 0.01), and 8.9 points for interference (p value .09). Similarly, Residual Limb Pain measures were lower for cases than controls for intensity, behavior, and interference but failed to reach significance. Neuroma symptoms

occurred less frequently and with less intensity in the TMR cohort. Functional and prosthesis control outcomes improved following TMR in most studies.

Conclusion: The current evidence in the literature suggests that TMR is a promising novel therapeutic strategy for improving pain, prosthesis use, and functional outcomes after major limb amputation.

Prognostic Value of Lunotriquetral Ligament (LT) Injury in the Management of Hamate Arthrosis Lunotriquetral (HALT) Lesion

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Background: HALT lesion is a condition of the proximal pole of hamate arthrosis associated with LT injury, presenting as ulnar-sided wrist pain. The purpose of this study was to evaluate the prevalence of LT injury in patients with HALT lesions, characterize other associated injuries, and determine its prognostic value for functional outcomes.

Methods: This is a single-center, single-surgeon retrospective study. Consecutive patients with HALT lesions treated surgically were included over ten years period. Baseline variables, injury patterns, and functional results were collected from patient charts.

Results: Thirty-nine patients met the inclusion criteria. The LT injury was found in 14 patients (35.9%). Patients with LT injury are similar in terms of age distribution, wrist dominance, and traumatic mechanism, $p>0.05$. Patients in the LT injury group were more likely to be male, 11 (78.6%) versus 11 (44%), $p=0.04$. Concurrent injuries i.e., scapholunate ligament injury, triangular fibrocartilaginous complex injury, and carpal derangement such as Scapholunate Advanced Collapse were statistically similar, $p>0.05$. Functional outcomes such as visual analog pain scores, grip strength, wrist range of motion, return to full work were not statistically different. Mayo wrist scores after the surgical procedure were not statistically different 79 ± 18.2 versus 80 ± 15.2, $p=0.91$.

Conclusions: Contrary to previous reports we have found LT injury is not as commonly involved in HALT lesions. Our study did not find prognostic value of LT injury in determining functional outcomes after surgical management of this condition.

Use Of Questionnaire-Based Research In Hand Surgery

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Introduction: Questionnaire-based research is ubiquitous, and careful survey design is paramount to obtaining meaningful results. Although questionnaires may be powerful research tools, there are numerous methodological pitfalls that can potentially limit the value of their findings. A myriad of validated survey instruments, especially patient-reported outcome measures, have been developed and are commonly used in hand surgery research (1). However, not all research questions may be answered with validated surveys, and non-validated and study-specific questionnaires are often required to answer novel research questions that are outside the scope of existing validated instruments. These non-validated questionnaires are inherently subject to an increased potential for uncertainty and bias (2). Careful survey development and reporting are paramount to obtaining meaningful and generalizable results (3,4). Despite the popularity of questionnaire-based research in hand surgery, to our knowledge no formal systematic review investigating the characteristics of these studies has been reported. This study characterizes the use of questionnaire-based studies in the current hand surgery literature.

Methods: We conducted a systematic review of questionnaire-based studies published between 2010 and 2020 in four major American research journals in which hand surgery articles are frequently published, including Journal of Hand Surgery American Volume (JHS), HAND, Plastic and Reconstructive Surgery (PRS), and Journal of Bone and Joint Surgery American Volume (JBJS). We included studies in which questionnaire results represented a primary outcome. Validation status of the survey instruments was assessed, and topics of study were categorized. Non-validated instruments were assessed for reporting of parameters to limit bias.

Results: Three hundred fifty-four studies were identified, including 186 (52.5%) using validated instruments, 98 (27.7%) using non-validated instruments, 64 (18.1%) using a combination, and 6 (1.7%) that sought to validate an instrument. Of studies that used validated instruments, 84.9% focused on patient-reported outcomes (PROs) and 15.1% focused on other patient-centered topics. In contrast, of studies that used non-validated instruments, 44.9% focused on physician practice, 30.6% were patient-centered, and 13.3% focused on education. A total of 102 non-validated questionnaires were reported in 98 studies. Among non-validated questionnaires, only 26 (25.5%) reported performing pre-distribution pilot testing prior to administering the instrument. The response rate was reported for 68 questionnaires (66.7%). The full text of the questionnaire was available either within the article or in the associated supplemental materials in 52 questionnaires (51.0%), partially available in 12 (11.8%), and not available in 38 (37.2%).

Conclusions: Questionnaire-based research is common within the hand surgery literature, and the number of these studies being published has up-trended over the past 10 years. While a small majority of the studies included in our analysis, used validated instruments, 47.5% used at least some component that was non-validated, including 27.7% that used non-validated instruments exclusively. Clearly, not all research questions can be answered with existing validated questionnaires, and it would be impractical to develop and validate a new questionnaire each time such a question arises. Given these limitations in the scope and applicability of validated instruments, there continues to be a role for the use of non-validated and study-specific instruments. However, the use of a non-validated instrument is inherently more subject to

sources of bias, not only from sample selection and response rate, but also from question and questionnaire design (2). Techniques to limit bias in the design, performance, and reporting of studies based on non-validated surveys were not consistently disclosed across studies in our review. Identified areas for improvement in the reporting of non-validated survey studies include pre-distribution pilot testing to assess for question clarity and absence of bias, publication of survey full texts to improve transparency, and better reporting on sample selection, respondents, and non-respondents.

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Firearm-Related Extremity Nerve Injuries at A Level 1 Trauma Centre

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Hypothesis and Purpose: Extremity trauma resulting from firearms can lead to significant nerve injuries. These injuries have traditionally been conceptualized as "closed injuries", wherein nerve transection (neurotmesis) is less likely and the capacity for spontaneous regeneration is higher and have thus been managed with "watchful waiting." However, misdiagnosis of neurotmetic injuries as lower grade injuries results in treatment delay and poor functional recovery. The purpose of our study was to identify the rate of neurotmetic injuries in extremity firearm traumas at a level 1 trauma centre and assess the trends in management and functional outcomes over time.

Methods: The Sunnybrook Health Sciences Centre trauma and emergency databases were used to identify patients who sustained firearm-related nerve injuries to the upper and lower extremities between January 2000 and January 2020. All patients who had a confirmed nerve injury by physical exam or electrodiagnostic studies were included in the study. Digital nerve injuries and other minor sensory nerve injuries were excluded. Demographic data, injury details, imaging and electrodiagnostic data, treatment plans and functional outcomes were collected.

Results: A total of 1957 patients sustained trauma from firearms, of which 931 patients sustained injuries to the upper or lower extremities. Eighty-six patients (9%) had a confirmed nerve injury in 87 limbs; 62 in the upper extremity (71%) and 25 in the lower extremity (29%). A total of 120 nerves were affected; median (n=21, 18%), ulnar (n=28, 23%), radial (n=29, 24%), sciatic (n=15, 13%) and brachial plexus (n=9, 8%) nerve injuries were most common. The median [interquartile range] duration of time between injury and diagnosis was 0 [0-1] days. Twenty-seven percent (n=26) of nerve injuries were confirmed to be nerve transections. The majority of nerve transactions had associated vascular injuries (n=20, 77%); nerve transaction was associated with a fracture in 9 cases (35%). Diagnosis of neurotmesis was aided by early surgical exploration and targeted nerve imaging. Median [interquartile range] duration of hospitalization and follow-up was 8 [2-12] days and 202 [86-394] days, respectively. Superior functional outcomes correlated with earlier surgical intervention.

Conclusions: Extremity trauma resulting from firearms can result in devastating nerve injuries. Early targeted imaging (ultrasound, MRI) can identify the presence of nerve transection, which warrants early surgical management and improves functional outcomes.

Long Term Outcome of 118 Acute Total Brachial Plexus Injury Patients Using Free Vascularized Ulnar Nerve Graft to Innervate the Median Nerve

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Background: The restoration of finger movement in total brachial plexus injuries is an ultimate challenge. Pedicled VUNG connecting a proximal root to distal target nerves have shown unpredictable outcomes (1) (2). We have modified this technique by harvesting VUNG as a free flap to reinnervate median nerve (MN) and occasionally musculocutaneous nerve (MCN). In situations where there is a lack of donor nerves, coapting to two targets is a plausible option (3). We analyzed the long-term outcomes of these methods.

Methods: 118 acute total brachial plexus patients received free VUNG to innervate the MN. Donor nerves included the ipsilateral C5 root (Ipsi C5: 25 patients) or contralateral C7 root (CC7: 93 patients). Recovery of finger and elbow flexion were evaluated with the modified British Medical Research Council (MRC) muscle grading system. Michigan Hand Score and Quick-DASH were used to represent the patient reported outcomes ≥5 years after the initial surgery.

Results: For finger flexion, Ipsi C5 transfer to MN alone yielded similar outcomes to MN+MCN, while CC7 had significantly better finger flexion when coapted to MN alone than to MN +MCN. Approximately 75% patients were able to achieve finger flexion with nerve transfer

alone. For elbow flexion, best outcome was seen in the Ipsi C5 to MCN and MN, while ICN to MCN was able to reach MRC M3 within the shortest amount of time (24.0 ± 15.3 months).

Conclusion: In acute total BPI, the priority is to identify the Ipsi C5 root to innervate MN and possibly MCN. CC7 is more reliable when used to innervate one target (MN).

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Doxycycline in the Treatment of Cancer-related Lymphedema

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Purpose/background: Secondary lymphedema is a common complication of cancer treatment for which there exist no effective drug treatments. Level I clinical data suggests that doxycycline is effective for treating filariasis-induced lymphedema, decreasing tissue edema and skin abnormalities; however, it is not clear if this treatment is effective for treating cancer-related lymphedema Over the past year, we used doxycycline in an off-label manner in patients with cancer-related secondary lymphedema. The purpose of this report was to retrospectively analyze the efficacy of this treatment.

Methods: Patients who presented to our lymphedema clinic between January 2021 and January 2022 were evaluated, and barring allergies or contraindications to doxycycline treatment, were counseled on the off-label use of this treatment. Patients who wished to proceed were treated with doxycycline (200 mg PO QD) for 6 weeks. Lymphedema outcomes were retrospectively reviewed after IRB approval of our retrospective analysis.

Results: 17 patients with a mean follow-up time of 17.0 ± 13.2 weeks were identified in our retrospective review. Although doxycycline treatment had no significant effect on relative limb volume changes or L-Dex values, we found a significant improvement in patient reported quality of life outcomes. Analysis of patient responses to the Lymphedema Life Impact Scale (LLIS)

showed a significant improvement in the total impairment score due to increased physical well-being and improvements in psychological well-being subscales (p=0.03, p=0.03, p=0.04, respectively).

Conclusions: This small, retrospective study did not show significant improvements in limb volume or L-Dex in patients with cancer-related lymphedema treated with doxycycline. However, our patients reported improvements in quality-of-life measures using a validated lymphedema patient reported outcome instrument. Our results suggest that doxycycline may be of use in patients with cancer-related lymphedema; however, larger and more rigorous studies are needed.

Diversity in Hand Surgery Leadership: The Impact of Mentorship and Bias

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Purpose: Diversity in leadership drives innovation. (1,2,3) However, underrepresented minorities may face barriers such as unconscious or overt bias or difficulty establishing mentors and sponsors. (4,5) The aim of this study is to understand the experiences of leaders in hand surgery and the impact of gender and race.

Methods: An anonymous survey was sent to leaders in hand surgery. Leaders were defined as current or past president of the American Society for Surgery of the Hand (ASSH) or American Association for Hand Surgery (AAHS), chief or chair of a division or department, or hand fellowship director. The survey assessed demographic information, self-identified factors for success and barriers to effective leadership, mentorship, and bias.

Summary of Results: One-hundred-twenty-one leaders responded for a response rate of 60.5%. Most were national society present or past presidents (41.8%), chief or chair (39.3%) or fellowship director (13.9%). Males represented 81.0% and females 19.0%. Most respondents were white (87.6%).

Ninety-one percent of females live in a dual career household, compared to 53.7% of males (OR 0.15, p=0.017). Most reported that the gender of their most influential mentor/sponsor was male, however men were more likely to have a male mentor than women (95%: 76% respectively, p=0.001). White respondents were more likely to have a white a mentor/sponsor than non-white respondents (91%: 61% respectively, p=0.009).

Ninety-five percent of females reported experiencing bias compared to 27% of males ($p<0.001$). Specifically, females reported bias in salary, promotion, nomination, sponsorship, networking, and clinical resources. Nonwhite respondents were significantly more likely to experience bias in promotion ($p=0.006$).

Variables are described as counts and percentages if categorical and means ± standard deviations or median and range if continuous, depending on the distribution. Continuous outcomes are compared between groups using t-tests or ANOVA, and categorical outcomes are compared between groups using Fisher's exact or chi-square tests. Spearman's rho correlation was used to assess association between continuous variables. Significance was set at $p < .05$. All statistics were calculated using SPSS® software version 28 (IBM® Corp, Armonk, NY).

Conclusions: Most leaders in hand surgery are white males. Mentors and sponsors tend to be demographically similar to their mentees. Females and non-whites experience bias more compared to male and white respondents. These results demonstrate that women and racial minorities continue to face bias and barriers to leadership within hand surgery.

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Salvage Reconstruction of Oncologic Humeral Defects with Free Fibula Flap After Failure with Prosthesis-Based reconstruction

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Background: Advancements in orthoplastic reconstructive surgery have enabled surgeons to perform limb salvage surgery successfully after long bone tumor extirpation of upper extremities. A variety of reconstructive options (allograft, prosthetics, allograft-prosthetic combination, non-vascularized autografts) exist for surgical rehabilitation of such cases. Even

though reconstruction by prosthesis is most commonly used in this setting, the associated risks of mechanical failure, aseptic loosening, and infection, can potentially lead to failure and amputation. Furthermore, revision procedures of the primary surgery after implant failure are complicated by unfavorable local tissue properties like massive bone loss, unreliable local tissue, and osteopenic process of the host bone. Therefore, prosthetic reconstruction is usually undesirable; whereas vascularized bone flaps have proven to be an excellent alternative to restore the biomechanical framework of the limb. Herein, we present the free fibula flap (FFF) used to reconstruct oncological humeral defects previously treated with prosthetic based reconstruction which failed.

Methods: We conducted a retrospective review of patients who underwent salvage of the humeral reconstructions in which the prosthesis failed, during 2009 and 2019. We included patients with previous reconstruction of humeral defects only with prosthetic material and no tissue transfer. All cases were reconstructed with the FFF. The Musculoskeletal Tumor Society (MSTS) scoring system was used to evaluate functional outcomes.

Results: The mean age was 24 ± 5.54 years. Six male patients (85.7%) and one female were included (14.3%). None of the patients had comorbidities. Four patients had primitive neuro-ectodermal tumors (57.1%) while three had osteogenic sarcomas (42.9%). All patients had the radial nerve preserved during onco-resection. The average gap between implant surgery and salvage with FFFs was 77.5 ± 49.024 months. The indications for salvage with the FFF were infection of implants (42.9%) and aseptic loosening (57.1%). The defects were located proximally in seven patients (85.7%) and mid-shaft in one patient (14.3%). Seven patients had adjuvant chemotherapy (85.7%), while two had neoadjuvant radiotherapy (28.6%).

The defect length after debridement and implant removal was 13 ± 5.62 cm. The fibula head was incorporated in 57.1% of the flaps (n=4). For flap fixation dynamic compression plates was used in one patient (14.3%); number 20 cerclage wiring, prolene mesh, and ethibond was used in another patient (14.3%); K wires were used in four patients (57.1%); and ethibond in 1 patient (14.3%). Only one flap had a double venous anastomosis. Two patients underwent re-exploration of the anastomosis (57.1%), the only flap harvested with a skin paddle required debridement of the cutaneous component (14.3%), and one patient had wound dehiscence (14.3%). Six flaps survived (85.7%). Bone union was achieved at 17 ± 1.25 weeks on average. The average MSTS score was 74.9%. The average follow up was 59.57 ± 43.48 months.

Conclusion: The FFF is a resourceful alternative for the management of a failed prosthesis after oncologic resection of the proximal and mid-humerus, especially with previously infected prosthetic material. Due to its anatomical shape and the vascularized nature of tissue, the FFF provides a long bone segment for humeral reconstruction.

Measuring the Clinical Significance of Secondary Hand Surgery in Complex Hand Injuries

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Goals/Purpose: With advances in microsurgery and surgical technology, replantation, revascularization, and repair of complex hand injuries have become more common.1,2 However, after primary repair, many patients are left with functional deficiencies from contracture, tendon adhesion, joint stiffness, and poor sensation. As a result, secondary surgeries are needed for the restoration of cosmesis, sensation, and motion. Types of secondary surgery include, but are not limited to, tenolysis, capsulotomy, neurolysis, and scar release.3 Although there has been literature on types and trends of secondary surgery, there is a lack of quantitative evidence in the outcomes of secondary hand surgery.1-5 Our retrospective study aimed to assess the value of secondary hand surgery in complex hand procedures at a quaternary academic hand center.

Methods/Technique: A retrospective chart review was performed utilizing data from Loma Linda Medical Center. The electronic medical records of 166 patients over a five-year (what years) period were obtained using keywords that related to the surgeries that are performed as secondary procedures such as tenoylsis, contracture release, and capsulotomies. Of those patients, 116 were excluded from the study and 50 were included in the study. Patients were excluded due to lack of follow-up, inadequate documentation, or not undergoing hand therapy within the Loma Linda University Health System. Using hand therapy data, the primary outcome evaluated was the difference in the percentage of motion between post- and pre-secondary hand surgery.

Results/Complications: A total of 50 secondary hand surgery patients were identified and included in the study. Median follow-up period was 8.5 months and average follow-up period was 18.87 months. The average percentage of full motion prior to surgery was 49.43% and the average percentage of full motion after surgery was 66%, resulting in an overall improvement in range of motion to be +16.58%. The study also found no significant differences in the average change in range of motion between common comorbidities, such as asthma, diabetes, hypertension, obesity, and age over 45, or gender.

Conclusion: Overall, there was a statistically significant improvement ($p<0.05$) in range of motion after secondary hand surgery compared to prior to secondary hand surgery. These findings hint that the performance of secondary hand surgery on patients with complex hand injuries does lead to a positive impact on hand function outcomes, providing more evidence towards the importance of secondary hand procedures.

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Cold Arm in the Neonate/Infant: A Comprehensive Review of Up-to-Date Options and Associated Outcomes

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Purpose: Acute ischemia in the neonatal upper extremity is an uncommon but concerning plastic surgery consultation that can have substantial implications for the future functionality and independence of the individual patient. Because these occurrences are relatively rare, most of the literature available is comprised of small case reports or case series without the proper power or study design to establish evidence-based guidelines. The purpose of the present review was to offer a systematic review of updated recommendations for the management of acute vascular pathology in the upper extremity in the neonatal/infantile period, and to augment these recommendations with a meta-analysis of the various modalities implemented in the literature.

Methods and Materials: A literature review with the following search terms was conducted: "pediatric artery extremity vascular" on PubMed and Cochrane review. Papers that met the following criteria were included for review and integration of subject information into the meta-analysis: papers discussing patients in the neonatal or infantile age group (0-1 year of age) presenting with arterial ischemia in the upper extremities, who were managed conservatively, medically, or procedurally (either open or endovascular). Variables examined included age of subject at onset of ischemia, gestational age of subject at birth, etiology of ischemia, specific arteries that were occluded, treatment modality employed and time to initiate said treatment (if stated), outcomes. Descriptive statistics were conducted to characterize management and outcomes. A management protocol was generated based on the results of the review.

Results: The literature search yielded a total of 534 papers, 34 of which met inclusion criteria for a total of 48 patient cases. Age range was less than one day to seven months, and gestational age ranged from 24 weeks to full term. Etiologies for upper extremity ischemia included the following: compression/birth trauma (8), arterial/venous puncture (23), hematologic abnormalities (4), thromboembolic (5), SIRS/hypotension (1), idiopathic (3), umbilical catheter

with associated systemic vasospasm (2), and pseudoaneurysm (2). 28 (58.3%) of patients were originally treated with heparin drip. Other treatments utilized included the following: topical nitroglycerin (9, 16.7%), intravenous tissue plasminogen activator (7, 14.6%), brachial plexus block (7, 14.6%), balloon angioplasty (3, 6.3%), thrombectomy (12, 25%), or excision/ligation of abnormal vascular segment (3, 6.3%). Four (8.3%) patients underwent fasciotomy. Complete resolution occurred in 30 cases (62.5%). Negative long-term outcomes included tissue loss in 14 (29.2%) subjects and flexion contractures/limitations in range of motion in 4 (8.3%) subjects.

Conclusions: Cognizant of the sequelae of neonatal/infantile upper extremity ischemic events, the plastic surgeon should be armed with the appropriate knowledge and management skills to confidently handle these consults. Selection of treatment modality should be based on etiology of ischemia, contraindications for treatment, surgeon experience and available pharmacologic agents and instruments at the surgeon's institution.

Cost Efficiency of Leech Therapy Duration for Revascularized and Replanted Digits with Venous Congestion

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Purpose: Venous congestion is a common complication following digital revascularization and replantation which threatens immediate survival of the digit. Leech therapy is an accepted therapeutic option to relieve venous congestion. The duration and efficacy of leech therapy varies and may prolong hospital length of stay requiring significant hospital resources. Previous studies evaluated the difference in Quality Adjusted Life Years (QALY) of salvaging a dysvascular digit and immediate revision amputation.1 The purpose of this study was to evaluate the cost efficiency of leech therapy duration for treatment of venous congestion.

Methods: Retrospective review was performed to identify patients who underwent revascularization or replantation procedures for incomplete or complete digital amputations at a level 1 academic trauma center from January 2005 to December 2020. Only patients requiring leech therapy for venous congestion were included in the study. Leech therapy was started immediately after any signs of venous congestion appeared and was continued until either the congestion resolved or the digit lost viability. Leech therapy duration, digit survival, length of hospitalization, and hospitalization costs were obtained. Cumulative Incremental Cost Effectiveness Ratios (ICER) for each additional day of leech therapy were calculated using hospitalization cost, incremental leech success rate, and incremental QALY assumptions per published literature for one digit, a thumb, and multiple digits.1 Cost efficiency was analyzed by comparing calculated cumulative ICER of daily leech therapy to commonly accepted $/QALY cost efficiency thresholds of $50,000, $100,000 and $150,000.1

Results: Of the 213 digits that underwent revascularization (n = 135) or replantation (n = 78), venous congestion requiring leech therapy developed in 53 total digits. Leech therapy failed in 15 digits (56%) and 17 digits (65%) for the revascularization and replantation groups, respectively. Leech therapy duration ranged from 1 to 15 days (median of 5 days in both groups). Success rate diminished over time such that leeching for 1 to 3, 4 to 7, >7 days had success rates of 69%, 42% and 8% respectively. Hospitalization costs ranged from $12,622 to $123,563, and the average cost of an additional day of leech therapy was $2,951. Overall cost efficiency of leech therapy diminished with longer therapy duration, lower $/QALY threshold and lower relative importance of the leeched digit. Using the standard cost-efficiency $/QALY cutoff value of $100,000, leech therapy becomes cost inefficient after three days, five days, and seven days for one digit, a thumb, and multiple digits, respectively.

Conclusion: The cost efficiency of leech therapy for treatment of venous congestion of replanted and revascularized digits diminishes with time, ranging from 0 to 7 days depending on incremental QALY assumptions and cost efficiency thresholds. These data can help aid in determining the utilization of leech therapy and appropriate timing of treatment cessation based on cost efficiency for venous congestion in replanted and revascularized digits.

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Using Artificial Intelligence to Improve Outcome Measurement in Thumb-Base Osteoarthritis

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Background: Symptoms in thumb-base osteoarthritis (TBOA) fluctuate. Infrequent administration of patient-reported outcome measures (PROMs) risks failure to capture important temporal fluctuations in symptom severity, and results in over- or under-estimating the severity of the condition or impact of treatment.

This could be improved by administering PROMs more frequently, but this increases the burden of completing PROMs, leading to people not completing them.

Computerized adaptive testing (CAT) is a form of artificial intelligence that makes PROMs shorter and more patient-centred by selecting the most appropriate items to administer for an individual, one at a time, based on that person's previous responses. In TBOA, this could support more frequent PROM sampling while keeping burden low, patient-centred assessments, and clinically useful measurement of symptoms.

Purpose: Develop a CAT version of the Patient Evaluation Measure (PEM), a hand-specific PROM with 11 questions. The PEM is widely used in the United Kingdom and Europe across hand surgery and is the principal PROM in the UK national hand registry (UKHR).

Methods: Data from 924 patients in the UKHR treated for TBOA were used to create CAT algorithms that predicted full-length PEM scores from as few questions as possible. This involved psychometric techniques described by item response theory (IRT). CAT algorithms were programmed to have a high reliability, measured by a statistic called standard error of measurement (SEm). An SEm value of <0.3, is considered excellent and comparable to what is achieved by the popular PROMIS system. CAT algorithms were programmed to ask questions, one-by-one, until the SEm of the score estimate dropped below 0.3. In a simulated trial, we recorded the number of questions the CAT algorithm asked to 1000 different simulated respondents before achieving an SEm < 0.3.

Results: Our algorithm reduces the length of the PEM questionnaire from 11 questions to between 1 and 4 questions, per assessment (mean 2). The PEM scores estimated by the CAT algorithms were within +/- 10% of full-length PEM scores.

Conclusion: The CAT version of the PEM we developed can provide patient-reported outcome measurement in TBOA with exceptional precision, typically using only a fifth of the questions. Our CAT algorithm can be administered as a smartphone application to enable frequent sampling of symptom severity. Clinically, this could permit remote patient monitoring and more meaningful outcome measurement that captures day-to-day symptom changes in TBOA. For example, the CAT could track what is happening to a patient's symptoms after a trapeziectomy and allow for early targeted interventions like physiotherapy for people who are not progressing well. Given the ultra-low burden, the CAT might also be used to capture data in a person's natural environment, for example completing the CAT while gardening or preparing food involves minimal disruption to the activity, comparable to stopping to read a phone message. This would allow for a truer reflection of their symptoms than completing a PROM in clinic. We have begun to develop a smartphone application for this, which will be demonstrated during the presentation.

Assessing the Safety and Efficacy of Early Mobilization in Suture Button Suspensionplasty in the Treatment of Thumb Carpometacarpal Joint Osteoarthritis

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Purpose: Suture button suspensionplasty (SBS) using the Mini TightRope has been a well-documented treatment method for thumb carpometacarpal (CMC) joint osteoarthritis (OA) in conjunction with trapeziectomy.[1] Although many studies have indicated that shorter postoperative immobilization periods is one of the main benefits to SBS over other surgical reconstructive methods, no studies have examined how quickly patients may begin hand therapy and range of motion (ROM) exercises.[2] The aim of this study was to assess the safety and efficacy of early mobilization after SBS for thumb CMC joint OA.

Methods: A retrospective chart review of 97 thumb (86 patients) CMC joint arthroplasties treated with SBS at a single institution between February 2016 and September 2021 was done. Demographic data, length of follow-up, hand dominance, time to mobilization, mean operative time, postoperative complications, and Quick-Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire scores were all recorded. All patients with an established diagnosis of thumb CMC joint OA who failed conservative treatment and subsequently underwent trapeziectomy with Mini TightRope SBS were included. Patients were excluded if we were not able to reach them for a follow-up QuickDASH, they had a history of wrist arthrodesis in the same hand, or they had other procedures aimed at stabilizing the joint performed at the same surgery. Patients were also excluded if it had been less than 6 months since the procedure.

Results: We were able to reach 36 of the 86 patients for follow-up QuickDASH resulting in a response rate of 41.9%. There were 13 males and 23 females with an average age of 61.8 years. Mean follow-up time was 41.5 months (range, 7.75 – 67.5 months). The mean QuickDASH score at maximum follow-up was 7% (range 0 – 40.9%). Mean operative time was 45 minutes. Eighteen patients had procedures on their dominant hands, 14 on their non-dominant hands, and 4 on both hands. The mean time to hand mobilization was 5 days postoperatively. 52.7% of patients completed physical therapy. 50% of patients were not referred to physical therapy, but were given self-directed range of motion exercises instead. The mean QuickDASH of patients who went to physical therapy was 5.73%. The mean QuickDASH of patients who did not go to physical therapy was 9.2%. There was no statistically significant difference between the scores of patients who did and did not go to physical therapy. 90% of patients said that they were very satisfied with their results.

Conclusions: Early mobilization after suture button suspensionplasty with the Mini TightRope has been shown to be safe, and effective, during the short-to-intermediate follow-up period.[1] We recommend early mobilization at 5 days postoperatively for all patients undergoing SBS with the Mini TightRope and trapeziectomy.

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The Impact of Immersive Virtual Reality and the Office Setting on Patient Experience and Anxiety During Carpal Tunnel Release: A Patient Reported Outcome Study

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Background:
The purpose of this study is to examine how Wide-Awake Local Anesthesia No Tourniquet (WALANT) surgery in the office versus the standard operating room environment with central nervous anesthesia impacts patient experience, as well as the effect that Wide Awake Virtual Reality (WAVR) has in conjunction with WALANT on patient experience and anxiety in the office setting.

Methods: This is a patient-reported outcome study of 538 patients undergoing Carpal Tunnel Release (CTR) by a single surgeon between August 2017 – March 2021.

Patients were classified based on location and anesthesia choice; traditional operating room setting vs WALANT in-office. Patients in the office-based setting were further classified based on whether they chose to use WAVR or not. Patients rated overall experience, enjoyability, and anxiety using a Likert scale of 1-7.

Results: The online survey had a 44.8% response rate (241/538). Patients in the hospital setting were twice as likely to report a neutral or negative experience compared to office based WALANT patients (23% vs 11%, P=0.03) and reported significantly lower enjoyment scores (44% vs 20%, P=0.0007) and higher anxiety (42% vs 26%, P=0.04). With the addition of WAVR, office-based patients reported higher enjoyment than those who chose to not use WAVR (85% vs 73%, P=0.05). Patients reporting an anxiety disorder were more likely to choose WAVR when compared to patients without anxiety disorder (73.8% vs 56.4%)). When they chose WAVR they also had greater anxiolysis (79% vs 47%, P=0.01) and increased enjoyment (90% vs 59%, P=0.005) when compared to similar patients who had reported anxiety disorder and had not chosen to use WAVR.

Conclusions: This study demonstrates improved patient experience in the office setting, which was further amplified with the use of WAVR. Preexisting anxiety disorder is a positive predictive variable towards the patients' choice to use WAVR and is most effective in this group of patients during WALANT procedures.

Unblinding De Quervain: A Systematic Review Of Ultrasound-Guided Injection Of Corticosteroids For Treatment Of Stenosing Tenosynovitis Of The 1st Extensor Compartment

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Purpose: de Quervain's disease (dQD) can be managed by various treatments, including corticosteroid injections. The objective of the study was to perform a systematic review on the efficacy of ultrasound-guided injections regarding dQD.

Methods: A systematic review was conducted on studies reporting corticosteroid injections with ultrasound guidance for dQD. Data on patient demographics, outcomes and complications were obtained, as well as presence or absence of an inter-tendinous septum.

Experience:
N/A

Summary of results: 10 studies were included in this systematic review. A total of 396 wrists from 382 patients underwent ultrasound-guided steroid injections with 17 patients lost to follow-up. Out of the remaining 379 wrists, 73.9% (n=280) reported complete resolution of symptoms, 18.2% (n=69) presented with partial resolution of pain and 7.9% (n=30) had failure of treatment. When compared to the blinded technique, patients who received injections with ultrasound guidance showed significantly higher rate of symptom resolution ($P = 0.0132$), and lower VAS scores ($P < 0.0001$). 31 out of 39 (79.5%) wrists confirmed with a subcompartmental septum showed complete resolution of symptoms with ultrasound guidance. As for recurrence of symptoms, 29 patients out of 163 who initially showed complete resolution of symptoms reported subsequent radial-sided wrist pain.

Conclusions: Corticosteroid injections into the first dorsal extensor compartment remains a good option in the armamentarium of nonoperative treatments for de Quervain's disease. Corticosteroid injections guided by ultrasound present high rates of symptomatic relief through precise needle insertion, especially in cases of anatomic variability with sub-compartments.

Further comparative studies are required to determine if long-term outcomes are better than the standard blind technique.

Outcomes Of Brachial Plexus Reconstruction Using the Supraclavicular Nerve

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Background: Neonatal brachial plexus palsy (NBPP) commonly results from obstetric complications. Patient recovery is measured using the Active Movement Scale (AMS). Outcomes of shoulder abduction, elbow flexion, wrist extension, and shoulder external rotation are most often evaluated as markers of recovery as a part of this scale. Most infants with NBPP will recover during the first 3 months, however, an estimate of 30% may require surgical management, such as nerve grafting and nerve transfer, to achieve full recovery. To date, the sural nerve is conventionally used as donor's nerves with success. Nevertheless, the use of supraclavicular nerve grafting in pediatric brachial plexus reconstruction may offer minor-site morbidity, with relatable outcomes. In this study, the authors documented the outcomes of their experience using supraclavicular nerve graft and suprascapular nerve transfer in patients with neonatal brachial plexus palsy (NBPP).

Methods: A retrospective review was performed to identify patients with NBPP that underwent reconstruction with supraclavicular graft at our institution from April 2013 to November 2020. We included all infants who had at least 18 months of follow-up after repair. Demographic characteristics, injury classification and laterality, age at and duration of surgery, pre- and post-operative AMS, presence of pseudomenigocele, need of chemodenervation, and latest follow-up were documented.

Results: 21 patients met the inclusion criteria. Brachial plexus reconstruction was performed at a median of 9.6 [6.9, 18.1] months of age. The average total operative time was 5.5 [3.6, 7.8] hours. At a mean of 25 months of follow-up, there was a significant and favorable response in all AMS scores. Initial motor recovery (>2-point AMS score improvement) was found in over 50%

of patients in shoulder abduction, elbow flexion, and elbow extension. Antigravitation (AMS >5) of elbow flexion and shoulder elevation was found in 23.8% of the patients.

Conclusion: Our data suggest supraclavicular nerve grafting is a safe and effective method for reconstructing the brachial plexus in infants. This reconstruction provides significant favorable initial motor recovery of shoulder abduction and elevation, elbow flexion, and elbow extension. In addition, the supraclavicular nerve has the unique advantage of providing minor donor-site morbidity as the nerve is located within the operative field.

How Much Is Enough? Achieving Competence in Open And Endoscopic Carpal Tunnel Surgery

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Background: Longitudinal assessment of resident intra-operative performance remains a difficult challenge in graduate medical education. While the ACGME lists minimum case requirements, little data examines resident improvement over time, or transitions from requiring supervision to independent operation. The authors sought to use a validated tool, the Operative Entrustability Assessment (OEA), to describe transitions to independent practice in carpal tunnel surgery.

Methods: Operative Entrustability Assessments (OEA) were extracted from MileMarker™, a proprietary system for OEA recording. OEAs are scored from 1 to 5, with 1="observed the case", 4="can perform case independently" and 5="can take junior resident through case". "Competence" was defined as an OEA ≥4. Entries were included for endoscopic or open carpal tunnel release (CPT 29848, 64721). OEAs were excluded if data was incomplete, the resident did not have at least one OEA score ≥4, or the resident had <5 OEA entries per CPT code. Descriptive statistics were used to compare groups. Subgroup analysis was performed using the Mann-Whitney U test.

Results: After inclusion/exclusion criteria, 21 integrated and 8 independent residents performed 297 endoscopic cases, and 12 integrated residents performed 199 open cases. There was no significant difference between resident and attending scores. Residents logged a median of 8.5

open cases (range 6-27); no independent residents performed open cases. For endoscopic cases, integrated residents logged a median of 10 cases (range 7-19) and independent residents logged a median of 4.5 cases (range 6-11); there was no significant difference in number of endoscopic cases between integrated and independent residents.

For open surgery, residents required a median of 6 cases (range 1-14) or 14 months (range 5-29) from their first logged case to achieving competency. For endoscopic surgery, residents required a median of 7 cases (range 1-15) or 30 months (range 1-46) from their first logged case to achieving competency. However, integrated residents required a median of 7 cases (range 2-15) or 30 months (range 10-46) to achieve competency, while independent residents required a median of 2 cases (range 1-5) or 1 month (range 1-1) to achieve competency. Independent residents achieved competency significantly faster and with fewer cases ($p=0.037$, $p=0.012$).

Residents required significantly less time to achieve competency in open surgery vs endoscopic surgery, per resident and attending evaluation ($p=0.038$, $p=0.03$). Faculty were statistically more likely to rank residents as competent in open surgery vs endoscopic surgery ($p=0.005$). Residents performed significantly more open surgery than endoscopic surgery ($p=0.031$).

Conclusions: Residents achieved competency significantly faster for open surgery (6 cases, 14 months) versus endoscopic surgery (7 cases, 30 months), and independent residents achieved competency faster than integrated residents. There were no significant differences between faculty and resident self-assessment OEA scores, suggesting that resident self-assessment is an accurate reflection of competence. Data may be skewed by institutional access to open vs endoscopic surgery or by rotation schedules. A larger dataset is necessary to make recommendations on case requirements.

Statewide Prevalence of Congenital Hand Anomalies: A 5-Year Review of Patients Presenting to Mississippi's Only Children's Hospital

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Introduction: There is a significant lack of incidence and prevalence data for congenital hand and upper extremity anomalies in the surgical literature. This deficit is likely multifactorial stemming from a lack of federal and/or state reporting requirements, the absence of a centralized database, poor communication between electronic medical record systems (EMRs), and limited access to care with insufficient provider referral networks for the most at-risk populations. As the

state's only pediatric hospital, and the location of the only congenital hand clinic in Mississippi, the University of Mississippi Medical Center (UMMC) is uniquely positioned to capture and report the per capita rate of congenital upper extremity anomalies within the state.

Methods: Using the institution's EpicTM electronic medical record system SlicerDicer feature, a retrospective chart review was performed. All pediatric patients presenting to UMMC from 2015-2020 were identified via pre-defined International Classification of Diseases (ICD-9 and ICD-10) codes. Exclusion criteria included age > 18 at initial presentation and defects secondary to trauma. Diagnoses included but were not limited to; polydactyly, syndactyly, reduction defects, club hand malformations, and syndromes with upper limb anomalies. Demographic data was collected including age, race, gender, maternal age, family history of extremity anomalies, geographic location, and insurance status. Statistical analysis was performed, geographic trends were identified, and results were presented in incidence of disease per 10,000 births.

Results: A total of 477 pediatric patients presented to UMMC with a congenital upper extremity anomaly between 2015 and 2020. The average age at time of initial presentation was 236.5 days (range 0-2061 days). The average rate of congenital upper extremity anomalies in the State of Mississippi was 21.5 per 10,000 live births. The three most common upper extremity anomalies were polydactyly [13.1/10,000], congenital trigger thumb [2.67/10,000] and syndactyly [1.66/10,000]. Within the polydactyly group this was further divided into pre-axial [1.98/10,000] and post-axial [10.9/10,000] polydactyly. 19.5% of these patients presented with lower limb differences. 2.9% of patients presented with associated craniofacial syndromes. There was a male predominance in presentation with 60.4% (n=288) of patients presenting with congenital hand anomaly being male.

Conclusion: In the past 5 years, only the state of New York has published similar findings delineating the incidence of congenital hand anomalies through their Department of Health's Birth Defect Registry.(1) Hosting the only children's hospital in the state, the University of Mississippi Medical Center has the unique position and shares both the opportunity and responsibility to collect and publish data capturing statewide prevalence of congenital hand and upper extremity anomalies to further contribute to this literature. In areas where multiple hospitals and health systems have the additional burden of coordination for aggregation of such data, the vast majority of pediatric Mississippians with congenital hand and upper extremity anomalies present to the same institution.
The prevalence of upper extremity defects presenting to UMMC between 2015 and 2020 was 21.5 per 10,000 births. There were, however, specific counties where the prevalence was significantly higher ranging from 53.65-63.97 per 10,000 births; specifically Holmes, Yazoo, Hinds, Grenada, and Leake counties. For polydactyly, the most common anomaly identified, it can be safely assumed that the identified prevalence rate is an underestimation of true prevalence, as many clinic-based providers simply suture ligate the polydactylous digit during a pediatric visit. In order to develop effective programs to comprehensively treat the pediatric population with hand and upper extremity anomalies, identifying the most accurate reporting and data collection mechanisms is critical. Ongoing population health studies and database creation of pediatric congenital hand anomalies by academic institutions across the country is needed to treat children safely and effectively in this population.

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Understanding the Insurance Landscape of Dupuytren's Contracture Management

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Background: Dupuytren's contracture is a painful fibroproliferative disorder that results in contractions of most commonly the fourth and fifth digits of the hand.1 While there is no definitive cure, symptomatic relief can be achieved via open fasciotomy, percutaneous aponeurotomy, or the most frequent choice being collagenase clostridium histolyticum injections (CCH).2-5 The insurance coverage of these options has not been discussed in the current literature.

Methods: The authors evaluated American insurance coverage for the treatment of Dupuytren's and compared the coverage of open fasciotomy, percutaneous aponeurotomy, or CCH. A cross-sectional analysis of US insurance policies for coverage of Dupuytren's treatment was performed. Companies were selected based on those with the largest enrollment and their market share.

Results: Of the 100 companies examined, only 5% of companies had a policy that covered an open fasciotomy treatment, 6% had a policy that covered a percutaneous fasciotomy, whereas 37% had a policy for CCH. There were significantly more policies for CCH compared to open fasciotomy and percutaneous fasciotomy (CCH vs open fasciotomy: $p<0.001$; CCH vs percutaneous fasciotomy: $p<0.001$). The most common criterion for treatment options was the involvement of the MP joint or PIP (Open fasciotomy n = 5 (100%); percutaneous fasciotomy n = 5 (83.3%); CCH n = 30 (81.1%).

Conclusion: There is noted coverage discrepancies between companies for the coverage of Dupuytren's management. This variability is lacking for surgical, minimally invasive, and injection options.

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Distal Radius Fracture Rotational Malalignment with Dorsal Spanning Plating

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Background: Dorsal spanning plating of distal radius fractures is advantageous for poly-trauma or elderly patients because it allows weight-bearing across the wrist, facilitating early mobilization and ambulation. Dorsal spanning plating can also be used to offload a distal radius fracture, functioning as an alternative to external fixation. Further understanding of the surgical approach and technique for this dorsal spanning plating is necessary. The purpose of this study is to determine the effect of dorsal spanning plating on fracture rotational alignment.

Methods: Six upper extremity cadaveric specimens were utilized. After mounting in a custom apparatus, an osteotomy was created at the distal radius. The forearm was placed in terminal pronation, and a 2.4 mm spanning wrist plate was placed across the fracture with fixation to the second metacarpal and to the radius shaft. Measurements of passive forearm rotation were made prior to osteotomy, after osteotomy, and after plating. Rotation of the distal fracture fragment relative to the shaft was measured after osteotomy and after plating.

Results: Statistically significant rotational fracture malalignment of 13.7 degrees was found after osteotomy and fixation. Passive forearm rotation demonstrated a trend towards alteration of the rotation arc, but these changes were not significant.

Conclusions: This study demonstrates the potential for rotational malalignment to occur during dorsal spanning plating of the distal radius. The surgeon should be aware of the potential effect of positioning the forearm in terminal pronation during fixation, with special attention to fracture rotation during reduction and fixation.

Outcomes after Anterior Interosseous Nerve to Ulnar Motor Nerve Transfer

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Summary: Ulnar nerve lesions proximal to the elbow can result in loss of intrinsic muscle function of the hand. The anterior interosseous nerve (AIN) to deep motor branch of the ulnar nerve (DBUN) transfer has been demonstrated to provide intrinsic muscle reinnervation, thereby preventing clawing and improving pinch and grip strength. The purpose of this study was to evaluate the efficacy of the AIN to DBUN transfer in restoring intrinsic muscle function for patients with traumatic ulnar nerve lesions. We performed a prospective, multi-institutional study of outcomes following AIN to DBUN transfer for high ulnar nerve injuries. Twelve patients were identified, nine of which were enrolled in the study. The mean time from injury to surgery was 15 weeks. At final follow up (mean post-operative follow up 18 months +/- 15.5), clawing was observed in all 9 patients with MCP joint hyperextension of the ring finger averaging 8.9 degrees (+/- 10.8) and small finger averaging 14.6 degrees (+/- 12.5). Grip strength of the affected hand was 27% of the unaffected extremity. Pinch strength of the affected hand was 29% of the unaffected extremity. None of our patients experienced claw prevention after either end-to-end (ETE) (n=4) or end-to-side (ETS) (n=5) AIN to DBUN transfer. We conclude that, in traumatic high ulnar nerve injuries, the AIN to DBUN transfer does not provide adequate intrinsic muscle reinnervation to prevent clawing, normalize grip, and pinch strength.

Correlating Time from Injury and Rate of Nerve Grafting: A Retrospective Review

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Introduction: Successful primary nerve repair has been reported up to 14 days after sharp injury. We hypothesize that more proximal injuries have higher rates of nerve grafting earlier than 14 days.

Method: Data was collected data on all nerve repairs done at three trauma centers. Operative and postoperative information, including level of injury, method of repair, time from injury to repair, and recovery were collected.

Results: 314 total nerve injuries were found: 94 in the forearm, 48 in a common digital nerve, and 172 in a proper digital nerve. All injuries were sharp at one anatomic location.
For forearm injuries, 38 nerves (40%) required grafting. The rate increased from 10% within two days of injury to >50% at >3 days from injury. Graft length ranged from 0.5-5 cm and was independent of time from injury. Primarily repaired forearm nerves had an 80% return of function compared to 55% for grafted nerves, with similar follow up rates.
For common digital nerve injuries, 8 nerves (17%) required grafting. The rate increased from 0% within 14 days of injury to >50% at >14 days after injury. Graft length ranged from 1-3 cm and was independent of time from injury. Primarily repaired common digital nerves had a 90% return of function as compared to 60% for grafted nerves, with similar follow up rates.
For proper digital nerve injuries, 37 nerves (21%) required grafting, increasing from 10% within 14 days from injury to >40% at >14 days after injury. Graft length ranged from 0.1-3 cm and was independent of time from injury. Primarily repaired proper digital nerves had an 85% return of function compared to 70% for grafted nerves, with similar follow up rates.
The rate of grafting by age was also studied. In patients under twenty, 36 nerves were repaired, with 8 (22%) requiring grafting. In patients 21 through 40, 161 nerves were repaired, with 51 (32%) requiring grafting. In patients older than 40, 117 nerves were repaired, with 24 (21%0 requiring grafting.

Conclusions: In forearm injuries, the necessity of nerve grafting becomes significant at 3 days from injury, likely due to loss of elasticity in the nerves and increased inflammation in surrounding tissues. Grafted nerves have lower rates of return of function, suggesting that timely primary repair of these injuries is imperative for the best function.

The Use of Vibrators as A Novel Analgesia Modality For Injections Into The Upper Extremity: A Randomized, Controlled, Quality Improvement Study.

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Background: Hand surgeons routinely perform injections into the upper extremities that can cause significant pain for patients. Measures to reduce pain during procedures, such as vapocoolants during catheter insertion and a pediatric vibrating "buzzy" system have shown some promise in the literature.1,2 In 1965, Melzack and Wall proposed the gate control theory of pain, describing how non-painful sensations can override and reduce painful sensations.3 Based on this theory, we hypothesized that the use of a vibrating bar during injections into the upper extremity would reduce pain and sought to compare this to the use of vapocoolants.

Methods: This quality improvement study was conducted at a single institution at various outpatient clinic locations. Participants were prospectively recruited in a non-blinded, randomized, controlled study. Patients were randomized to 1 of 4 treatment arms: vibrator in same dermatome, vibrator in a different dermatome, vapocoolant, or control (no adjunct). Demographic data was collected including gender, age, injection site, and medicine injected. Patients rated the pain during injection using a 10-point visual analogue scale (VAS). For patients receiving two injections, different modalities were selected for their second injection. Results were analyzed using a standard paired t-test.

Results: 21 patients undergoing 25 total injections were enrolled. The average age of participants is 56.4 yrs (range 14-79 yrs) and the majority were female (71.4%, 15/21). All injections consisted of 1-1.5cc mixture of Kenalog and 1% plain lidocaine. Injections were performed most frequently for trigger finger (44%, 11/25), De Quervain's tenosynovisitis (28%, 7/25), and carpal tunnel syndrome (16.7%, 4/25). Control patients reported an average VAS of 3.6 (range 1-5). VAS scores decreased compared to control with vibrator use in same dermatome (average 2.5, range 1-4, p=0.108) and vapocoolant (avg. 3.43, range 1-8, p=0.850) and increased when the vibrator was applied to a different dermatome (avg. 4.71, range 2-10, p=0.210). VAS scores were highest for 1st dorsal compartment injections (avg. 4.43, range 1-10), CMC joint (average 4, range 3-5), and trigger fingers (avg. 3.55, range 1-10). Interestingly, carpal tunnel injections had the lowest VAS scores (avg. 2, range 0-4) and female participants reported a higher VAS score than males (avg. 3.76 vs. avg. 3.125, p=0.298).

Conclusions: Novel vibrating bars used in the same dermatome of the upper extremity at the time of injection appear to provide a roughly 30% pain reduction compared to a 4.7% reduction with vapocoolants (p=0.295). These preliminary trends, although not yet statistically significant, may help to guide selection of analgesic adjuncts for injections in hand surgery clinics.

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Isolated Ulnar Shortening Osteotomy in Distal Radius Malunions, What Surgical Technique to Perform?

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Purpose: Malunion is a common complication in distal radius fractures (DRF) (1). Despite malunion of the distal radius, the ulna is often subject to corrective surgery. Ulna osteotomies are assumed to be a simpler procedure, resulting in less complications and comparable outcomes (2). No consensus has been reached on the best surgical technique to use. The aim of this study is to identify the best surgical technique to perform ulnar shortening osteotomy (USO) to restore distal radio-ulnar joint (DRUJ) congruency after distal radius fracture malunion. Our primary hypothesis is that metaphyseal and/or oblique osteotomies show lower levels of non-union whereas diaphyseal osteotomies show lower levels of hardware complications. Our secondary hypothesis is that there will be no difference in functional and patient-rated outcomes between different surgical osteotomies.

Methods and Materials: A systematic review of the literature is performed following PRISMA guidelines in February 2022 to identify studies reporting outcomes and surgical technique for isolated ulnar shortening osteotomy. The primary outcome was complication rates. Secondary outcomes included functional, radiologic, and patient-rated outcomes. MINORS were used to assess the quality of evidence.

Results: Included were 9 studies (141 patients). Due to substantial heterogeneity, a meta-analysis could not be performed. Surgical techniques involved diaphyseal transverse, oblique, step-cut, and metaphyseal curved osteotomies. No significant differences in complication rates and functional outcomes between the reported surgical techniques were found. Overall complication rate was 25% (95% CI: 11% to 39%). The most reported complication was hardware irritation (15%), often requiring its removal (7). Non-unions were found in 2% of the cases. Functional and patient-rated outcomes improved in most patients after USO. Quality of

evidence of the papers was low to very low. Common methodologic flaws were related to retrospective research.

Conclusions: No evident differences in complications rates and functional outcomes between the surgical techniques were observed. Based on current literature most hardware irritation is the most frequent complication; non-unions and infections are rare. In current literature high level of evidence papers on surgical techniques for ulnar osteotomy after distal radius malunion are lacking. Curved USO might be the most promising surgical technique. However, further research is needed to prove this theory.

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Assessing Hand Perfusion via Video Using Pigment Enhancement Technology

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Purpose: Timely and accurate triage of upper extremity injuries is critical and can be challenging, especially in patients with higher skin melanin content.1-3 This pilot study evaluates a Eulerian Video Magnification (EVM) algorithm4 combined with color channel waveform extraction to enable video-based measurement of hand and finger perfusion across all skin types. We aimed to obtain preliminary data on how this technology impacts the accuracy and confidence of clinicians in detection of finger ischemia via video.

Methods and Materials: Videos of 10 volunteers with Fitzpatrick skin types III-VI were taken in a controlled environment during normal perfusion and tourniquet-induced ischemia. Videos were EVM processed (EVM), and red/green/blue color channel characteristics were extracted to produce waveforms. These videos were assessed by surgeons with a range of expertise in hand injuries. The videos were randomized and presented in one of three different ways: unprocessed, EVM, and EVM with accompanying waveform (EVM+waveform). Survey respondents

indicated whether the video showed an ischemic or perfused finger(s), or if unable to tell. We used group comparisons to evaluate response accuracy across video types, skin tones, and respondent groups, and inter-rater agreement analysis using the kappa statistic.

Results: Of 51 surveys sent, 25 (49%) responded. The frequencies of correct responses were statistically significantly higher in the EVM+waveform category compared to unprocessed or EVM videos. Participants assessing unprocessed and EVM videos had a decrease in accuracy with increasing skin melanin content. EVM+waveform outperformed the others, and that was consistent across the different levels of experience/training. Also, there was higher agreement amongst responses for the EVM+waveform group compared to unprocessed or EVM for all questions. Accuracy and agreement in the EVM+waveform group was consistent across all skin types evaluated.

Conclusions: Video-based EVM processing combined with waveform extraction improved assessment of perfusion in the distal upper extremity. These technologies have potential future applications including triage, post-surgery vascular assessment, and telemedicine.

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Migraine Abstracts

Surgical Interventions for Lumbosacral Plexus Injuries: A Systematic Review and Presentation of Two Cases

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Background: Techniques for reconstructing and restoring lower extremity function after lumbosacral plexus (LSP) injuries vary.1 There are no clear treatment guidelines available, and summative evaluations of the literature discussing these surgeries, in addition to case discussions, are lacking.2 These factors limit the ability of nerve surgeons to evaluate the available evidence and construct individualized treatment plans for patients. Therefore, the purpose of this investigation is threefold: (1) systematically review all literature discussing surgical interventions for LSP injuries, (2) cohesively present patient-reported and objective postoperative outcomes, and (3) present two unique case examples of patients who underwent lumbosacral plexus reconstruction to improve the broader understanding of these complex surgeries in the global plastic surgery community.

Methods: The authors conducted a systematic review using PubMed, Embase, Web of Science, and ProQuest Dissertation according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. After title and abstract screening, identified articles were read and selected for inclusion based on prespecified anatomic and intervention-based criteria. Outcomes were then extracted according to the location of the injury and the type of surgical repair implemented. Regarding our example cases, both patients were diagnosed with multi-level lumbosacral plexus root avulsions and complete femoral nerve palsy. Each patient subsequently underwent contralateral obturator nerve to ipsilateral lateral branch of the femoral nerve transfer to restore quadriceps function and knee extension capabilities.

Results: The literature search identified 8,683 potential citations published between 1966 and 2021. After duplicate removal, abstract screening, and full-text review, sixty-two studies remained meeting inclusion and exclusion criteria. Injuries were classified into isolated femoral nerve injuries, isolated obturator nerve injuries, isolated sciatic nerve injuries, and multi-level LSP injuries. Surgical treatment was further classified into exploration with neurolysis, direct repair, nerve grafting, and nerve transfer surgery. While an extensive analysis was deemed impossible due to significant study heterogeneity, outcomes were uniformly organized in tables, and descriptive statistics were calculated. Meanwhile, in our patient series, at twenty-eight months postoperatively, one patient had regained Medical Research Council (MRC) grade two knee extension. At three years postoperatively, the other patient had recovered MRC grade three knee extension with the ability to extend against ten pounds of resistance.

Conclusions: While results vary based on the location of the injury and the surgical technique employed, nerve grafts and transfers demonstrated reasonable success in improving functional and pain outcomes, both in the literature and in our two-patient series. Overall, isolated femoral and obturator nerve injuries in the literature had the best outcomes reported with surgical treatment. Furthermore, incomplete sciatic nerve and multi-level LSP injuries had more reported surgical options and better outcomes than complete sciatic nerve injuries. For LSP injuries, individualizing surgical care and carefully managing expectations for recovery are essential components when discussing treatments with patients.

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In Vivo Functional Outcomes of Stem Cell Delivery Methods to Acellular Nerve Allografts

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Background: Different cell delivery methods have been described to supplement biological scaffolds, such as acellular nerve allografts (ANAs). We sought to investigate the functional motor recovery of ANAs after dynamic seeding versus microinjection of adipose-derived mesenchymal stem cells (MSCs).

Methods: Forty Lewis rats underwent reconstruction of a 10-mm sciatic nerve defect. Animals were divided into four experimental groups (n = 10/group): I) autograft, II) ANA, III) ANA dynamically seeded with MSCs, and IV) ANA injected with MSCs. In group III, ANAs were dynamically seeded with1x10ˆ6 MSCs on a bioreactor for 12-24 hours prior to surgery. ANAs in group IV were longitudinally injected with 1x10ˆ6 MSCs in 10 μL of culture medium over the entire course of the nerve graft. During the survival period, the tibialis anterior (TA) muscle cross-sectional area was measured using ultrasound imaging. In non-survival procedures at 12 weeks, measurements of ankle contracture, compound muscle action potential (CMAP), isometric tetanic force (ITF), and wet muscle weight (MW) were determined. All results were expressed as a percentage of the contralateral non-operated side.

Results: TA cross-sectional area recovery was significantly higher in groups III and IV compared to groups I and II at week 8. Group IV also showed significantly higher recovery rates than group I and II at week 4. The ankle contracture and CMAP amplitude were inferior in ANAs alone compared to all other groups. Group IV demonstrated significantly higher ITF and MW compared to ANAs alone. No significant differences were observed between ANAs dynamically seeded with MSCs and ANAs injected with MSCs.

Conclusion: Addition of MSCs to ANAs demonstrated earlier regeneration compared to ANAs alone and autografts and were demonstrated as early as postoperative week 4. Both methods of seeding improved functional outcomes. The method chosen for human translation must be technically feasible, reproducible, and timely.

Utilization of "Pinch Test" As A Method of Facial Dermatomal Assessment In Patients Undergoing Corneal Neurotization

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Background: Neurotrophic keratopathy (NK) is an ulcerative disease of the cornea due to corneal anesthesia. NK can lead to corneal ulceration, scarring and in extreme cases, corneal perforation. The underlying pathology of NK is a palsy of the ophthalmic branch of the trigeminal nerve. The lack of blink response to everyday insults to the cornea leads to the ulcerative cycle. Corneal neurotization (CN), a procedure that consists of transplanting healthy nerves from another area to the insensate cornea, has emerged as a surgical management option for patients with NK. 1, 2 Often NK occurs in congenital cranial nerve disorders such as Moebius Syndrome and requires the surgeon to determine viable sensory donor nerve options for sural nerve grafts (SNG) in a pediatric population. This facial dermatomal assessment can be challenging given the patients age, lack of ability to communicate and overall uncooperativeness with the physical exam. To preoperatively assess donor dermatome suitability for nerve transfer, the surgeon has used a "pinch test" by pinching the patient in a dermatomal distribution. In this report we describe the "pinch test" as a means to assess facial dermatomes for sensory donor nerve surgical planning prior to nerve transfer.

Methods: This is a retrospective study, approved by the Institutional Review Board of Indiana University Medical Center. Inclusion criteria patients of any age that underwent corneal neurotization at Indiana University Riley Hospital for Children between 2021-2022. A chart review was completed on eligible patients based on the inclusion criteria above.
Pain sensation was assessed by pinching the following: ear lobule for greater auricular nerve (GAN), glabellar region for supratrochlear (STN)/ supraorbital nerve (SON). The surgeon pinches with enough force to result in an explicit meaningful response from the patient, usually the pinching left indentation. Family is asked about which dermatome areas on the patient have sensation, and with that information, the surgeon starts pinching assessment at the dermatome with the least sensation and progress to dermatome with the most sensation, as reported by the family.

If the patient reacts strongly to the pinch the surgeon has verified a functional sensory donor nerve. If the patient does not react, the patient likely has a palsy of the nerve supplying this dermatomal distribution.

Results: Eight patients underwent CN between 2021-2022. Seven of eight patients had congenital bilateral NK. One patient had R NK due to injuries sustained by a gunshot wound.

Mean age at the time of the CN was 10 ± 11. Six patients underwent bilateral procedures from the right GAN to the right cornea and left GAN to left cornea via a SNG. In all cases, patients had a positive "pinch test" to the ear lobes. The GSW patient underwent left SON to left cornea with forehead sensation noted on the "pinch test" which was particularly helpful given his prior TBI.

Conclusions: A pre-operative "pinch test" can assist the peripheral nerve surgeon prior to sensory nerve transfer to identify dermatomes with intact sensory nerves as potential donors.

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How's the "Babysitter" Doing? Measuring Sensory Return in Delayed-Immediate Neurotized DIEP Flap Reconstruction

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Background: Breast reconstruction patients who are anticipated to undergo adjuvant radiation are not suitable candidates for immediate deep inferior epigastric perforator (DIEP) flap reconstruction due to the risk of flap fibrosis, shrinkage, and fat necrosis. Rather, many of these patients undergo delayed-immediate, or "babysitter," reconstruction, where a tissue expander is placed first as a temporizing measure during adjuvant therapy before definitive flap reconstruction. In our previous study of breast sensory recovery, we demonstrated that neurotized DIEP flap reconstruction yields superior sensory return compared to implant-based reconstruction. In this study, we aim to delineate the temporal pattern of sensory changes in "babysitter" patients following final stage neurotized flap reconstruction.

Methods: Ninety-one patients who are undergoing or underwent mastectomy with immediate reconstruction, including 26 patients (46 breasts) with "babysitter" procedures and 65 patients with DIEP flaps (120 breasts), were prospectively identified at their pre-operative visit. For both cohorts, baseline level (t = 0) is defined as prior to mastectomy. Sensitivity evaluation was performed in nine breast regions, utilizing the AcroVal pressure-specified sensory device (AxoGen, Alachua, FL) to determine 1-point static cutaneous thresholds at which stimulus was perceived. Higher thresholds indicated worse sensitivity. Sensitivity data was averaged between

patients at each time point, plotted over time, and compared between "babysitter" and DIEP groups.

Results: "Babysitter" patients underwent final stage neurotized flap reconstruction on average at 12 months following mastectomy and initial tissue expander placement (range, 3 to 18 months). At 18 months post-mastectomy (6 months post-DIEP), "babysitter" patients had comparable sensitivity measurements as immediate DIEP flap patients in all regions of the breast ($p > 0.05$ for all breast regions). For "babysitter" patients, at 18 months post-operatively, sensitivity measurements were comparable to baseline levels only in the outer superior, outer medial, and outer lateral regions of the breast ($p > 0.05$). At 24 months post-operatively, cutaneous thresholds were comparable to baseline in all regions of the breast ($p > 0.05$) except the inner inferior region, following a similar sensory recovery trajectory as immediate neurotized DIEP flap patient.

Conclusions: In patients who undergo "babysitter" procedures, the combination of sensory return from the native mastectomy skin flap along with the neurotized DIEP flap yields sensory recovery comparable to immediate DIEP flap patients following definitive flap reconstruction. When final-stage flap reconstruction occurs by 12 months post-mastectomy, patients can expect sensation to pressure to return to baseline levels by 24 months post-operatively, with sensation returning even sooner in some regions of the breast.

Nerve Injury After Joint Replacement Surgery: Strategies To Improve Function And Reduce Pain

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Purpose: Peripheral nerve injuries are rare but potentially devastating complications of joint replacement surgery that can result in loss of motor function, sensory disturbances, and/or chronic pain. When these injuries occur they are often thought to be non-operative thus early referral to a peripheral nerve surgeon is deferred. Depending on the type of injury and the timing of the referral to a peripheral nerve surgeon, treatment options such as nerve transfers and/or nerve decompressions can be offered patients to improve function and reduce pain.

Methods: Retrospective review identified patients who presented with nerve injury after joint replacement. Patient characteristics were gathered including, joint replaced, timing of presentation from date of their nerve injury, and surgical procedure performed. The visual analog scale was used to quantify patient-reported pain, quality of life, and depression. Preoperative and

postoperative motor function were assessed using the medical research council grade in patients who underwent nerve transfers.

Results: Seven patients presented with nerve injuries - five after total hip arthroplasty, and two after total shoulder arthroplasty. Average time from nerve injury to presentation to our clinic was 568.11 days (range: 59-1738 days). The average time to presentation for those patients who underwent nerve transfer was 136 days, compared to 893 days for those who underwent decompression only. Four patients underwent nerve transfers and nerve decompression, and five patients underwent nerve decompression only. All patients reported postoperative improvements in pain, quality of life, and depression scores [Table 1]. Of the four patients who underwent nerve transfers, two had preoperative and postoperative MRC grades which improved from 0/5 on presentation to 4/5 on most-recent follow-up. All surgeries were outpatient and no 30-day post-operative complications occurred.

Conclusion: Nerve injury after joint replacement is uncommon, but when it occurs it is devastating to a patient's quality of life. Nerve decompressions can provide pain control benefits no matter the time from injury, and if a timely referral is made, nerve transfers may offer the ability to restore function. Collaboration with orthopedic surgeons about nerve reconstruction options is essential to optimize function and improve quality of life in this patient population.

Morphopathologic Basis of Migraine Surgery: New Insights

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Summary: Today, Migraine Surgery has been widely accepted as an effective surgical solution for chronic headaches refractory to medical treatment. Indeed, in the past two decades, extra-cranial trigger deactivation for migraine headaches has been used more and more routinely in surgical practice. Our surgical technique will be detailed, underlying indications, results, and complications. We have twelve years of specific clinical experience, with more than five hundreds of operated patients. The present study focused on the characterization of the morphological architecture of the superficial temporal and occipital arteries (and surrounded tissues) of migraine patients. Fresh biopsies were collected during the minimally invasive surgery procedure and immediately processed for light and electron microscopy analysis. In normal arteries, the tunica intima (endothelial layer) consists of a single layer of endothelial cells surrounded by a connective tissue basement membrane with elastic fibers. The middle layer, the tunica media, is primarily composed by smooth muscle and is usually the thickest layer. Regardless to the type of artery, in all samples analyzed we found tunica intima hyperplasia and internal elastic lamina fragmentation, as well as cellular alterations in the tunica media. In particular, a consistent fraction of vascular smooth muscle cells shifted from contractile versus synthetic phenotype. Vascular smooth muscle cells are highly specialized cells that regulate vascular tone and participate in vessel remodeling in physiological and pathological conditions. Phenotypic conversion from a contractile- quiescent- to 'synthetic' -active- state contributes to

vascular pathologies. Taken together, these results support, in selected patients, a mininvasive vascular approach for migraine surgery.

Non-Medication Treatments for Chronic and Episodic Migraine: A Systematic Review and Meta-analysis

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Introduction: Treatments for refractory and intractable migraine have been of growing interest, particularly given the diversity and utility of novel treatments. Neuromodulators, nerve blocks, botulinum toxin A (BT-A), and surgery for migraine headache all offer new avenues for patients who do not sufficiently respond to conventional therapies or tolerate the side effects of medications. However, no studies have compared outcomes for these treatments. Furthermore, although headache frequency is an important factor that is often analyzed, headache intensity and duration are essential aspects of migraine treatment inherent to quality of life improvement but are often underreported.[1-4] Thus, this study is the most rigorous analysis and the first to compare the effectiveness of these contemporary treatments for migraine based on changes in the frequency, duration, and severity of migraines in adults.

Methods: PubMed, Embase, and Cochrane Library databases were searched to identify randomized placebo-controlled trials that compared BT-A, nerve block, neurostimulation, or migraine surgery to placebo for preventive migraine treatment. Data on changes from baseline to follow-up in headache frequency, severity, duration, and quality of life were analyzed.

Results: After exclusion, there were four studies with 137 patients for nerve block, ten studies with 1857 patients for BT-A, ten studies with 416 patients for nerve stimulator, and four studies with 185 patients who underwent surgical treatment. There was a significant decrease in headache frequency of 5.69 days in patients who underwent nerve block (95% CI: 0.37, 11.01; p=0.04). p=0.04) and 4.58 days in surgery (95% CI: 2.26, 6.90; p<0.001). Headache severity (VAS score 1-3) was significantly decreased in all four treatments. Duration of headaches was significantly reduced for the BT-A cohort by 4.58 days (95% CI: 2.26, 6.90; p<0.001) and the surgery cohort by 0.44 days (95% CI: 0.13, 0.74; p=0.01). Quality of life as demonstrated by MIDAS score was improved significantly for patients who underwent treatment with BT-A (95% CI: 0.31, 0.52; p<0.001). Adverse events were significantly higher in the BT-A group only (95% 0.32, 0.88; p<0.001).

Conclusion: Of these treatments, only migraine surgery and BT-A significantly improved migraine severity and duration, the first study to do so. Migraine surgery is a cost-effective treatment to reduce headache frequency, severity, and duration without significant risk of

complications compared to placebo. BT-A is also effective in reducing severity and duration with improved migraine burden but is associated with significantly more adverse events and greater lifetime cost.

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Multiple Spatiotemporal Gait Irregularities Seen in Neuropathic Adults: A Prospective Quantitative Comparative Study Of 108 Patients

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Purpose: Peripheral neuropathy affects proprioception, however, the parameters of adult gait that may be significantly affected have yet to be established. This study aims to collect quantitative data in distinguishing neuropathic and non-neuropathic adult gait parameters.

Background: Peripheral neuropathy is a common disorder often associated with diabetes, alcoholism, and neurological disorders, among others. Prior studies have noted how altered proprioception leads to altered gait which increases the risk of falls, aberrant force distributions, and the potential for added healthcare costs. Despite its importance, no large cohort study has investigated spatiotemporal gait differences of neuropathic patients versus non-neuropathic patients. To our knowledge, this study has the largest comparative sample to date that analyzes gait outcomes in these patient populations.

Methods: Adult patients who could safely ambulate unassisted and without pain, without open wound, and without previous lower extremity surgery in the previous three months were offered participation. To reproducibly evaluate gait, participants completed a standardized protocol with wearable Opal sensors (ADPM, Portland Oregon) and completed a 120-second walk test and a 30-second Romberg (sway) test. We analyzed data provided from the Motility Lab software (Hamilton Thorne) that included cadence, gait speed, elevation midswing, single limb support, double limb support, and sway. Data was analyzed using unpaired student's t-tests with significance defined as $p < 0.05$.

Results: A total of 108 patients were included with an average age of 57.81 ± 15.56 years and a BMI of 29.23 ± 6.61 kg/m2. There were 59 patients diagnosed with peripheral neuropathy. 49 patients without peripheral neuropathy served as a control. Neuropathy significantly predicted a reduced gait speed (0.82 vs. 1.02 m/s, p=.0001), increased elevation midswing (1.52 vs. 1.06 cm, p=.0015), increased step duration (0.63 vs. 0.58 s, p=.0025), decreased cadence (97.54 vs. 105.05 steps/min, p=.0008), increased double limb support (28.39 vs. 24.36%, p=.0001), and decreased single limb support (35.79 vs. 37.654%, p=.0011). There was no significant difference in sway between the groups (0.2 vs. 0.18 m/s2, p=.64).

Conclusion: These results demonstrate that patients with peripheral neuropathy have multiple significantly impaired spatiotemporal gait parameters when compared to patients without peripheral neuropathy. Understanding and projecting these deficiencies in gait better prepare plastic and reconstructive surgeons to assess risk in their patient populations; establishes surgeon and patient expectations; may guide treatment modalities, procedure selection, and course; and has the potential to mitigate costly sequelae such as ulceration and amputation associated with peripheral neuropathy.

Targeted Muscle Reinnervation and Regenerative Peripheral Nerve Interfaces for Pain Prophylaxis and Treatment: A Systematic Review

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Purpose: Nerve pain frequently develops following amputations and peripheral nerve injuries. Two innovative surgical techniques, targeted muscle reinnervation (TMR) and regenerative peripheral nerve interfaces (RPNI), are rapidly gaining popularity as alternatives to traditional nerve management, but their effectiveness is unclear.

Methods and Materials: A systematic review was conducted, and studies were included if pain outcomes were assessed after TMR or RPNI in the upper or lower extremity, both for

prophylaxis performed at the time of amputation and for treatment of postamputation pain as well as symptomatic neuromas after peripheral nerve injuries.

Results: Seventeen studies were included, with 14 evaluating TMR (366 patients) and three evaluating RPNI (75 patients). Of these, one study was a randomized controlled trial. Nine studies had a mean follow-up time of at least one year (range 4–27.6 months). For pain treatment, TMR and RPNI improved neuroma pain in 75-100% of patients and phantom limb pain in 45-80% of patients, averaging a 40-71% reduction in pain scores postoperatively. When TMR or RPNI was performed prophylactically, many patients reported no neuroma pain (48-100%) or phantom limb pain (45-87%) at time of follow up. Six TMR studies reported PROMIS scores assessing pain intensity, behavior, and interference, which consistently showed a benefit for all measures. Complication rates ranged from 14-28%, most frequently delayed wound healing.

Conclusions: Both TMR and RPNI may be beneficial for preventing and treating pain originating from peripheral nerve dysfunction compared to traditional techniques. However, randomized trials with longer term follow up are needed to directly compare the effectiveness of TMR and RPNI with traditional nerve management techniques.

Targeted NAC Reinnervation (TNR) with Nerve Fascicle Split in Gender Affirming Double Incision Mastectomy with Free Nipple Grafting

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Background: Restoration of breast sensation has become an important goal in autologous and implant-based breast reconstruction after cancer related mastectomy. Although gender affirming mastectomy with free nipple grafting (FNG) results in similar sensory deficits, chest reinnervation concepts have not been applied to this procedure.

Methods: We describe Targeted NAC Reinnervation (TNR), a novel technique to reinnervate the FNG in patients undergoing double incision gender mastectomy with FNG. Our technique differs from previously described reinnervation techniques in several aspects: 1) the donor axon count is maximized by preserving the 3rd to 5th lateral cutaneous nerves for anastomosis to the nipple areola complex (NAC) 2) the reinnervation approach varies and is based on patient anatomy 3) the distal graft or donor nerve is split into fascicles to increase the reinnervation zone and 4) the split fascicles are coapted to dermal sensory units. Nine patients were prospectively enrolled in this study. Semmes- Weinstein filament testing (2.83, 3.61, 4.31, 4.56, 6.65) was performed mid- nipple and in the superior, inferior, medial, and lateral quadrant of the NAC

preoperatively, at 2 weeks, as well as at 3 months postoperatively. Subjects were asked to answer questionnaires regarding sensation at the same timepoints.

Results: Preoperatively, all patients were moderately to very concerned about nipple sensation. Average nerve allograft length was 3.5cm. The mean preoperative sensation was 3.49 mid nipple, and 3.9 in all NAC quadrants. At two weeks postoperatively, average sensation was 6.65 or insensate in all tested areas. At three months postoperatively, all patients had a positive Tinel sign. Sensation was 3.98 mid nipple, 4.16 in the superior NAC, 4.12 in the medial NAC, 3.65 at the inferior NAC and 4.17 at the lateral NAC. One patient reported return of erogenous sensation.

Conclusion: Chest reinnervation is technically feasible in patients undergoing double incision gender mastectomy with FNG. Early results show improving sensation at three months with positive Tinel sign indicating nerve regeneration across the grafted sites. Longer follow up and a control group is needed to validate these findings.

Postoperative Pain Course Following Primary and Secondary Targeted Muscle Reinnervation - a Temporal Description of Pain Outcomes

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Purpose: Targeted muscle reinnervation (TMR) has been demonstrated to be an effective option in the surgical treatment of neuropathic pain for amputees.1–3 However, insufficient data has been presented on the postoperative pain course for patients that undergo either primary (<14 days since amputation) or secondary (≥14 days) TMR surgery. Our exploratory study aims to outline the postoperative pain course within these patients in an effort to aid in educating patients on expectations after TMR surgery as well as on the anticipated postoperative pain management.

Methods: A retrospective review of amputee patients, treated with either primary or secondary TMR who were enrolled in a prospective repository between 2018 and 2022, was performed. Pain scores were collected with VAS/NRS instruments throughout the first six months postoperatively. Locally weighted scatterplot smoothing (LOWESS) curves were utilized to visualize postoperative pain courses. Mean pain scores were and compared between primary and secondary TMR cohorts.

Results: A total of 89 amputee patients were included in this study, with 62% of these patients being male. The median duration of follow-up was 160 days (IQR 69 - 276). Primary TMR patients experienced an initial rapid decline in pain scores within the early postoperative phase which continued a downward trajectory as evidenced on the LOWESS curve throughout the study period examined (see Figure 1). Secondary TMR patients however experienced a much more gradual yet consistent decline in their LOWESS pain curve throughout their period reviewed (Figure 1). At the 1-month, 4-month and 6-month mark, primary TMR patients reported a mean pain score of 4.5, 3.0, and 3.1 respectively, while secondary TMR patients reported a mean score of 4,7 (P=0.57), 3.9 (P=0.15) and 3.4 (P=0.77) respectively.

Conclusions: Primary TMR patients illustrated rapid initial postoperative decrease in pain which continued a downward trend throughout the period studied. Secondary TMR patients experienced a slower initial decrease in pain for the early postoperative period as well as a more gradual reduction in their pain throughout the period reviewed. At 6 months, there is a mean difference in pain between both cohorts of 0.3 points on a 0-10 VAS/NRS scale, which is not significant with this sample size. Future studies may provide more insight in the differences in postoperative pain courses following TMR and may also identify factors that affect the rate and extent of pain decrease. However not significant, the current trend may assist in the understanding postoperative pain course and help for counseling in pain expectations and pain management after TMR surgery.

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Injuries to the Motor Nerve by Injection Needle or Suture Needle. Experimental Study in the Rat

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Introduction: Invasive procedures may injure a peripheral nerve. Any anesthesia, suture, blockage, infiltration is subject to this risk (1). Thus, a way to experimentally simulate these situations was sought.

Purpose: To evaluate peripheral nerve injury and functional disability caused by an injection needle puncturing, transfixing the nerve by a suture stitch, injecting saline solution and Lidocaine into the nerve.

Method: Groups of 6 male Wistar Rats were formed and the peroneal nerve exposed. Groups: Control (nothing done); Suture (stitch applied for 48 hours); Needle (puncturing by insulin needle for 5 minutes); Saline (intraneural injection); Lidocaine (intraneural injection); SHAM (skin and muscle dissected). After the procedures the animals were evaluated by WTA (Walking Track Analysis) for 8 weeks. After that, the amplitude and latency of the electrical impulse in the peroneal nerve and the strength and weight of the cranial tibial muscle were bilaterally analyzed.

Results: During the first 13 days, the groups had different WTA results - PFI (Peroneal Functional Index) mesurements ($p<0.001$), with no difference from day 14 to 62 ($p>0.05$).

Strength Test: there was no side effect ($p=0.78$). Latency: there was no side effect ($P=0.08$).

Amplitude: there was no side effect ($p=0.18$). There was no significant difference between rat weights and cranial tibial muscle weights.

Conclusion: Invasive procedures involving needles are safe in everyday practice. Occasional peripheral nerve injuries tend to present partial and transitory functional loss. All groups showed functional normalization after 13 days.

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The Insurance Landscape of Botulinum Toxin Policies for Migraines in the United States

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Purpose: The authors reviewed 101 US insurance companies on their policies for botulinum toxin use in migraines and headaches and associated medical necessity criteria. Migraines affect

as much as 10% of the population worldwide and constitute significant clinical and economic burden to the US. Botulinum toxin injections have been proven to treat migraines safely and effectively. Access to this treatment in the US is dependent on coverage by insurance companies, but the coverage of botulinum toxin injections is currently unknown.

Methods: Insurance companies were selected for inclusion in the study based on their state enrollment and market share. Policies were collected through web-based searches and telephone interviews. Policies were organized into three groups by coverage status: pre-authorized coverage, covered on a case-by-case basis, and never covered.

Results: Most insurers held a policy on botulinum toxin use in migraines (n = 65), with the majority providing coverage for their use (n = 59, 91%). This was significantly more than for headaches alone (17% vs 91%, p <0.001). Four types of toxins were approved, with the most common being onabotulinumtoxinA (n = 56, 95%). Approved dosages ranged from 155 to 400 units per treatment cycle. To achieve approval, 26 potential criteria were identified, with the most common being headache occurring more than 15 days per month (n = 37, 63%). Many policies also required a prior failure of one to three drug classes of oral migraine medication (n = 38, 64%).

Conclusion: Though botulinum toxin is largely covered by most health insurers in America, there are significant discrepancies in criteria to access the treatment. Greater standardization between approval criteria and the method of provision, such as approved toxin type and dosing amount may be recommended to further streamline access to treatment.

Don’t Short-circuit the Breast: Nerve Grafting Improves Sensory Return in DIEP Flap Reconstruction

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Background: Poor breast sensation is commonly reported after mastectomy and reconstruction due to the necessary disruption of sensory nerves. Further, the process of nerve regeneration is slow and unpredictable, causing some patients to experience suboptimal sensation years after surgery. During deep inferior epigastric perforator (DIEP) flap reconstruction at our institution, we routinely coapt the 10th, 11th, or 12th intercostal nerve within the autologous flap to the anterior cutaneous branch of the 3rd intercostal nerve using a nerve allograft. In this study, we aim to evaluate the efficacy of nerve grafting in improving sensory recovery following neurotized DIEP flap reconstruction.

Methods: Thirty patients (54 breasts) who underwent mastectomy with immediate reconstruction using the DIEP flap were prospectively identified. All patients underwent nerve grafting using the 70x1–2 mm Avance Nerve Graft (AxoGen Inc., Alachua, FL). Sensitivity evaluation was performed in nine breast regions, utilizing the AcroVal pressure-specified sensory device to determine 1-point static cutaneous thresholds at which stimulus was perceived. Higher thresholds indicated worse sensitivity. For each patient, sensation was compared between two time points: 3 to 6 months postoperatively versus 12 to 24 months postoperatively. Sensitivity data across the 9 regions of the breast were averaged between patients and compared across the two time points. Sensitivity was further assessed at additional time points and plotted over time to establish sensory recovery over time.

Results: In our cohort, patients undergoing DIEP flap reconstruction had an average age of 48 and average body mass index of 26.63. At 3 to 6 months postoperatively, patients had a mean sensitivity measurement of 52.09 g/mm2. At 12 to 24 months postoperatively, patients had a mean sensitivity measurement of 40.32 g/mm2. There was a statistically significant decrease in the mean cutaneous threshold required for patients to perceive sensation between the two time points (29.1 percent, $p = 0.041$). At 18 months postoperatively, mean cutaneous thresholds were comparable to baseline levels in the outer superior, outer medial, and outer lateral breast regions ($p > 0.05$). At 24 months or more months postoperatively, sensitivity measurements were comparable to baseline levels in all regions of the breast ($p > 0.05$) except the inner inferior region.

Conclusions: Patients who undergo nerve graft-based DIEP flap reconstruction can expect significant improvements in sensation to pressure over time. Further, they can expect sensation to pressure to return to preoperative levels by 24 months or more postoperatively, with sensation returning even sooner in the outer superior, outer medial, and outer lateral breast regions. Our results can help inform preoperative counseling and guide patient expectations on the timeline of sensory recovery following surgery.

Effect of Muscle Graft Mass on Survival and Function of Regenerative Peripheral Nerve Interfaces in a Large Animal Model

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Background: Regenerative peripheral nerve interfaces (RPNIs) are free muscle grafts constructed around a transected nerve developed for prosthetic control and neuroma prevention. Graft viability is maintained by diffusion of nutrients from the surrounding wound bed. We sought to characterize the effect of graft size on muscle viability and function in a large animal model.

Methods: Twelve swine were assigned to 3 experimental groups (n=4 per group) of varying muscle masses. Muscle grafts of the following masses were evaluated: 1) small (SM) (300-500 grams) 2) medium (MD) (700-900 grams), 3) large (LG) (2400 grams). Each group underwent surgical RPNI implantation on the end of a transected ulnar nerve, using free muscle grafts obtained from the ipsilateral pectoralis major muscle. Compound Muscle Action Potentials (CMAPs) were evaluated in-vivo. We explanted RPNIs and stored them in 10% formalin at postoperative day (POD) 14. Half of each group's samples were stained with hematoxylin and eosin (H&E) utilizing tissue cross-sections from one-half of the muscle lengths. Two blinded reviewers assessed muscle and nerve viability.

Results: Electrophysiological evaluation at POD 14 revealed generation of CMAPs in the SM RPNI group, with a mean amplitude of 4.7 mV. No CMAPs were detected in RPNI samples >300g. Histologic analysis using H&E revealed central muscle viability (+++) in the SM group, moderate viability (++) in the MD group and minimal viability (+) in the LG group. Peripheral viability was moderate (++) in the MD and SM groups and minimal (+) in the LG group. There was minimal (+) fibrosis in the SM group and moderate (++) fibrosis in the MD and LG groups.

Conclusion: Electrophysiological evaluation of varying muscle graft masses revealed a mass threshold of 300g, beyond which no action potential was recorded. Histological analysis demonstrated fibrosis and deceased viability of the innermost layers of RPNIs with increasing mass. These results indicate muscle graft mass has an inverse effect on RPNI viability and function. This is an important consideration for surgeons when selecting the size of free muscle grafts for neuroma prevention and prosthetic control.

The Positive and Negative Predictive Value of Diagnostic Botox Injection in Nerve Decompression Migraine Surgery

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Introduction: Nerve decompression surgery is an effective treatment modality for patients who suffer from migraines. Botulinum toxin type A (BOTOX) injections have been traditionally used as a method to identify trigger points, however there is a paucity in data regarding its diagnostic

efficacy. The goal of this study was to assess the diagnostic capacity of BOTOX in successfully identifying migraine trigger sites and predicting surgical success.

Methods: A sensitivity analysis was performed on all patients receiving BOTOX for migraine trigger site localization followed by a surgical decompression of affected peripheral nerves. Positive and negative predictive values were calculated.

Results: A total of 40 patients met our inclusion criteria and underwent a diagnostic BOTOX injection followed by a peripheral nerve decompression surgery with at least three months follow. Patients with successful BOTOX injections (defined as at least 50% improvement in MHI scores post injection) had significantly higher average reduction in migraine intensity (56.7% vs 25.8%; p=0.020, respectively), frequency (78.1% vs 46.8%; p=0.018, respectively), and MHI (89.7% vs 49.2%; p=0.016, respectively) post-surgical decompression. Sensitivity analysis shows that the use of BOTOX injection as a diagnostic modality for migraine headaches has a sensitivity of 56.7% and a specificity of 80.0%. The positive predictive value is 89.5% and the negative predicative value of 38.1%.

Conclusion: BOTOX injections have a very high positive predictive value. It is therefore a useful diagnostic modality that can help identify migraine trigger sites and improve pre-operative patient selection.

A Novel Nanomaterial-based Formulation for Sustained Release of Neuromodulators for Chronic Migraine and Facial Aesthetics

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Introduction: Neuromodulators of the botulinum toxin family have emerged as highly effective therapeutics for a range of indications including chronic migraine, muscle spasticity, and rhytid prevention and reduction. Neuromodulators are widely utilized, commercially successful and one of the most frequently performed minimally invasive aesthetic procedures. However, their potential is limited by the duration of effect as frequent re-dosing is required and diffusion away from target sites results in unwanted muscle paralysis from off-target activity. The aim of this study was to develop a novel nanoparticle-based delivery system for neuromodulators to provide sustained release at target tissue sites and assess the efficacy of locally delivered neuromodulation in prolonging muscle paralysis.

Materials: Botulinum toxin A (BoNTA) was encapsulated into polymeric nanoparticles (NP). Neuromodulators were mixed with a carrier molecule and fabricated into polyelectrolyte complex (PEC) nanoparticles using flash nano-complexation and nanoprecipitation. Release kinetics of the nanomaterial-based neuromodulator formulation were evaluated in vitro using enzyme-linked immunosorbent assays and bioactivity of the released neuromodulator was assessed using substrate hydrolysis assays. The therapeutic potential was assessed in vivo using a rodent forelimb model. The nanomaterial-based neuromodulator formulations were injected unilaterally into the muscles of the volar forelimb. The paralytic effect was quantified by measuring functional recovery using stimulated grip strength testing. Functional recovery was assessed weekly and compared to baseline grip strength as percentage recovery from baseline until this plateaued when animals were sacrificed for histologic analysis.

Results: BoNTA was encapsulated efficiently into nanoparticles with 83–88% of the input neuromodulator encapsulated. BoNTA released from NPs exhibited retention of bioactivity at greater than 80%. NP maintained at an ambient temperature (20–25°C) for up to 70 days demonstrated similar release kinetics and therefore acceptable shelf stability. Animals injected with unencapsulated BoNTA were first to fully regain grip strength, 17 weeks after injection. BoNTA NP produced total muscle paralysis for 3 weeks while BoNTA PEC paralyzed muscle for the longest at 7 weeks. Both groups fully regained function 29 weeks after injection with PEC treated animals regaining function at a faster rate compared to NP treated animals. Lastly, neuromodulators encapsulated in both NP and PEC were injected concurrently. This similarly resulted in total paralysis for 7 weeks with animals regaining function at a slower rate compared to those treated with BoNTA NP alone. Thus far, the PEC/NP treated animals demonstrated recovery of 29.1%, 15 weeks after injection compared to those treated with only BoNTA PEC or BoNTA NP which exhibited recovery of 47.0% and 61.1%, 15 weeks after injection, respectively.

Conclusion: Our novel nanomaterial-based neuromodulator formulation provides linear, long-acting release of BoNTA and the encapsulation process does not impact bioactivity. The flash nano-complexation and nano-precipitation techniques used for nanoparticle production are already established as protein delivery. NP and PEC injected together paralyzed for longest. The BoNTA PEC/NP has the potential to paralyze muscle for longest by delaying the onset of recovery and extending the duration of release. Such a sustained release formulation and local delivery modality promises superior therapeutic outcomes with less frequent re-dosing.

Vascularized Denervated Muscle Targets: A Comparison with Regenerative Peripheral Nerve Interfaces to Determine Association Between Muscle Graft Size and Pain

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Background: Regenerative peripheral nerve interfaces (RPNIs) were developed as a technique to prevent neuroma formation by implanting transected nerve ends into denervated, devascularized muscle grafts. However, this technique is limited by size constraints as RPNIs too large to be maintained by diffusion will undergo central necrosis prior to successful reinnervation. [1] Vascularized, denervated muscle targets (VDMTs) address this problem by isolating a small muscle flap on its vascular pedicle before implantation of a transected nerve. This study aimed to 1) examine the utility of VDMT and RPNI in prevention of neuromatous pain in a rodent hindlimb model, and 2) examine the influence of the size of these constructs on their efficacy.

Methods: This study was performed with Institutional Animal Care and Use Committee approval. Male Lewis rats were divided into 8 treatment arms: neuroma formation, sham surgery, RPNI (small, medium, large), and VDMT (small, medium, large). Transection of the common peroneal nerve (CPN) was utilized for neuroma formation; sham surgeries involved CPN exposure without transection. In RPNI groups, a muscle graft from the lateral gastrocnemius (LG) was used as a target for the proximal end of the transected CPN. In VDMT groups, a muscle flap was developed using a portion of the LG maintained on a vascular pedicle prior to implantation of the proximal end of the transected CPN. Small and medium RPNIs/VDMTs were defined by removing 450-500 mg and 250-300 mg of muscle, respectively, prior to implantation of the injured nerve. Large RPNIs/VDMTs utilized the entire LG muscle for the construct. Animals underwent weekly post-operative behavioral testing using varying Semmes-Weinstein monofilaments (evaluator sizes: 4.93, 5.07, 5.18, 5.46) to assess for the development of neuromatous pain.

Results: In total, 23 Lewis rats were included in the first cohort. Friedman's test showed that for all four Semmes-Weinstein monofilaments, there were statistically significant differences in average pain response based on treatment group (4.93, 5.07, 5.18 sizes: $p<.001$; 5.46 size: $p<.05$). Pain scores in response to each filament were averaged for each group at each week post-operatively. Graphical representations of these aggregate data demonstrate that for each filament, animals in the small or medium VDMT group showed either similar or higher pain scores than the same size RPNI group. However, the large VDMT group demonstrated either similar or lower pain scores compared to the large RPNI group. Pain scores for experimental treatment arms expectantly increased over the 24 weeks, and scores for these groups were appropriately higher than the sham surgery group but lower or similar to the neuroma group.

Conclusion: Preliminary data collection demonstrates that larger VDMTs may attenuate pain when compared to similarly sized RPNIs, but that this association may not persist for smaller muscle grafts/flaps. Data collection is ongoing for additional cohorts to provide greater power for future post-hoc statistical analysis and histomorphometry.

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Long-Term Hyperbaric Oxygen Treatment Enhances Nerve Regeneration Pace And Rate In A Rat Sciatic Nerve Graft Model

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Introduction: The treatment of choice for peripheral nerve injury remains microsurgical nerve repair. However, microsurgical nerve repair often achieves inconsistent limited functional regeneration depending mainly on patient's age, comorbidities, the length of nerve defect and the duration between injury and repair. Hyperbaric oxygen (HBO) treatment was reported to enhance nerve regeneration in short-term (days) regeneration experiments. The aim of the study was to reaffirm these findings in a long-term clinically relevant HBO treatment protocol.

Methods: A nerve segment of 10 mm of the sciatic nerve was transected, inverted and coaptated as a nerve graft in forty-two male Wister rats. Following surgery rats were either treated with a two-month HBO treatment protocol or left untreated. Post-operative follow-up consisted of electrophysiological study (on post operative day 20, 30, 60 and 90) and immunohistochemistry and morphometric assessments (POD14, 35 and 90).

Results: EMG results show a faster regeneration pace in the animals exposed to HBO treatment with all the treatment group showing a recordable M wave on pod20 as in pod 30, compared to only a third from the control group on pod20 and two thirds on pod30. Immunohistochemistry analyses performed on POD35 demonstrated showed significantly improved nerve regeneration, demonstrated by enhanced axonal and myelin regrowth, nerve regeneration in POD35 in the HBO treated group compared to the control group. By pod90 the motor nerve fibers percentage in the treatment group reached normal values while the control group did not.
Conclusion: A Long term clinically relevant HBO treatment protocol significantly enhanced peripheral nerve regeneration rate and quality.

Targeted Muscle Reinnervation and Regenerative Peripheral Nerve Interface Support Similar Quantities of Sensory Neurons But Vary In Motor Neuron Regeneration In A Rat Model

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Purpose: Targeted muscle reinnervation (TMR) and regenerative peripheral nerve interfaces (RPNI) are surgical procedures that re-route nerves during or following limb amputation to provide motor input for bio prostheses. In TMR, cut nerves are coapted to proximal, functional motor nerve branches; in RPNI, cut nerves are coapted to denervated muscle grafts. An unforeseen benefit to these procedures is prevention and relief of neuropathic pain in amputees. However, the mechanism by which TMR and RPNI provide analgesia is not completely understood. Relative retention of sensory neurons following nerve injury is correlated to analgesia. (1) We hypothesize that these interventions similarly support sensory neuron regeneration. This study used retrograde labeling to compare the difference in regenerating motor and sensory nerve counts between TMR and RPNI interventions in a rodent animal model following nerve injury.

Methods: Rats underwent transection of the common peroneal and the tibial nerves at the level of the sciatic trifurcation. The sural nerve was maintained to prevent autotomy. Rats were divided into 3 cohorts for intervention: injury alone (no further surgery), injury with immediate TMR, or injury with immediate RPNI. Interventions were performed on the left hind legs of all animals. For TMR, the common peroneal and tibial nerves were coapted to semimembranosus and biceps femoris, respectively. For RPNI, extensor digitorum longus and hemi-soleus muscles were taken from donor animals as free muscle grafts and coapted to the common peroneal and tibial nerves, respectively. 8 weeks after intervention, the operated nerve was retrograde labeled with 4% Fluorogold dye distal to the intervention coaptation performed on the common peroneal nerve. After 1 week, spinal cords and the L5 dorsal root ganglia (DRGs) were harvested and frozen. Samples were cut, imaged, and sensory and motor neurons were counted (n=5-7). (2)

Results: Following TMR, 417 +/- 155 motoneurons and 693 +/- 373 sensory neurons regenerated through the coaptation. Following RPNI, 120 +/- 53 motoneurons and 499 +/- 237 sensory neurons regenerated through the coaptation. Compared to historical data on the normal number of neurons at baseline, TMR preserved 107% +/- 40% of the baseline population of motoneurons, while RPNI preserved significantly fewer, 34.2% +/- 14.6% ($p<0.05$). RPNI and TMR interventions preserved 53-87% of sensory neurons, respectively, and were not significantly different from historical data.

Conclusion: TMR resulted in greater preservation of motoneurons compared to RPNI, while both interventions preserved similar quantities of sensory neurons. This supports clinical data showing that both interventions have efficacy in preventing neuropathic pain following injury. Both interventions create a microenvironment that would seem to preferentially support motor axon regeneration over sensory regeneration. This was the case in TMR, while RPNI seemed to equally support motor and sensory neuron regeneration.

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fMRI Data Demonstrate Evidence of Change in Brain Connectivity Following Migraine Surgery

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Purpose: While surgical management of migraine headaches is becoming more commonplace in the field of plastic surgery it is still met with some criticism in the greater medical community due to the subjective nature of patient-reported results.1 Many studies have demonstrated that cranial nerve decompression is both safe and effective for the relief of migraine symptoms.2,3 The purpose of this study is to use functional and structural MRI to demonstrate objective changes in the brains of subjects following successful migraine surgery.

Methods: Subjects were recruited from the senior author's practice. They failed medical management of their migraine headaches and have been deemed appropriate candidates for migraine surgery. Subjects participated in one preoperative and one postoperative study visit. The postoperative visit took place a minimum of 6 months following surgery and/or when symptoms plateaued. Each study visit consisted of 1) neurocognitive battery, 2) fMRI at rest, 3) fMRI while performing verbal fluency task, and 4) static T1 MRI. Statistical mapping was performed to analyze and compare pre- and postoperative fMRI data. Cortical reconstruction and volumetric segmentation were performed to measure cortical thickness and compare pre- and postoperative structural MRI data. Pre- and postoperative measurements were compared using a paired t-test.

Results: Preliminary data indicate that chronic migraine patients presenting for surgery score extremely high for depressive symptoms and demonstrate impairment in executive function in the form of poor focus/attention. Analysis of our completed postoperative study visits shows a dramatic improvement in depressive symptoms and a trend toward improved executive function, specifically in the form of verbal fluency tasks. Most interestingly we are seeing potential changes in functional connectivity on fMRI that may correlate with this improvement in verbal fluency. Both pre- and postoperative fMRI images show responses in regions typically activated during this task, but the postoperative images show greater involvement of the right inferior

frontal gyrus, in addition to the standard regions. The inferior frontal regions form part of Broca's area that is typically involved in language production and fluency tasks. This suggests a more co-hemisphere pattern on this task postoperatively, compared to a left-lateralized pattern before surgery.

Conclusion: Our results further support migraine surgery as a safe and effective procedure. We also demonstrate improvement in depression scoring and attention following surgery. Most importantly we demonstrate objective change in postoperative fMRI data that accompanies the improvement in neurocognitive data. Migraine surgery affects objective, measurable change in subjects' brains.

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Uncover the Wiring: A Pilot Study Comparing Sensation in Buried vs Non-Buried DIEP Flaps

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Background: Neurotized DIEP flaps have been shown to improve sensory recovery following mastectomy and reconstruction. Our previous study of DIEP flap patients has shown that sensation to pressure begins returning as early as 18 months postoperatively. (1) With the recent trend toward nipple-sparing mastectomies, sensation originates within the buried DIEP flap and then innervates the breast skin. In contrast, for patients undergoing skin-sparing mastectomies, the DIEP flap skin is preserved, brought up to the surface, and directly innervated. In this study, we aim to evaluate inner breast region sensation between patients whose DIEP flap is buried and whose DIEP flap skin is brought to the surface.

Methods: Seventy patients who underwent mastectomy with immediate reconstruction using the DIEP flap were prospectively identified. Of these, sixty patients underwent nipple-sparing mastectomy with buried DIEP flap reconstruction while ten patients underwent skin-sparing

mastectomy with non-buried DIEP flap reconstruction. Patients in both cohorts received nerve grafting using the 70x1–2 mm Avance Nerve Graft in identical fashion. Sensitivity evaluation was performed in five inner breast regions (corresponding to the non-buried DIEP flap area) using the AcroVal pressure-specified sensory device to determine 1-point cutaneous thresholds at which stimulus was perceived. Higher thresholds indicated worse sensitivity. Sensitivity data was averaged between patients, plotted over time, and compared between the two cohorts.

Results: The buried and non-buried DIEP flap cohorts were comparable in age, body mass index, medical comorbidities, and oncologic regimen ($p > 0.05$). In the buried DIEP cohort, at 6 months postoperatively, there was a statistically significant difference in inner breast region sensitivity measurements compared to baseline levels ($p < 0.001$). At 24 months postoperatively, buried DIEP flap inner breast region sensitivity measurements were comparable to preoperative baseline measurements ($p = 0.195$). In contrast, in the non-buried DIEP cohort, at 6 months postoperatively, sensation in the inner breast region was comparable to preoperative baseline levels ($p = 0.236$).

Conclusions: Neurotized DIEP flap skin raised directly to the surface confers earlier sensory recovery than buried DIEP flaps. Patients who undergo skin-sparing mastectomies with non-buried DIEP flap reconstruction, they can expect significantly better sensation in the inner regions of the breast at 6 months postoperatively. In patients who undergo nipple-sparing mastectomies with buried DIEP flap reconstruction, they can expect sensation in the inner breast to return to preoperative baseline levels as early as 24 months postoperatively. Our results can help inform preoperative patient counseling on mastectomy and reconstructive approach from a breast sensation perspective.

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Migraine As an Entrapment Neuropathy? Epidemiological And Genetic Associations with Carpal Tunnel Syndrome.

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Background: Surgical decompression of extracranial peripheral nerves has emerged as a treatment for migraine headaches over the past two decades, and its efficacy is now supported by a plethora of studies. Parallels have been drawn between nerve decompression for migraine and median nerve decompression in carpal tunnel syndrome (CTS), and two studies from the US have reported an epidemiological association between migraine headache and CTS. [1,2]

Aims: We sought to (1) replicate the association between migraine and CTS in a substantially larger cohort from the UK, and (2) interrogate the genetic underpinnings of the association using genetic summary data from published genome-wide association studies (GWAS) for the two diseases.

Methods: For the epidemiological study, we used the UK Biobank cohort, a prospective cohort study of ~500,000 individuals from the UK who have allowed linkage of phenotypic data with their medical records. Migraine and CTS cases were defined using ICD-10, OPCS4 surgical codes, and self-reported diagnostic codes. Migraine cases were matched to controls 1:5 on age and sex, with a secondary case-control dataset additionally matching on body-mass index (BMI).

For the genetic analyses, we used the largest available GWAS summary statistics for Migraine [3] and CTS[4] to perform linkage disequilibrium score regression to ascertain the degree of genetic correlation. We also used two complementary approaches – CPASSOC (Cross-Phenotype Association) and MTAG (Multi-Trait Analysis of GWAS) – to define the genomic regions demonstrating overlap in genetic architecture between the two diseases.

Results: Within the cohort of 401,656 white, British individuals, there were 12,312 CTS cases and 14,453 migraine cases. With migraine as the exposure, the odds ratio (OR) for association with CTS was 1.14 (95% CI: 1.04–1.25; p=0.006). Sex-stratified analysis revealed a significant association in females (OR=1.15; 95% CI: 1.04–1.28, p=0.006) but not in males (OR=1.07; 95% CI: 0.82–1.40, p=0.61). Matching on BMI in addition to age and sex had the effect of marginally increasing the odds ratio in the female-specific (OR=1.17; 95% CI: 1.06–1.29, p=0.002) and overall cohort (OR=1.15; 95% CI: 1.04–1.26, p=0.004).

We found a statistically significant positive genetic correlation between migraine and CTS (r=0.12, p=0.004), and the CPASSOC/MTAG analyses highlighted a region on chromosome 9 where there was strong evidence of genetic overlap. One particular genetic variant, rs1040851, was strongly associated with both diseases (MTAG p-values: CTS, 3.87×10^-5; migraine, 1.32×10^-12), and this variant is known to affect the expression levels of the TRIM32 gene.

Conclusions: We have used the largest cohort study to date to provide robust evidence for an epidemiological association between CTS and migraine in females but not males. We also provide the first ever demonstration of a significant genetic correlation between migraine and CTS, with a notable genetic overlap at the TRIM32 locus on chromosome 9. Our results strongly suggest a shared genetic susceptibility between the two diseases, adding credibility to the intriguing notion that an element of entrapment neuropathy may underlie migraine pathophysiology.

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Technical Considerations for Peripheral Nerve Sheath Tumor Excision with Intraoperative Neuromonitoring and Magnification

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Background: Peripheral nerve sheath tumors (PNSTs) are benign tumors arising from Schwann cells within the peripheral nerve sheath that frequently present with pain but may also have accompanying focal neurological deficits. As there is limited literature describing techniques for PNST excision, this paper's objective is to introduce our institution's technique, leveraging intraoperative neuromonitoring in conjunction with visualization under magnification and microsurgical instrumentation.

Methods: A retrospective review of all patients undergoing surgery for neurofibromatosis type 1 (NF1), neurofibromatosis type 2 (NF2), and schwannomatosis was conducted for a single surgeon's experience including both pediatric and adult patients from 2009-2020. Patients with dermal or cutaneous neurofibromas were excluded. Patients with malignant peripheral nerve sheath tumors were included. Chart review included documentation of patient demographic factors, details of clinical presentation, and surgical details. Pathology and post-operative complications were also documented.

Results: A total of eighty-eight operations were performed on seventy-seven patients involving 171 peripheral nerve tumor excisions. Mean patient age was 37.9 years ± 15.4 years with a slight predominance of females (52.3%). The majority of patients were diagnosed with NF1 (54.5%) pre-operatively, followed by NF2 (24.6%). Pain was the most common presenting symptom occurring in 82.9% of patients. Average and median follow-up after surgery for this cohort was

4.39 ± 3.02 and 3.71 years, respectively. Lesions were most frequently observed in the upper extremity, accounting for nearly half of tumors (47.7%). The average number of tumors excised per case was 2.1 ± 1.97 (range: 1-9). Intraoperative nerve monitoring was utilized in 58% of cases and nerve repair following tumor resection was required in 46.6% of cases. Cases not requiring intraoperative nerve monitoring were incidents of cutaneous nerves, digital nerves, or pure sensory nerves. When nerve repair was indicated, epineurium repair was sufficient in 78% of cases, while 22% demanded fascicular coaptation. Half (50%) of all tumors were between 2.0 and 4.9 centimeters, and 19.3% measured larger than 10 centimeters. Minor complications including infection, seroma, and hematoma occurred in 3 cases (3.4%). Fourteen tumor resections were associated with new onset post-operative neurologic symptoms (8.2%). These included cases pain (2.3%), weakness (3.5%), and paresthesia (5.8%). Two of the cases of weakness were temporary and resolved within one year of surgery.

Conclusion: Peripheral nerve sheath tumors present a difficult reconstructive challenge. By utilizing, intraoperative nerve monitoring, tourniquet control of the extremity, magnification, microsurgical instruments, enucleation from the tumor capsule where applicable, epineural repair, and fascicular repair when there is interfascicular resection, effective results can be achieved with low complication rates.

Vascularized Denervated Muscle Targets are Effective in the Mitigation of Neuroma Pain

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Background: Peripheral nerve injuries often result in painful neuromas that may be treated surgically. The regenerative peripheral nerve interface has demonstrated efficacy in neuroma treatment and prevention but is limited by the lack of vascularity. To address this limitation, we developed a surgical technique that utilizes a vascularized denervated muscle target (VDMT). We performed a study in rodents to evaluate the efficacy of VDMTs and elucidate the importance of denervation and vascularity of muscle targets for neuroma prevention.

Methods: 10-week-old male Lewis rats (n=8 per group) were used in a tibial nerve transection model in which the nerve was transected and buried into a soleus muscle that was 1) devascularized, denervated (RPNI) or 2) vascularized, denervated (VDMT) or 3) vascularized and innervated (bury in muscle approach; BIM). In the 4) untreated control group, the tibial nerve was transected without implantation into muscle. Pain thresholds with Von Frey

monofilament test were assessed weekly for 15 weeks. Fluorogold retrograde tracing technique was used to visualize dorsal root ganglia (DRG) of labeled regenerating tibial nerve.

Results: Composite pain scores were analyzed and demonstrated the VDMT group experienced statistically significant less pain than BIM and Neuroma groups ($p < .0001$). Muscle and DRG histology are pending.

Conclusion: VDMT group experienced statistically significant less pain than BIM and Neuroma groups. VDMT and RPNI groups were similar in pain scores. Future studies assessing muscle size and pain thresholds are necessary to discern the proper applicability of these surgical procedures.

Trends in Nerve Transfer Procedures Among Board-Eligible Plastic Surgeons

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Background: In the past decade, nerve transfers have gained popularity in the management of peripheral nerve injuries, but it remains unknown whether these trends are driven by increased exposure at the trainee level. Exploring changes in trainee exposure to nerve transfers during fellowship will inform our understanding of the increasing role that nerve transfers may play in nerve reconstruction over the coming decades. The present study describes trends in nerve transfer procedures logged by board-eligible plastic surgeons over the past 14 years.

Methods: We queried the American Board of Plastic Surgery case log database for all nerve reconstruction CPT codes for examination years 2008 to 2021, following a method set forth by Morris et al. [1] Information collected for each case included examination year, surgery year, surgeon fellowship subspecialty, geographic region, patient age, and patient sex. Trends in nerve transfer utilization were assessed using the Cochran-Armitage test for trends. Chi-square testing and linear regression analysis were used to assess relationships between geographic region, examination year, and utilization of nerve transfers at the group and individual candidate level.

Results: A total of 1959 nerve reconstruction cases were logged by 738 candidates between examination years 2008 to 2021. Of these cases, 12.0% included nerve transfer CPT codes. 107 unique candidates performed nerve transfer cases. There was a statistically significant increase in the proportion of nerve transfer codes over the study period, from 0.7 % in examination years

2008-2009 to 8.0% in examination years 2020-2021 ($Z= -11.57$; $p < 0.0001$). There was also a statistically significant increase in the proportion of total candidates performing nerve transfers over the study period, from 0.9% of candidates in examination years 2008-2009, to 10.9% of candidates in examination years 2020-2021 ($Z= -9.21$, $P < 0.0001$). There was a significant relationship between nerve transfer cases and geographic region ($X2$ (6, $N = 1959$) = 25.826, $p = 0.0002$) with the most nerve transfers being performed by candidates in the Midwest (26.4%), followed by the Northeast region (22.6%). Examination year was also a significant predictor of the proportion of nerve transfers used at the individual candidate level ($p < 0.001$).

Conclusions: There has been an increase in nerve transfer procedures logged by board-eligible plastic surgeons over the past fourteen years. Observed trends are attributable both to an increase in the proportion of the total pool of eligible candidates who are performing these procedures, and an increase in the number of procedures performed by individual candidates. There is also geographic variation in candidate use of nerve transfers, with the Midwest and Northeast regional candidates contributing to nearly half of all reported nerve transfers in the study period. Further work should examine how these changes at the trainee level impact reliance on nerve transfers at the national level in the coming decade.

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Is Patient Frailty a Stronger Predictor of Peripheral Nerve Decompression Postsurgical Complications, As Compared To Historic Proxies? An American College of Surgeons NSQIP-Based Study

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Background: Peripheral nerve decompression is well-tolerated, with low risk of non-nerve complications (1,2). While extreme age, obesity, or comorbidities are reasonable proxies of

surgical risk, current literature suggests that for surgical patients, patient frailty may be a more accurate predictor than other proxies. For extremity surgery, the modified Charlson Comorbidity Index (mCCI) has been shown to be an accurate predictor of 30-day postsurgical complications in humerus fractures, and the modified 5-item frailty index (mFI-5) has been shown to be a stronger predictor of 30-day postsurgical complications in distal radius fractures, using the National Surgical Quality Improvement Program (NSQIP) database(3,4). The authors hypothesized that mFI-5 and mCCI are more predictive of 30-day postoperative complications in peripheral nerve decompression than historic risk proxies.

Methods: A retrospective review was performed of patients from the NSQIP database who underwent peripheral nerve decompression (CPT 29848, 64702, 64704, 64708, 64718, 64719, 64721, 64722) from 2013-2019. Patients were excluded if a concurrent procedure not from this list was performed. The mFI-5 and mCCI scores were calculated, and complications data were gathered. Age, BMI, major comorbidities, ASA class, mFI-5 score, and mCCI score were compared as predictors of all-cause 30-day complications, 30-day surgical site complications, length of stay, and aggregate Clavien-Dindo complication severity score, using univariate and multivariate logistic regression.

Results: There were 1384 patients identified. Major comorbidities, and mFI-5 and mCCI score, were predictive of all-cause complications ($p=0.007$, $p=0.005$, $p=0.041$). Only major comorbidities were predictive of surgical site complications ($p=0.019$). Complication severity was associated with major comorbidities and mFI-5 score ($p=0.027$, $p=0.041$). Length of stay was predicted by age and mCCI score ($p=0.0008$, $p=0.041$). Readmission was predicted by mFI-5 score ($p=0.016$). Reoperation was only predicted by smoking status ($p=0.038$).

Conclusions: Both historic and newer surgical risk proxies may predict postoperative complications in peripheral nerve decompression. Surgeons may use these indices to expand their range of elderly or frail patients to be considered for outpatient peripheral nerve decompression. Further research is necessary to delineate contributing factors to risk, and to separate pre-emptive 24-hour observation and hospital admission from medically necessary admissions.

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Nasal Mucosa Neurotization With End-To-Side Nerve Graft: An Effective Treatment For Anosmia?

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Purpose: To present a reproducible technique of neurotization of the nasal mucosa using end-to-side neurorrhaphy between a nerve graft and the supratrochlear nerve to the nasal mucosa, enabling improvement in the complaint of anosmia.

Material and Methods: Here we report a 40-year-old male patient with a 10-year history of anosmia secondary to trauma. The supratroclear nerve was exposed on the left side through an upper blepharoplasty incision. After stripping of the periosteum, a hole of 3-mm in the cephalic part of the frontal process of the maxilla was created by a drill. Between the upper and lower lateral nasal cartilage, an incision in the nasal mucosa was made, allowing dissection of the nasal mucosa. After, a tunnel was done under the nasal mucosa and extended from the bony hole until the nasal mucosal incision. Sural nerve graft harvested from the leg was used, and tiny windows along the length of the graft was done. Then, eight French catheters were introduced into the bony hole, being grasped inside the nose to retrieve the nerve graft from the bony hole to the nasal mucosa. The cephalic end of the graft coapted to the supraorbital nerve in an end-to-side fashion. The sural nerve was buried under the nasal mucosa caudally. Closure of the nasal incision was made by chromic catgut 5/0 and skin in the upper eyelid by 6/0 Nylon.

Results: 6 months after the surgery, the patient presented a great improvement and recognized 35 odors out of 40 in the Brief Smell Identification

Conclusion: A simple surgical procedure can be used to neurotize the olfactory epithelium using end-to-side nerve repair, with great results.

Penile Reinnervation: a viable surgical technique for the treatment of Erectile Dysfunction?

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Purpose: To present and evaluate the Penile Reinnervation technique for the treatment of erectile dysfunction, using nerve grafts and end-to-side neurorrhaphies.

Material and Methods: In a retrospective review of one hospital unit, 32 patients who underwent Penile Reinnervation technique from September 2012 through March 2020, were evaluated. The mean age of patients was 63 years.
The surgery involved resection of sural nerve grafts from both limbs. These grafts were divided into two equal parts and served to bridge the bilateral femoral nerves to the dorsal nerve of the penis and the corpus cavernosum. The connection between the nerves was achieved with end-to-side neurorrhaphies performed with 8-0 monofilament nylon sutures. At the base of the dorsal penis, one of the nerve grafts was introduced into the corpus cavernosum, to produce a direct neurotization.

Results: This study involved a convenience sample, reporting the results of patients who answered to the proposed questionnaire. The average follow-up period was 49 months, and the average period between erectile disfunction and penile reinnervation surgery was 36 months. Only 2 patients (6,3%) had no kind of erection after the procedure, and 3 patients (9,4%) had only penile reaction such as penile engorgement. Twenty-five patients (78%) were satisfied with the results and believed that the surgery was worth it.

Conclusion: From the result presented here, we can conclude that penile reinnervation surgery is a viable technique, with effective results, and could offer itself as a viable and reproducible treatment modality for erectile dysfunction.

Effect of Targeted Muscle Reinnervation (TMR) on Post-Amputation Pain and Functional Outcomes: A Systematic Review and Meta-Analysis

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Background: Targeted muscle reinnervation (TMR) can potentially alleviate phantom limb pain (PLP) or residual limb pain (RLP) in post-amputation patients (1-3). This systematic review and meta-analysis aimed to evaluate the quality of data and determine the efficacy of TMR on pain reduction and functional outcomes in limb amputees.

Methods: The protocol was published a priori on PROSPERO (CRD42021285083). Medline, Embase, CENTRAL, Science Citation Index and PsycINFO databases were queried until December 2021. Two independent reviewers performed a two-step review process. Inclusion criteria were adult patients who underwent limb amputation and suffered from postoperative pain, underwent operative treatment with TMR compared to standard treatment or no treatment, and English language. Exclusion criteria were failure to report desired outcomes and patients under 18 years. Primary outcome measures were pain and functional outcomes using validated quantitative measures, including numerical rating scale (NRS) and patient-reported outcomes measurement information system (PROMIS). Study quality was evaluated using GRADE and risk of bias (RoB) using Cochrane's RoB tool for randomized controlled trials (RCT) and ROBINS-I tool for observational studies. Meta-analysis was performed for comparative trials.

Results: Seven studies met inclusion criteria, including one RCT (2) and six cohort studies (N=1,115 patients) (1-4). All studies demonstrated a reduction in PLP and RLP following TMR. Three studies were included for pooled analysis (3,4). For NRS scores, the pooled mean difference was -2.77 (95% CI: -3.36, -2.18; $p<0.0001$) for RLP and -2.01 (95% CI: -2.60, -1.42; $p<0.0001$) for PLP, in favor of the TMR group. The PROMIS scores were also in favor of the TMR group for both RLP and PLP, with pooled mean differences that were significantly lower for intensity, behavioral and interference domains (all $p<0.0001$). TMR showed enhanced functional outcomes in three studies. Complication rates varied among the studies, and the overall number of complications ranged from 0-16%. The RCT was of 'high' quality, with low risk of bias. Cohort studies ranged from 'moderate' to 'low' quality.

Conclusions: TMR resulted in a significant improvement of pain. Using pooled analysis, a reduction in NRS scores and all PROMIS domains for both RLP and PLP was found in the TMR group. Three studies assessed functional outcomes and all showed an improvement post-TMR. The RCT was identified as a 'high' overall quality study, while the remaining cohort studies were ranged between 'moderate' to 'low'. Further level I studies are needed to increase the quality of data.

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Targeted Muscle Reinnervation is an Effective Treatment for Refractory Symptomatic Neuromas in Non-amputee Patients

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Background: Symptomatic neuromas can be debilitating and hinder quality of life. Targeted muscle reinnervation (TMR) is increasingly being employed to prevent or treat neuromas and phantom limb pain in amputee patients. We previously reported successful pain outcomes in a small cohort of non-amputee patients with symptomatic neuromas who underwent TMR. We now have 2.5 years of experience with this procedure. The goal of this study is to evaluate the patient-reported outcomes and complications of using TMR to treat symptomatic neuromas in nonamputee patients.

Methods: A retrospective review was conducted of patients with symptomatic neuromas treated with TMR from January 2019 to October 2021 at a single institution. Patients' medical records were reviewed to identify neuroma characteristics, TMR details, and postoperative follow-up. Neuromas were excised to healthy nerve fascicles and a redundant donor motor fascicle was selected for nerve transfer. Phone surveys were conducted to evaluate pain frequency and severity, physical function, and quality of life before and after TMR. Pain severity, physical function, and quality of life were assessed on a scale of 0 to 10. Pain frequency was based on number of times per day and number of days per week patients experienced pain. Statistical analysis was performed to compare pre- and postoperative scores, with statistical significance defined at values of $p < 0.05$.
Results: Thirty patients were identified. Average age and body mass index were 52.4 years and 33.7 kg/m2, respectively. Fifteen patients (50%) had undergone a prior neuroma excision. Neuromas were located in the lower extremity (n=17, 56.7%), upper extremity (n=8, 26.7%), and trunk (n=5, 16.7%). At mean follow-up of 11.1 months (range 1.9 to 24.1 months), pain frequency decreased from 6.8 days per week to 4.7 ($p<0.001$) and from 9.2 times per day to 6.1 ($p<0.001$). Average pain severity decreased from 8.4/10 to 5.5/10 ($p<0.001$). Overall physical

function increased from 3.6/10 to 5.8/10 (p=0.004) and overall quality of life increased from 4.2/10 to 6.2/10 (p=0.002).

Conclusion: TMR is a promising surgical treatment for symptomatic neuromas. Our study cohort benefited from decreased pain, improved physical functioning, and better quality of life. Larger studies are warranted to further elucidate the advantages of TMR in non-amputee patients with symptomatic neuromas.

Practice Management Abstracts

Recent Training Trends in Independent Plastic Surgery Graduates: American Board of Surgery Certification and Academic Priorities

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Purpose: Amongst graduates of the independent Plastic and Reconstructive Surgery (PRS) training pathway, the majority have previous General Surgery (GS) training, but the utility of GS board certification in PRS practice is unclear. The authors aim to elucidate the attitudes and trends of American Board of Surgery (ABS) certification in recent American Board of Plastic Surgery (ABPS) diplomates trained in the independent pathway.

Methods: The authors reviewed all new ABPS diplomates from 2018-2020 and identified independent PRS graduates by referencing official websites of residency programs, hospital/health systems, and private practices. An anonymous survey was then electronically distributed to these graduates. The survey assessed sociodemographics, employment type, fellowships completed, ABS certification attempts, current operative practices, and attitudes pertaining to ABS certification. We investigated characteristics associated with ABS certification and the attitudes towards the utility and benefit of ABS certification.

Results: Of the 568 ABPS diplomates certified in 2018-2020, 223 (39%) independent pathway graduates were identified. More than two-thirds (68%, n=154) of these graduates completed ABS certification, a proportion that did not significantly vary over the three years. Of these double board-certified surgeons, 55% (n=85) achieved ABS certification during their first year of PRS training. Additionally, 41% (n=62) pursued fellowship training. In terms of current practice, around half of the independent graduates are in private practice, 25% (n=56) are part of a hospital group, and 17% (n =38) work in universities. Of the 223 independent graduates

identified, 52 (23%) responded to the survey. Most (84.6%) reported obtaining ABS certification, but only 22.7% currently perform GS procedures. The majority (51.9%, n=27) stated that GS training was valuable to their PRS career, regardless of ABS certification. Most (57.7%, n=30) also agreed that ABS certification benefited their PRS career. Of those with ABS certification, 72.7% (n=32) plan to recertify, with patient appeal being the most common rationale (78.1%, n= 25). More than half completed a PRS fellowship (59.6%, n=31). Surgeons who did not complete fellowship training felt more strongly that ABS certification was beneficial to their training and career (p=0.014) and valued by patients (p=0.026) compared to surgeons who completed a fellowship.

Conclusions: Pursuit of ABS certification appears to be a priority to independent PRS trainees, despite the potential disruption to their PRS training, potential personal costs, and unclear utility to their practice. Although few perform GS procedures, this study showed that most independent graduates achieved ABS certification, and interestingly, plan to recertify. Therefore, future studies should further investigate attitudes towards recertification among graduates who are further along in their careers. Additionally, investigators should analyze the impacts of dual board certification on PRS practice among independent graduates.

Fat Grafting Practices and Preferences, Are We Any Closer to a Standardized Approach? A Survey Providing Insights on Current Trends in Small and Large Fat Grafting

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Introduction: Fat grafting has revolutionized plastic surgery practices since Coleman brought it to the frontline in 1995, and it is now used in a variety of areas ranging from breast reconstruction to regenerative medicine. However, due to a lack of evidence-based studies, multicenter, prospective, and/or randomized trials, we still don't recognize which variables influence fat grafting's positive clinical outcomes.

Methods: Following International Society of Plastic Regenerative Surgeons (ISPRES) Board approval, a 30-item questionnaire online survey was designed for distribution to a randomized cohort of ISPRES members) from 2nd July to 16th July 2021, participation in the survey was voluntary and participants could exit the survey without submitting their responses at any time. No participant compensation was provided. The questionnaire was designed to delineate in

addition to demographic information, experience, practices, and beliefs among surgeons with regard to the use of autologous fat for contour restoration.

Results: The survey was completed by 62 ISPRES members, with 93.5% of the participants having Plastic Surgery Board Certification Status. The mean age of the surveyed members was 53 (9.7). The majority of the members (69.4%) work predominantly in aesthetic plastic surgery.

Experience with Large-volume Fat Grafting Donor Site Selection: The most commonly used donor area selection criteria were based on the patient's fat availability (59.7 percent). In addition, 35.5 percent said they preferred to go directly to the abdomen, and only three (4.8 percent) said the patients chose the donor area. Nevertheless, when asked which zones they prefer to remove fat, when possible, abdomen (88.7%) was the commonest site, followed by flanks (62.9 percent).

Fat Grafting Harvesting Infiltration Solution, Harvesting Instrument and Technique: The most common infiltration solutions used in high volume fat transfers are the 3: 1 ratio tumescent solution (41.9 percent), secondly the super wet solution (40.3 percent) and thirdly the wet solution {100-300 ml of liquid (with or without epinephrine) at each site to be treated} (14.5 percent).

Most respondents chose multiple options for the preferred cannula size, tip, holes and method used for fat harvest. The most common instrument preferred for large-volume fat harvesting amongst the respondents are 3-4mm cannulas (69.5 percent). Respondents' preference of type of cannula tip and holes for fat harvest in large-volume procedures were the three-hole standard cannulas. Handheld suction (59.7 percent) was the most preferred fat harvest method followed by vacuum machine suction (46.8 percent.)

Fat Graft Processing: Following fat harvest, 56.5 percent (n=35) respondents (without exclusivity) performed decantation of fat, 43.5 percent performed centrifugation. Routine addition of PRP (platelet-rich-plasma) and adipose stem cells have been reported by 12.9 percent and 9.7 percent respondents respectively. Furthermore, 13 respondents report employing additional processing steps to isolate, prepare and store adipose stem cells.

Fat Injection: For handheld injections (without exclusivity), respondents prefer 1-2mm cannula with 1cc syringe (58.1 percent), closely followed by 1-2mm cannula with 10cc syringe (56.4 percent).

Assessment of Outcome: Preoperative and postoperative picture evaluation (59.6 percent) and clinical assessment (20.9 percent) were the most commonly used for assessment of fat graft survival by respondents. Only 14.5 percent of participants use preoperative and postoperative 3D images to evaluate.

Fat Transfer in Cosmetic Breast Augmentation and Application of Pre-expansion Devices for Breast Augmentation: The most commonly preferred plane for fat injection in cosmetic breast augmentation were gland and subcutaneous tissue. Only 8.1 percent (n=5) respondents routinely use pre-expansion devices for breast augmentation before fat grafting.

Experience with Small-volume Fat Grafting: The majority (53.3 percent) of the responders performed none or less than 25 percent of the small volume fat grafts under general anesthesia. Although there are almost 29 percent of surgeons who apply general anesthesia in 50 percent or more of them, being that 8 percent of them perform almost all surgeries with general anesthesia.

Conclusion: Evidence-based studies incorporating randomized controlled, prospective, multicenter trials are imperative to understand which variables influence positive fat grafting clinical outcomes. Our research shows preliminary findings analyzing the current practices and preferences of the ISPRES community. The respondents' tendencies were similar to previous literature, with some exceptions, such as the technique for preparing fat and enrichment, as well as the disparity in responses in the use of cannulas.

Amputation Acceptance: A Survey of Factors Influencing the Decision to Undergo Lower Extremity Amputation

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Objectives: Losing a limb redefines a patient's identity and functionality. Accepting to undergo amputation is an arduous process often fraught with confusion, fear, and uncertainty. To assess the most effective methods to facilitate discussions with at-risk patients, we surveyed recent lower extremity (LE) amputees treated at a tertiary limb salvage center to assess their experiences surrounding this decision-making process.

Methods: Following IRB approval, patients who underwent LE amputation at MedStar Georgetown University Hospital from October 2020 to October 2021 were asked to complete a five-item phone survey assessing their decision to undergo amputation and their overall satisfaction after the procedure. Patient demographics, comorbidities, operative details, and complications were collected using electronic medical records.

Results: Of 89 LE amputees identified, 41 (46.1%) responded to the survey. Mean age and body mass index were 59.7+/-15.5 years and 31.7+/-7.0 kg/m2, respectively, with a mean Charlson Comorbidity Index score of 5.4+/-2.7. The most common indication for LE amputation was infection (n=22, 53.6%), followed by ischemia (n=9, 21.9%). The majority of patients underwent

below-knee amputations (n=34, 82.9%) and received targeted muscle reinnervation (TMR; n=30, 73.2%) or regenerative peripheral nerve interface (RPNI; n=7, 17.1%). Postoperatively, seven patients (17.1%) experienced complications which required return to the operating room. Complications most commonly included dehiscence (n=5, 12.2%) or infection (n=3, 7.3%). At a mean follow-up of 5.9+/-3.5 months, 20 patients (48.8%) were ambulatory.

Surveys were completed at a mean 7.4+/-4.0 months since amputation. The most cited reasons that helped patients decide to undergo LE amputation included discussions with their doctors (n=32, 78.0%), concern for worsening health if they did not undergo amputation (n=19, 46.3%), and advice from friends and family (n=14, 34.1%). Worsening ability to walk (n=18, 45.0%) was cited as the most common concern about undergoing amputation. Other concerns included worsening health (n=7, 17.5%), undergoing surgery itself and postoperative recovery (n=7, 17.5%), and having to make the decision quickly due to life-threatening circumstances (n=7, 17.5%). However, 11 patients (27.5%) reported no concerns with undergoing amputation. When asked about ways the surgical team could have eased the decision process, many had no additional recommendations (n=19, 47.5%). In comparison, 22.5% (n=9) stated that speaking with other amputees would have aided in their decision. Most patients were pleased with their decision to undergo amputation (n=38, 92.7%).

Conclusion: Patients primarily cited satisfaction with their decision to undergo LE amputation and that they would not recommend additional changes to their surgical decision-making process. Nevertheless, it is critical to consider factors that affect patients' decisions and their recommendations to improve the decision-making process to undergo LE amputation. Additionally, using functional-based amputations and pain reduction techniques (i.e., TMR or RPNI) may have uniquely impacted our patient population to provide satisfying postoperative results.

Financial Literacy and Plastic Surgery Residency: Knowledge Gaps and the Way Forward

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Background: Medical training is known to impose a large financial burden on most trainees, which additionally has been shown to contribute to burnout and even possibly compromising patient care.1–3 Financial literacy allows for management of financial situations that effect both professional and personal life. We aimed to evaluate the current financial status and knowledge amongst Plastic Surgery residents.

Methods: A 33-item survey querying financial status and financial literacy of plastic surgery residents was sent to all the current accredited US residency programs through the American Council of Academic Plastic Surgeons. A descriptive analysis was performed, and multiple Fisher's Exact tests evaluated comparisons.

Results: Eighty-six residents were included. Most of the trainees had a student loan (59.3%), with 22.1% having more than $300k, and a majority had at least one personal loan debt other than educational (51.1%). Most of the residents who "never" or "rarely" paid their monthly balance off had ≥$300k student loan debts (66.7%) compared with those who "sometimes or very often" (33.3%) or "always" (19.3%) paid their balance off (p=0.041). A total of 17.4% of trainees did not have a plan for how to invest their retirement savings, whereas 55.8% reported not knowing how much they need to save to retire. Regarding their opinion on financial literacy, 20.9% of trainees did not feel prepared to manage personal finances/retirement planning after graduation, 52.3% stated not having any formal personal finance education as part of their curriculum, 45.3% felt dissatisfied with the financial literacy offered during training, and 89.5% agreed that financial literacy education would be beneficial.

Conclusion: Many residents are lacking in knowledge of personal finance, despite most having significant debt. Additional financial literacy education is critically needed in Plastic Surgery training. Curricula development at a graduate medical education or national society level are possible paths towards a coordinated response towards this need.

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Surgeon Reimbursement for Breast Reduction Surgery – Trends Over the Past Decade

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Purpose: Bilateral breast reduction (BBR) surgery is commonly performed by plastic surgeons. Between 2010 and 2020, Medicare reimbursement for plastic surgery procedures increased by about 2% as inflation has increased by about 19%. Declining reimbursement may result in plastic surgeons opting for cash-only practice. Given the lack of data on reimbursement trends, we sought to evaluate trends in surgeon reimbursement for BBR.

Methods: A retrospective chart review was performed of all staff plastic surgeons at an academic medical center in New England for BBR (CPT 19318-50) performed between October 2011 and September 2021 (FY 2012-2021). Top three private payors are referred to as Insurers #1-3. Payments were adjusted for inflation and converted to the equivalent 2021 USD value using Consumer Price Index data. Outliers were removed using the z-score method. To determine differences between adjusted payments, a one-way ANOVA test was performed with Tukey's and Dunnett's post-hoc test. Payments are reported as mean ± standard deviation. A p-value <0.05 was considered statistically significant.

Results: During the study period, 486 patients underwent BBR. Of those, payments for 36 procedures were outliers resulting in inclusion of 450 payments. Private payors had the highest yearly average reimbursements, with Insurer #1's reimbursement of $3875 ± $200.40; and Medicaid had the lowest yearly average of $1376 ± $62.66. All three private payors had a significantly higher average reimbursement when compared to Medicare ($p<0.0001$; 119.6%, 122.7%, 61.21%, respectively for Insurers #1-3). There was a significant difference in average yearly reimbursement between the three private payors. Reimbursements for Insurers #1, #2 were comparable ($p=0.880$); however, reimbursements for both Insurers #1, #2 were remarkably higher than for Insurer #3 (by about 37%, $p<0.0001$).
Three payors were found to have a significant change in reimbursement when compared to inflation. Insurer #1 had a significant increase over the study period, averaging $46.13/year ($p=0.023$). Medicare reimbursements significantly declined averaging -$58.58/year ($p=0.033$), as tracked along the published CMS Facility Price (CMS-FP), -$19.89/year.
Using CMS-FP as control, only Medicare trended negatively. The rest of the payors trended positively with Insurers #1, #2 having significant average yearly increases.

Conclusion: The data from this study reveals valuable information for hospitals and surgeons. First, significant differences in reimbursement between private payors were noted. Second, changes in private payor reimbursement were found not to track changes in Medicare reimbursement, making Medicare an unreliable benchmark. Third, not all payors outpaced inflation. Specifically, only two payors trended higher than inflation (both private); albeit only one being significant.

This study also revealed a couple of trends that warrant further investigation. We found a discrepancy between listed CMS-FP and Medicare reimbursements, with Medicare reimbursements trending down in comparison to the CMS-FP. This is concerning because CMS-FP represents CMS's advertised reimbursement, so a deviation, specifically a negative one, warrants further investigation. We also found Medicaid reimbursements changed at nearly the same rate as CMS-FP, suggesting a pegging of the two rates. Future studies on regional healthcare disparity may need to focus on state-specific variations in the relationship between respective Medicaid and Medicare.

Do Corporate Payments Influence Research Related to the Use of Acellular Dermal Matrices in Breast Surgery?

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Background: No study has assessed the impact of financial conflicts of interests (COI) on the reporting of breast reconstruction outcomes with acellular dermal matrix (ADM) in peer-reviewed publications. We hypothesized that there is: (1) an association between financial COI and likelihood of studies reporting benefits in using ADM, and (2) inconsistent reporting of financial COI.

Methods: The PubMed database was used to identify articles that reported on the use of ADM in breast surgery in four leading plastic surgery journals from January 2014 to December 2019. Financial COI for authors were determined using the open payments database.

Results: Fifty-five articles were included. Twenty-four (43.6%) articles supported the use of ADM, 12 (21.8%) did not promote ADM use and 19 (34.5%) were neutral. 92.7% (n=51) of studies had either a first or senior author with a COI and authors with a COI more commonly reported positive outcomes (p=0.02). Studies with positive outcomes featured first authors who received significantly larger financial payments ($95,955 vs. $15,642, p= 0.029) compared to studies with negative or neutral outcomes. ROC curve demonstrated studies with first authors receiving over $376.28 were more likely to report positive results. Eight senior authors and three first authors received greater than $500 from ADM producers yet did not report any financial disclosure.

Conclusions: Financial COI is associated with a higher likelihood of studies reporting benefit of using ADM in breast surgery. There remains inconsistent reporting of COIs and better oversight is needed to ensure unbiased publication on the use of ADM in breast surgery.

Physician Assistants in Academic Plastic and Reconstructive Surgery: Results of a National Survey

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Purpose: Physician Assistants (PA) have become an essential part of the healthcare team who improve access and optimize patient care. As PAs continue to increase in the workforce, a better understanding of the impact and current utilization of PAs in Plastic and Reconstructive Surgery is needed. The purpose of this study was to evaluate the role and scope of practice of PAs in academic plastic surgery, as well as characterize current trends of PA utilization, compensation, and insight into the overall perceived value from a PA perspective.

Methods: An anonymous survey was distributed electronically via SurveyMonkey. The survey was sent to practicing PAs at academic plastic surgery programs via an American Council of Plastic Surgeons (ACAPS) program administrators' group. While the survey was open three weekly electronic reminders were sent. The survey consisted of 50 total questions separated into five sections: role, management, benefits, compensation, and value. Statistical analysis included the use of descriptive statistics using SurveyMonkey software.

Results: Eighty-seven academic programs were contacted. 32 programs responded and 115 PAs were identified to work within PRS at their given institution. Ninety-one PAs completed the survey in its entirety resulting in a response rate of 79%. The years of experience in plastic surgery ranged from <1 year to 15 years. The most common practice environment included outpatient clinics followed by the operating room and inpatient care. 72.53% of surveyed PAs ran independent clinics with visit types including new and established patient evaluations, postoperative care, and minor procedures. Over 24% of respondents reported performing independent office procedures. With respect to inpatient care responsibilities, 25.27% of surveyed PAs perform emergency room consultations and 28% perform independent inpatient consultations. Most commonly, respondents supported multiple surgeons (45%) as opposed to one surgeon's practice (38.46%). For 56.82% of respondents, compensation is based on a tiered system that accounts for specialty and relevant experience. The other 43% reported all Advanced Practice Providers are on the same pay scale regardless of their specialty and primary place of work. Due to the complexity of plastic surgery skills, some report a "clinical skills pay increase" once they complete specified criteria for training. When asked if our respondents felt valued at their institution as an academic plastic surgery PA, 56.18% feel valued "most of the time". When asked what measures would make PAs feel more valued, we had multiple responses of "work-life balance", "improved compensation", "performing up to our scope of practice".

Conclusion: This study explored the roles and responsibilities of PAs in Plastic and Reconstructive Surgery in academic medicine. We found that PAs are involved in various practice locations and with a multitude of responsibilities. As academic plastic surgeons have pressures to be clinically productive, prolific in research, and rise in the academic ranks, the ability for PAs to support the surgeons becomes more important. For this collaboration to have ultimate success, ensure job satisfaction, and improve patient care, PAs need to be supported in their roles, compensated fairly, and given opportunities to grow professionally.

Perceptions of Plastic and Reconstructive Surgery Among Latino Medical Students

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Background: Latinos remain underrepresented in the field of Plastic and Reconstructive Surgery (PRS). Many PRS departments and divisions have recently endorsed efforts to increase diversity in the field. In this study, we surveyed Latino students about their perception of the field of plastic surgery and barriers to entry.

Methods: Under institutional IRB approval, electronic surveys were distributed to medical students in the Latino Medical Student Association (LMSA) via LMSA chapter presidents and medical school student listservs with support from the national leadership. Survey data was collected using Qualtrics (Seattle, WA) and statistical analysis was performed using STATA/SE 17 software (College Station, TX).

Results: Forty-nine members of the LMSA were surveyed. Most were female (67.4%, n=33) and identified as Hispanic/Latino (97.96%, n=48). Respondents were racially heterogenous, with 46.9% identifying as mixed-race Hispanic/Latino and at least one other racial category (n=23). Most respondents spoke both English (65.3%, n=32) and Spanish (75.5%, n=37) at home, half reported Spanish as their first language (51.0%, n=25), and most reported proficiency in Spanish (75.5%, n=37). Almost all respondents were concerned about minority representation in PRS (98.0%, n=48) and 55.1% "strongly agree" or "slightly agree" that they would be more likely to apply to integrated PRS residency if minorities were better represented (n=27). Additionally,

55.1% of students "strongly disagree" or "slightly disagree" that national PRS organizations and their respective medical schools have an interest in recruiting minorities into PRS (n=27). Using Pearson's Correlation, a significant association was found between students who endorsed PRS as a realistic career option and those who reported availability of PRS attending mentors (r=0.36, p=0.01) and PRS resident mentors (r=0.34, p=0.02). Importantly, a significant association was also found between the number of generations a student's family has been living in the US and the belief that PRS is a realistic career option (r=0.28, p=0.05). A correlation was noted between speaking Spanish in the childhood home and being more likely to pursue PRS if underrepresented minorities were better represented (r=0.30, p=0.037).

Conclusion: Latino medical students are concerned about representation within PRS and would be more likely to pursue plastic surgery residency if representation was higher. Mentorship is critical to all students' interest in PRS, especially among underrepresented students. First- and second-generation students and students who spoke Spanish growing up are particularly sensitive to Latino representation within PRS. Feelings of inclusion and established mentorship structures are essential to increasing the number of underrepresented medical students within the field of plastic surgery.

Health Literacy Among General and Plastic and Reconstructive Interest Population

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Purpose: The United States population has varying levels of health literacy (HL), which impacts patient care and clinical outcomes. However, little is known regarding the levels of HL among plastic and reconstructive surgery (PRS) patients compared to the general population. Therefore, this study aims to characterize HL of PRS patients and those interested in PRS. Moreover, this study aims to assess potential risk factors for low levels of HL among this population.

Methods: Amazon's Mechanical Turk (MTurk) platform was used through October 2021 in an IRB-approved cross-sectional study to survey adults aged 18 or older residing in the U.S. Respondents self-reported their experience or interests in PRS, and their HL was assessed using the validated Chew's Brief Health Literacy Screener. The cohort was broadly divided into two groups: (1) a no-PRS group containing participants with no background nor interest in PRS; and (2) a PRS group containing participants interested in or who previously had any PRS. Two subgroups were created with interest or experience in: (1) cosmetic surgery or (2) reconstructive surgery, and two additional subgroups with no interest or experience in: (3) cosmetic surgery, and (4) reconstructive surgery. Differences were evaluated using unpaired t-test and Fisher's

Exact tests for continuous and categorical variables, respectively. A multivariable logistic regression model was constructed to assess associations between levels of HL and socio-demographic characteristics.

Results: A total of 510 responses were included and analyzed in this study. 159 (69%) participants pertain to the PRS group and 351 (31%) to the non-PRS group. The mean age was 38.3 SD 13.0 and 39.0 SD 11.9 for the PRS and non-PRS groups, respectively. The non-PRS group had more males (60%) compared to the PRS group (43%). Most of the cohort self-identified as white (83% in the PRS group vs. 84% in the non-PRS group), and non-Hispanics (80% in the PRS group and 79% in the PRS group). Gender (<0.001) and ethnicity (p 0.048) showed a statistically significant difference between groups. Low levels of HL in the non-PRS and PRS groups showed no statistically significant difference (p 0.718). Notably, a statistically significant difference in HL levels was evidenced between non-reconstructive vs. reconstructive groups [0.29 OR, 95% CI (0.15 – 0.58), p <0.001), not seen between the non-cosmetic and cosmetic groups. Age [1.03 OR, 95% CI (1.01 – 1.04), p <0.001) and being non-Hispanic (0.60 OR, 95% CI (0.37 – 0.94, p 0.028) were significant.

Conclusion: PRS patients' HL is representative the U.S. population, with almost half of the participants having low HL. This highlights the importance of adequately assessing HL levels among PRS patients in both clinics and the hospital setting. Reconstructive patients had notably higher levels of HL than patients who had not undergone any reconstructive procedures, potentially indicating that experience in reconstructive surgery can improve HL. This could also partly be attributed to the inherent complexity of reconstruction necessitating increased patient education for informed consent. Our study encourages providers to assess patient HL with evidence-based techniques, such as the teach-back method, to provide appropriate level patient counseling.

Travel Distance and National Access to Gender Affirming Care

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Introduction: Gender-affirming care (GAC) across the United States is unequally distributed due to resource allocation, state-based regulations, and availability of trained physicians. Across the country, it is common for those who seek GAC to travel vast distances to receive care. Increasing barriers of physical distance, travel expenses, and forgone wages make receiving care more difficult. Providing coverage for necessary checkups and any GAC-associated emergency

is extremely inconvenient, if not impossible, for most patients and providers. For context, consider the fact that the average patient travels 19 miles to receive cardiac valve surgery and lives within 2 hours of ground transport to a verified burn center.1,2 This study aims to describe distances patients travel to receive GAC based on procedure type and patient home-of-record location.

Methods: Patients in the Optum Clinformatics Data Mart that underwent surgical GAC were identified via CPT codes. Data on patient demographics, procedural care, and location for patient and provider were collected. To be included, a patient had to meet diagnostic criteria to receive surgical GAC and have a recorded surgical procedure that was reimbursed as part of GAC surgery. Patients residing or receiving care outside the continental U.S. were excluded. Driving distances between the zip code of each patient's home-of-record and the zip code of the state's geometric centroid where the GAC was performed were calculated via the Google Maps Distance Matrix API. Distance traveled for GAC by patient geographic region, patient state, and GAC procedure (defined by CPT code) were determined. Distance-to-care was determined for other procedures of varying regularity and compared to distance-to-care for different GAC procedures.

Results: Across 86 million longitudinal patient records, the study population included 2,964 patient records corresponding to 1,902 patients who received GAC between January 2003 and June 2020. The median distance traveled for the procedures was 184 miles (mean: 391.5). Patients undergoing male-to-female transition, female-to-male transition, intersex transition for clitoroplasty, and vaginoplasty traveled an average of 910, 1164, 422, and 354 miles, respectively. Patients with reported home-of-record in South Dakota traveled the farthest for an average distance of 870 miles. Patients with reported home-of-record in Vermont traveled the least for an average distance of 59 miles.

Conclusions: These results shed light on the massive accessibility gap many individuals face in the United States in their odyssey to receive GAC. Restrictive guidelines imposed by state laws on both the access to and provision of GAC compound the myriad of common difficulties that patients face, to include covering the cost of their care and other access issues. It is imperative to discuss potential factors that may mitigate these overwhelming barriers that currently exist for those who require GAC.

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Ready To Launch: Making The Jump To Department Status

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Purpose: The first plastic surgery department was founded at the University of Virginia in 1960; since then, only 19 other plastic surgery units have founded independent departments. By comparison, peer surgical specialties – orthopedics, neurosurgery, otolaryngology – have largely transitioned to forming independent departments. The remaining divisions of plastic surgery have unique strengths and weaknesses that may be leveraged in attaining department status. However, the criteria for becoming a department remain unclear. Here we characterize the academic variables that define departments of plastic surgery and identify which divisions closely resemble their peer departments, thereby recognizing the programs that may be next to succeed as independent departments.

Methods: Divisions and departments of plastic surgery with integrated and/or independent residency programs were identified from the American Council of Academic Plastic Surgeons website. Data were collected from institutional websites. Variables of interest included the year of integrated residency program founding and the number of residents, fellows, research faculty, research laboratories, and clinical faculty within the division or department. We also found the number of peer faculty within cardiothoracic surgery and otolaryngology at the same institution. Ratios of plastic surgery faculty to the faculty of peer surgical subspecialties were calculated at that institution. Divisions and departments were compared with a Mann-Whitney test. Variables for individual plastic surgery divisions were compared to the medians for plastic surgery departments. The ten divisions most closely resembling departments of plastic surgery were identified.

Results: 98 academic units of plastic surgery in the US were identified (Departments, n=20; Divisions, n=78). Academic plastic surgery departments tended to have older integrated residency programs (median: 17 years vs. 9 years, p=0.002) and more residents (median: 16 vs. 12, p=0.027), research faculty (median: 0.5 vs. 0, p=0.001), research laboratories (median: 1 vs. 0, p=0.015), full-time faculty (median: 11.5 vs. 8, p=0.047), and full professors (median: 3.5 vs. 2, p=0.045). Departments also tended to have a larger relative size when compared to cardiothoracic surgery (median ratio: 1.42 vs. 0.82, p=0.002) and otolaryngology units (median ratio: 0.61 vs 0.46, p=0.041). We identified 10 programs that closely resembled their peer departments for a majority of these variables (Brigham and Women's Hospital-Harvard, Brown University, Duke University, Nassau/Stony Brook, Stanford University, University of Texas Medical Branch, University of Washington, Washington University in St. Louis, and Yale University).

Conclusions: Plastic surgery department status at an academic institution allows the entity to chart its own course. Historically, plastic surgery has found itself as a subsection within departments of surgery. In 1960, the transition towards independent plastic surgery departments began. However, this change has been slow. The decision to become a department is

multifactorial and unique to each specific institution. Identifying important characteristics of plastic surgery departments can help divisions recognize their relative strengths and weaknesses to assess a possible jump to department status. Here we have identified 10 divisions that appear most well-positioned to succeed as independent departments. Further investigation is needed to characterize other factors in academic succession, including the financial metrics of successful departments of plastic surgery.

Postoperative Antibiotics are Associated with Increased Complications following Fat Grafting for Breast Reconstruction

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Introduction: Autologous fat-grafting following breast reconstruction is a commonly used technique to address asymmetry and irregularities in breast contour. While many studies have attempted to optimize patient outcomes following fat-grafting, a major factor that has yet to be fully explored in fat grafting is the optimal use of peri- and postoperative antibiotics. Reports suggest that complication rates for lipografting are already low relative to those experienced following reconstruction and have been shown to not be correlated to antibiotic protocol. Studies have even shown that the use of prolonged prophylactic antibiotic substances do not lower the complication rates, stressing the need for a more conservative, standardized antibiotic protocol.

Methods: Patients in the Optum Clinformatics Data Mart who underwent all billable forms of breast reconstruction followed by fat grafting were identified via CPT codes. Patients meeting inclusion criteria had an index reconstructive procedure at least 90 days before fat grafting, while patients with unrelated invasive procedures within 90 days of fat-grafting were excluded. Data concerning these patient's demographics, comorbidities, breast reconstructions, perioperative and postoperative antibiotics, and outcomes were collected via querying relevant reports of CPT, ICD-9, ICD-10, NDC, and HCPCS codes. Antibiotics were classified by type and temporal delivery -- peri-operatively or postoperatively. If a patient received postoperative antibiotics, the duration of antibiotic exposure was recorded. Outcomes analysis was limited to the 90-day postoperative period. Multivariable logistic-regression was performed to ascertain the effects of age, race, coexisting conditions, reconstruction type (autologous or implant-based), perioperative antibiotic class, postoperative antibiotic class, and postoperative antibiotic duration on the

likelihood of any common postoperative complication occurring. All statistical assumptions made by logistic regression were met successfully. Odds ratios and corresponding 95% confidence intervals were calculated.

Results: From over 86 million longitudinal patient records, our study population included 4,661 unique records of reconstruction-fat grafting pairs corresponding to 3,926 patients who underwent fat grafting between March 2004 and June 2019. Independent predictors of complications and their effect sizes, odds ratios, and 95% confidence intervals were generated by a multivariate logistic regression model. Tobacco use, prior irradiation, and longer postoperative antibiotic regimens were independent predictors of increased complication likelihood. In the model, an additional day of postoperative antibiotic administration multiplies the odds that a patient experiences a complication by a factor of 1.131. Therefore, the odds that a complication occurs are nearly two and a half times higher for a patient that undergoes a week-long postoperative antibiotic regimen than that of a patient receiving no postoperative antibiotic treatment.

Conclusion: This study provides national, claims-level support for antibiotic stewardship following fat-grafting procedures. No single antibiotic type conferred a statistically significant benefit to patient outcomes following fat grafting, while increasing the duration of any postoperative antibiotic regimen conferred a statistically significant increase in the likelihood that a patient experienced a complication. These findings may encourage the adoption of more conservative postoperative antibiotic prescription practices for clinicians that perform breast reconstruction followed by fat grafting, potentially curbing the likelihood of postoperative complications.

The Scope of Plastic Surgery: The Unfortunately Narrow Public Perception of Our Broad and Diverse Specialty

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Background: The term Plastic Surgery derives from the Greek word plastike, meaning the art of sculpting or molding.1 The profession dates back to approximately 800BC where forehead flaps were utilized to reconstruct noses in India.1 Today, plastic surgery is one of the most romanticized fields in medicine. Due to the influence of social media surgeons and reality TV, there has never been a larger spotlight on the profession. Ironically, this spotlight brings a narrowed perception of the scope of plastic surgery in the eyes of the layperson.2 The field of plastic surgery can be further divided into its subspecialties such as aesthetics, reconstruction, craniofacial, hand, and microsurgery. In 2020, the Plastic Surgery Statistic Report estimated 6.8 million reconstructive surgeries were performed; three times more than the 2.3 million for

cosmetic surgery.3 This study aims to assess the scope of plastic surgery through the eyes of the average American to identify gaps in public knowledge needing to be addressed in order to better represent the field.

Methods: A series of 47 questions were developed under the supervision of faculty survey methodologists and administered by Qualtrics®. Survey responses were gathered, and data was analyzed to assess the public's knowledge of the scope of plastic surgery.

Results: Two thousand five hundred individual responses were obtained balanced across regional, racial, and gender demographics similar to that of the United States. When asked what surgical specialties the respondent would feel comfortable with performing a tummy tuck or face lift, 67.8% and 63.3% of respondents chose plastic surgery. When asked about non-aesthetic procedures, respondents showed a dramatic drop in their willingness to choose plastic surgery. For example, when asked what specialties the respondent would feel comfortable repairing a broken hand, 5.4% chose plastic surgery. Only 5.36% and 6.28% of respondents felt comfortable with a plastic surgeon performing lymphedema surgery and carpal tunnel release, respectively. While 57.64% would seek a "nose job" from a plastic surgeon, only 34% would feel comfortable with repair of a broken nose. The strict association between plastic and aesthetic surgery is further displayed when 81.51% believe it is required to complete a plastic surgery residency to legally perform cosmetic surgery.

Conclusion: The data collected by this survey demonstrates a persistent gap in public awareness of plastic surgery as a field and the scope of plastic surgery outside of typical aesthetic procedures that are dramatized by the media. There remains no clear or consistent understanding of the qualifications of plastic surgeons or the provider makeup of the field of cosmetic surgery. Subfields such as hand surgery and craniofacial surgery proved to be overlooked by the public, and knowledge of board certification within the field was exceedingly sparse. Further effort is needed to educate both the general public and prospective patients of the scope of plastic surgery, so that they might seek and gain access to appropriate treatment in the most efficient manner to optimize outcomes regarding the form and function of the body.

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An Analysis of Volume and Cost of the Most Popular Cosmetic Plastic Surgery Procedures: 2010-2018

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Purpose: An understanding of trends in cosmetic procedures and their associated fees is important for a successful plastic surgery practice. Recent studies have demonstrated that Medicare reimbursement for craniofacial, reconstructive, and a variety of common plastic surgery procedures have not kept up with rates of inflation.1-3 The purpose of this study was to evaluate trends in volume and prices for the most popular cosmetic procedures in the United States from 2010-2018.

Methods: The estimates of the total number of 28 cosmetic surgical and 14 minimally invasive procedures and the national average surgeon fee for each were collected from the American Society of Plastic Surgeons Report of Plastic Surgery Statistics from 2010-2018. Of these procedures, the most commonly performed surgical and minimally invasive procedures performed annually were identified. The United States consumer price index was used to adjust surgeon fees for inflation to the 2018 US dollar. The average annual and overall percent changes in the volume of most common procedures performed and changes in surgeon fees for each were calculated and analyzed to determine both changes in popularity of procedures as well as changes in price point relative to inflation during the study period.

Results: The overall number of total cosmetic surgical and minimally invasive procedures increased by 16% and 21% respectively between 2009 and 2018. The most common procedure performed, Botulinum Toxin Type A injection, increased the most in popularity rising from 5.4 million injections in 2010 to 7.4 million injections in 2018. The average surgeon fee increased for each of the most common cosmetic surgical procedures. While the increased average price of liposuction, rhinoplasty, abdominoplasty, and rhytidectomy outpaced that of inflation by 7-9%, the fees for breast augmentation and blepharoplasty were found to have decreased adjusted costs of -0.24% and -2.44% respectively. In contrast, of the most popular minimally invasive procedures, only the fee for hyaluronic acid based soft tissue fillers were found to have an increased with an adjusted cost of 9% above that of inflation.

Conclusion: This study evaluated recent trends in popularity and fees associated with cosmetic surgical and minimally invasive procedures. When surgeon fees were adjusted for inflation, the fees for the most popular minimally invasive cosmetic procedures decreased on average by 14% while the fees for the most popular surgical procedures increased by 4% when adjusted for inflation. Knowledge and understanding of trends in popularity of cosmetic procedures and their average fees is essential for the informed cosmetic plastic surgery practice.

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Trends in Popularity of Cosmetic Plastic Surgery Procedures by Age and Gender: 2010-2018

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Purpose: As cosmetic plastic surgery has continued to grow in popularity across the United States, it is important that plastic surgeons examine trends in cosmetic procedures and how they relate to both gender and age. A thorough understanding of these trends is important when it comes to running a successful practice. The purpose of this study was to evaluate trends in popularity of the most common plastic surgery procedures performed based upon patient gender and age from 2010-2018.

Methods: The estimates of the total volume of 28 surgical and 14 minimally invasive cosmetic procedures performed annually were collected from the American Society of Plastic Surgeons Report of Plastic Surgery Statistics from 2010-2018. Of these procedures, the most common surgical and minimally invasive procedures performed annually were identified for males and females as well as within the age categories 13-19, 20-29, 30-39, 40-54, and 55+ years old. The average annual and overall percent changes in the volume of the most common procedures performed were collected and analyzed by gender and age group to determine trends in the popularity of surgical and minimally invasive procedures performed.

Results: The overall number of cosmetic surgical and minimally invasive procedures increased by 16% and 21% respectively between 2010 and 2018. Women were found to comprise 87% of surgical and 92% of minimally invasive patients, with no change in gender composition found throughout the study period. Rhinoplasty in men and breast augmentation in women were the most performed surgical procedures comprising 27% and 21% of total procedures in their genders respectively. The volume of liposuction performed increased by 55,452 procedures per year, or more than 27%, and its popularity increased the most of any surgical procedure across all age groups. The most commonly performed procedure in both males and females as well as those above the age of 30 was Botulinum Toxin Type A injection. More than 6.5 million injections of Botulinum Toxin Type A were given on average per year comprising 50% of all minimally invasive procedures.

Conclusion: This study evaluated recent trends in popularity of surgical and minimally invasive cosmetic procedures by age and gender. While surgical procedure differed in popularity for each gender, the most popular minimally invasive procedure, Botulinum Type A injection, was found to be the same for males and females as well as for those over the age of 30. Evaluating trends in popular cosmetic procedures by age and gender can help plastic surgeons better manage their practice and focus their marketing efforts.

Advanced Practice Providers in Plastic Surgery: What Are The Financial Implications For Top Of License Practice?

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Purpose: The purpose of this study is to examine economic and financial trends of PAs and NPs practicing in plastic surgery and correlate with the top of license practice in our own institution.

Methods: We conducted a narrative review of the medical literature using the following databases: PubMed, CINAHL, Web of Science Core Collection, and Scopus. Research terms were restricted to the following: physician assistants, physician extender, nurse practitioners, advanced practice provider, costs and cost analysis, cost-benefit analysis, hospital costs, financial and employment/economics. We compared this information to the current top of license APP practice at our own institution.

Results: We identified 114 full-text articles (2010-2021), 3 of which met our inclusion criteria. The 3 articles reported on the financial impact of employing PAs and NPs in general plastic surgery, Oral and maxillofacial surgery, and breast reconstruction. There is a significant paucity of research on the direct and indirect economic impact of APPs in plastic surgery practices in the United States; however, our institutional first quarter data results demonstrate an increase in 188% collections when compared to the previous year.

Conclusion: While emerging research seems to suggest downstream clinical and financial benefits of APPs in plastic surgery, the scarcity of literature makes it difficult to draw any conclusions about the financial and differential effects of employing physician extenders in plastic surgery practices. However, at our institution top-of-license practice appears to be resulting in a financial benefit.

National Institutes of Health Funding to Plastic Surgeons: An analysis of the past 25-years

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Introduction: Surgeon-scientists have a unique role in research innovation and translating between the bench and bedside. The National Institute of Health (NIH) is the largest biomedical and health research funding agency in the U.S. With the rising challenge of complex human diseases, surgical research offers an invaluable investment to develop innovative clinical solutions. Plastic surgeons, who operate across multiple organ systems, are uniquely positioned in this effort. In this study, we examine the NIH funding profile of plastic surgeons. We hypothesize that NIH funding to plastic surgeons is limited, particularly for female plastic surgeons.

Methods: NIH-funded plastic surgeons were identified from NIH RePORTER from 1995 to 2020. Plastic surgeons were defined as MD or MD-PhD faculty with board certification in plastic surgery. Research project grants (RPGs) included grants with the following activity codes: DP1/2/3/4/5, P01, PN1, PM1, R00/01/03/15/21/22/23/29/33/34/35/36/37/61/50/55/56, RC1/2/3/4, RF1, RL1/2/9, RM1, UA5, UC1/2/3/4/7, UF1, UG3, UH2/3/5, UM1/2, and U01/19/34. These grants were selected to match the NIH's definition of research project grants, inclusive of small and large grants. Gender was determined by pronouns and image on institutional and Doximity profiles.

Results: Between 1995 and 2020, 366 NIH RPGs were awarded to 45 plastic surgeons. Most grants were awarded by the National Institute of General Medical Sciences (25.14%), the National Institute of Dental and Craniofacial Research (23.77%), and the National Institute of Arthritis and Musculoskeletal and Skin Disease (11.75%). 273 grants (74.59%) were R01 grants, and 38 (10.38%) were R21 grants.

Among the 45 NIH-funded plastic surgeons, 22 (42.22%) were from the top 10 research-ranked institutes. Eight NIH-funded plastic surgeons (17.78%) were females. However, of the 366 RPGs awarded to plastic surgeons between 1995 and 2020, 89 (24.32%) were awarded to female plastic surgeons. Therefore, compared to their representation, female plastic surgeons hold more than their share of NIH grants. Over time, the number of NIH-funded female plastic surgeons increased at a rate of 0.10 per year, from one NIH-funded surgeon in 1995 to 4 in 2020 ($p=0.0003$). The growth of male NIH-funded plastic surgeons was slower; the number of male NIH-funded plastic surgeons increased from 7 in 1995 to 10 in 2020, or 0.03 per year ($p=0.37$). On average, plastic surgeons receive their first grant 7.0-years after their first faculty appointment. Female and male plastic surgeons have similar average time to first grant (male: 7.08-years, female: 6.87-years, $p=0.91$).

Conclusions: In the past 25 years, the number of NIH-funded plastic surgeons had increased minimally, with only significant gains in the number of NIH-funded female plastic surgeons.

Notably, despite an increase in number of NIH-funded investigators, the number of NIH-funded plastic surgeons remains small. The plastic surgeon-scientist plays a unique role in conducting translational research that supports innovative patient care. Some surgical subspecialties, such as ENT and Vascular surgery, support surgeons who wish to pursue NIH-funded research in collaboration with the NIH. Plastic surgery divisions, national societies, and the NIH should also consider implementing similar support mechanisms to develop the plastic surgeon-scientist's pathway.

Current Trends in the Use of Tik-Tok in the field of Plastic Surgery

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Background: In the past decade, social media has taken on an important role in shaping the public's perception health care. It offers a new avenue for providing health care education for users and for physicians to promote their practice. Plastic Surgery is one of the most trending topics when it comes to social media platforms, and the most recent emerging social media app, Tik-Tok, has received particular interest. Tik-Tok is the fastest-growing video-sharing social media network since 2019. In this study we aim to characterize what plastic surgery-related content is being posted to Tik-Tok, who is posting this content, and what is the purpose of their use of this platform.

Methodology: We queried 21 Tik-Tok plastic surgery-related hashtags. Content analysis was used to qualitatively evaluate each of the 20 "most liked" posts associated with each hashtag (420 posts). The data extracted for each post included the number of likes, number of comments, type of poster (physician vs non-physician), and primary purpose of the post (promotional vs educational).

Results: A total of 420 posts associated with 21 Tik-Tok plastic surgery-related hashtags were analyzed. The geographic distribution of the content uploaders included a total of 15 countries, with the greatest numbers from the United States 317 (75%), Mexico 35 (8%), Canada 13 (3%), and the United Kingdom 13 (3%). 208 (49%) of the content uploaders were identified as male, 206 (49%) as female, 1 (<1%) as transgender, and 5 (1%) as of unclear gender. Furthermore, 210 (50%) of the posts were by physicians, 205 (49%) by non-physicians, and 5 (1%) by private practice/business owners. Among the physicians, there were 169 (79%) plastic surgeons, 38 (18%) cosmetic surgeons/aestheticians, 5 (2%) dermatologists, 2 (1%) otolaryngologists, and 1

(<1%) gynecologist. The majority of the posts were categorized as promotional 253 (60%), as opposed to educational 105 (25%) or personal 62 (15%). Moreover, the majority of the posts by physicians 147 (69%) were categorized as promotional compared to educational 72 (31%).

Conclusion: We aimed to identify and categorize plastic surgery related content on the fastest growing social medial platform in the last two years, Tik-Tok. More than half of the included posts were uploaded by physicians, of which almost 80% were certified plastic surgeons. The majority of plastic surgery-related posts on Tik-Tok by plastic surgeons were categorized as promotional, highlighting the platform's potential as a tool for surgeons to promote and expand their practices.

Frailty in Plastic Surgery: Assessment of the Five Factor Modified Frailty Index

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Background: Frailty has been shown to have a strong association with adverse outcomes in numerous surgical specialties.1-2 However, in the field of plastic surgery with its large number of elective procedures, the association has been less clear with inconsistent results noted regarding predictive value for mortality, morbidity, and 30 day readmission. 3 More recent studies have suggested that frailty is a significant risk factor when examining certain plastic surgery procedures. 4-5 This study examined the modified 5-Item Frailty Index (mFI-5) using a subcategory analysis to identify which types of plastic surgery procedures may be significantly affected by patient frailty.

Methods: The 2012-2019 ACS-NSQIP dataset was used identify all patients undergoing plastic surgery procedures. Subcategory analysis was performed based on CPT code and the impact of frailty was examined in relationship to 30-day morbidity. The mFI-5 score was calculated for each subcategory and then C-statistics were used to determine predictive ability for 30-day morbidity utilizing models that were both unadjusted and adjusted for possible confounding variables. Multivariable logistic regressions were then calculated to determine which models based on odds ration had mFI-5 as a heavily weighted variable for predicting thirty-day morbidity.

Results: The mFI-5 of plastic surgery patients is lower than in other surgical subspecialty populations. The models held predictive ability in terms of morbidity within facial fractures (C stat: 0.72), breast mastectomy (0.784), gender surgery (0.744), incision and drainage (00.719), lymph surgery (0.825), oral maxillofacial surgery (0.837), sacral ulcer procedures (0.721), tissue transfer (0.711), breast reconstruction (0.778), and head and neck flaps (0.741). Regression models showed that mFI-5 is one of the top three drivers for incision and drainage (OR 2.97,

p<.005), adjacent tissue transfer (OR 6.69, p<0.001), breast reconstruction (3.22, p<0.001), and head and neck flaps (2.43, p<.005) indicating that further study of frailty may be warranted in these subcategories of plastic surgery.

Conclusion: There is a role for frailty within plastic surgery, however, it is important for surgeons to know it which areas it may have predictive value. There are certain procedural categories where evaluating frailty may reliably impact risk assessment and others where it should not be utilized. Our study shows that there may be clinical implication for the mFI-5 specifically within incision and drainage, adjacent tissue transfer, breast reconstruction and head and neck flaps plastics procedures and that these warrant further prospective investigation.

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The Demographic of Academic Surgeons in the United States Practicing Gender-Affirming Surgery

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Introduction: As the demand for gender transition surgery continues to increase, so does the number of surgeons required to perform them. Academic surgeons opting to specialize in such procedures come from a range of backgrounds, not just in surgical specialty, but of race, gender and research experience. However, the literature has yet to describe the diversity of surgeons choosing to train in gender-affirming surgery in academic centers. This study aims to review the demographic of surgeons performing transgender surgery in academic hospitals in the United States.

Methods: The authors conducted a cross-sectional analysis of academic surgeons who practice gender-affirming surgery. The authors identified faculty, specialty, sex, academic rank, and leadership positions from surgery residency program websites. Race and ethnicity were primarily determined by speaker surname and online photograph using a two-person evaluator method and, when possible, through online confirmation methods. Racial and ethnic distribution were compared with AAMC reports of practicing surgeons. The authors then collected details on years in practice, and h-index for use as independent variables.

Results: A total of 274 academic surgeons were included. The cohort was predominately male (n = 166, 61%), with a median 9 years in practice and a median h-index of 10. A quarter were collectively classified as nonwhite (25%), with 5% identified as African American. This incidence of African American transgender surgeons was significantly greater than that of surgical population as a whole (5% vs 2%, $p = 0.043$). The most common specialty of gender-affirming surgeons was plastics (59%, $p < 0.001$), followed by OBGYN (18%) and urology (14%), with the most offered procedure being breast augmentation (51%).

Conclusions: Academic surgeons choosing to specialize in transgender procedures were more likely themselves to represent a demographic minority. As this new field continues to solidify, the surgeons currently practicing it are of a younger cohort with a greater predisposition for an interested in research.

The Impact of Fat Grafting Donor Site on The Efficacy And Safety Of Contouring

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Background: Autologous fat grafting is a popular technique for volume replacement in the breast and face. The efficacy, safety, and complications of this technique at UAB plastic surgery will be described in this review.

Methods: An IRB-approved retrospective review of fat grafting patients was performed. The patients were stratified into grafting location either: bilateral breasts, unilateral breasts, face or other. A total of 534 patients underwent fat grafting procedures of the face and body from January 2015 through July 2018. We reviewed these records for fat graft recipient site, donor site, and amount grafted for 399 patients. Complications were also reviewed. Fat harvest was generally from the abdomen, thighs, and flanks using Toomey syringes or an enclosed power-assisted system with 3.7- or 3.0-mm cannulas.

Results: Fat grafting for volume replacement to the face and breasts demonstrated improved results for patients. Patients undergoing removal of breast implants with fat grafting replacement have also had successful results, and none of the patients have requested a second session for breast enhancement. Average amount of fat grafted for all grafts was 125.5 grams. 250 (62.7%) of the grafts involved the bilateral breasts with an average of 140.6 grams used, 70 per side. 105 (26.3%) of the grafts involved a unilateral breast with an average of 92.4 grams of fat grafted. The remaining 44 (11.0%) fat grafts did not involve a breast. Of the grafts that did not involve the breasts, 27 (61.4%) of those were solely to the face or temporal region for an average amount of 15.9 grams fat grafted. The average graft amount to other locations was 261.3 grams, greatly skewed by several large grafts to the buttocks. Of the total 399 fat grafts studied, only 22 (5.51%) of all procedures involved fat grafts to multiple sites. In our patient series there have been no complications such as infection, skin loss, paresthesias, vascular compromise, embolization or blindness resulting from the fat injections.

Conclusions: Fat grafting can be a a safe and reliable method for volumization throughout the body. Our analysis revealed a period where there were no infections, no embolizations, or other identifiable complications. Further research is needed to adequately characterize long-term complications and benefits.

Environmental Sustainability of Breast Implant Supply Chains

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Background: Sustainable procurement is becoming a critical benchmark across several industries, but it is rarely mentioned in healthcare. Few surgeons have any idea of the carbon footprint of performing their surgical procedures. Hospitals produce more than 4.67 million tons of waste per year, and operating rooms use 30% of the supplies for any given hospital. This environmental footprint is not only based on the resource utilization of operating rooms, but

rather on the entire value chain of intraoperative products utilized. The purpose of this investigation was to assess the corporate environmental responsibility of two leading manufacturers of breast implants.

Methods: The sustainability practices of two leading breast implant manufacturers were investigated based on self-reported corporate environmental data. Data were standardized per $1 million USD in revenue. Recent corporate initiatives and their resulting sustainability impact were analyzed over the last three years, specifically within the categories of greenhouse emissions (in metric tons of carbon dioxide equivalent, MTCO2e), water withdrawal (in cubic meters, m3), solid waste (in metric tons), and energy utilization (in gigajoules, GJ).

Results: Regarding greenhouse emissions, Company A most recently reported 4.25 MTCO2e per $1M in revenue, while their competitor Company M most recently reported 9.0 MTCO2e per $1M in revenue. While Company M has over twice the greenhouse emissions, they have achieved an impressive decreased of 2.0 MTCO2e per $1M per year.

Regarding water withdrawal, Company A utilizes an astounding 68 m3 per $1M in revenue, whereas Company M utilizes only 1.43 m3 per $1M in revenue. Nevertheless, Company A has been making improvements with a recent decrease of 4.3 m3 per $1M per year.

Regarding nonhazardous waste, Company A only produces 0.09 tons of solid waste per $1M in revenue, whereas Company M produces 1.1 tons of solid waste per $1M in revenue. Company A was able to recycle 66% of this solid waste, whereas Company M was able to recycle an impressive 91.3% of its nonhazardous solid waste.

Regarding energy utilization, Company A utilized 190 GJ per $1M in revenue, whereas Company M utilized 145 GJ per $1M in revenue. Most strikingly, Company A has reduced its energy utilization by 40 GJ per $1M per year over the last two years, compared to a decrease of only 8.5 GJ per $1M per year by Company M.

Conclusions: There are substantial differences in the business practices between breast implant suppliers. Does the clinical benefit of one implant manufacturer truly outweigh the reality of that company having more than double the greenhouse emissions and twelve times the amount of solid waste? While digging into this data and its implications on changing our practice might be uncomfortable, physicians and administrators need to begin discussing responsible resource procurement. Future research will investigate every intraoperative supplier to analyze the supply chain footprint of each operative procedure, as well as the supply chain footprint of our plastic surgery department overall.

Does Early Referral Lead to Early Repair? Quality Improvement in Cleft Care

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Background/Purpose: Cleft lip and palate (CLP) is the most common congenital birth defect of the head and neck, occurring in approximately 1 in 700 live births. This diagnosis can often be made prenatally by conventional or 3-dimensional ultrasound. Early cleft lip repair (ECLR) (<3 months of age) for unilateral cleft lip, regardless of cleft width, has been the mainstay of cleft lip reconstruction at our institution for the past 6 years. Prior to this novel protocol, traditional lip repair (TLR) was performed at 3-6 months of age ± preoperative nonalveolar molding (NAM). Previous publications from this institution report on the benefits of ECLR, such as enhanced aesthetic outcomes, decreased revision rate, better weight gain, increased alveolar cleft approximation, cost savings of NAM, and improved parent satisfaction. Occasionally, parents are referred to our institution for prenatal consultations to discuss ECLR. The purpose of this study was to evaluate the timing of both prenatal cleft diagnosis and preoperative surgical consultation as well as referral patterns to validate whether prenatal diagnosis and prenatal consultation lead to ECLR.

Methods: A retrospective chart review evaluated patients who underwent ECLR or TLR±NAM from November 2009-January 2020. Timing of repair, cleft diagnosis, and surgical consultation, as well as referral pattern, were abstracted upon review. Inclusion criteria dictated: age <3 months (ECLR group) or 3-6 months (TLR); no major comorbidities (ASA class I/II); and diagnosis of non-syndromic unilateral cleft lip without palatal involvement. Patients >6 months, or with bilateral cleft lip, cleft palate, clefts associated with craniofacial syndromes, or significant systemic comorbidities were excluded.

Results: Upon review, 51 patients (47.7%) received ECLR while 56 patients received TLR (52.3%). The average age at surgery was 31.8 days for the ECLR cohort and 112 days for the TLR cohort. Of these 107 patients, 75 patients (70.1%) were diagnosed prenatally with unilateral cleft lip while only 5.6% of families (6/107) had a prenatal consult for cleft lip repair, all of which underwent ECLR (11.8% of ECLR cohort). The majority of patients who received ECLR were referred by a pediatrician (n=39, 76.5%). A statistically significant association was found between the incidence of prenatal consults and ECLR (p=0.008). Additionally, prenatal diagnosis of unilateral cleft lip was significantly correlated with the incidence of ECLR (p=0.027).

Conclusions: Our data demonstrates significance between prenatal diagnosis of cleft lip and prenatal surgical consultation with the incidence of ECLR; accordingly, we advocate for education to the referring providers as well as those in the surrounding community about the benefits of ECLR and the potential for prenatal surgical consultation. Efforts will be expanded to Obstetrician/ Gynecologists and Maternal-Fetal Medicine providers in the hopes that patients and families alike may enjoy the myriad benefits of ECLR. Further research should investigate the correlation of socioeconomic status with prenatal consultation for ECLR.

Wanted or Wanting: Telemedicine's Impact on Patient Satisfaction and Efficiency in a Pediatric Plastic Surgery Practice

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Background: For decades, clinicians have cited telemedicine as a useful and effective tool for delivering care in surgical specialties. Moreover, the use of telemedicine presents potential time, cost, and travel benefits for patients and providers alike. In response to the COVID-19 pandemic, the Centers for Medicare and Medicaid Services announced a lift of telemedicine billing restrictions for federally qualified health centers, making telemedicine services more widely available. This study aims to investigate the direct impact of telemedicine on a pediatric plastic surgery practice, examining patient satisfaction and visit efficiency.

Methods: In this combined retrospective and prospective review, all patients participating in both in-person and telemedicine visits at a pediatric craniofacial surgery practice between March 2020 and May 2021 were enrolled. Guardian satisfaction with their child's visit was determined via the administration of an online survey. Visit efficiency, defined as visit duration, was documented from the electronic medical record along with patient demographics including race, ethnicity, primary language, and insurance status.

Results: A total of 595 participants received the survey. One hundred participants completed the survey, with ninety-five completing the English survey and five completing the Spanish survey (16.8%). Telehealth visits were rated as more convenient than in-person visits, with a satisfaction rating of 3.72±0.59 compared to 3.35±0.93 ($p=0.008$). Multiple participants cited that they preferred to avoid long commutes and parking payments. The ability to communicate questions or concerns was rated as statistically similarly ($p=0.118$), though 10.7% of telehealth participants described connectivity issues and 5.5% described audiovisual issues that impeded visit communication. Quality of the physical exam was notably rated as statistically worse for the telehealth visits, with a satisfaction rating of 3.40±0.87 against 3.85±0.47 ($p<0.0001$). Regarding visit efficiency, telehealth visits were dramatically shorter across all visit types including new patient visits (29.3±25.5 versus 65.1±43.4 minutes, $p<0.001$), postoperative visits (24.9±22.9 versus 61.3±48.8 minutes, $p<0.001$), and follow-up visits (34.3±81.1 versus 55.7±44.1 minutes, $p=0.01$).

Conclusion: Telemedicine provides an excellent modality for treatment in the pediatric plastic surgery setting, minimizing time and cost associated with presenting for in-person visits. While patients from relatively lower socioeconomic statuses may benefit from this decrease in costs, the requirement for appropriate network resources to carry out telemedicine visits may limit this

conclusion. Furthermore, there remains clear concern about the efficacy of the physical examination in the telemedicine setting from the patient perspective, which may ultimately mandate further in-person follow-ups.

Assessment of the Influence of Plastic Surgeon Gender on Patient Preference

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Purpose: Patient autonomy and ability to choose their plastic surgeon hold considerable merit. The purpose of this study was to characterize how the public considers surgeon gender when choosing a plastic surgeon.

Methods: Survey participants were recruited during April 2021 using Amazon's Mechanical Turk crowdsourcing service. Demographic information, plastic surgeon gender preference for pre-defined plastic surgery categories, and Likert importance-rating of plastic surgeon selection factors were examined. Descriptive and comparative statistical analysis were performed.

Results: Of 495 respondents, 54.5% identified as female and 44.0% as male. 68.3% respondents identified as Caucasian, 11.1% as Asian, and 9.5% as African American. The majority of participants were between 25-44 years old (65.0%) and had a bachelor's or graduate degree (73.1%). Of six plastic surgery categories inquired about, more than 60% of respondents had a preference on surgeon's gender for performing breast (e.g. reconstruction, 60.8%) or genital (e.g. labiaplasty, 67.9%) surgeries. Between 46.3-50.9% of respondents had a preference on surgeon's gender for performing facial (e.g. rhinoplasty), minimally invasive (e.g. Botox injections), body (e.g. abdominoplasty), and sex reassignment (e.g. phalloplasty) procedures. Participant gender was significantly associated with plastic surgeon gender preference across all six categories ($p<0.001$). Participants who did have a preference preferred their surgeon to be of the same gender as themselves. The most important factor when selecting a plastic surgeon was surgeon skillset and experience, followed by cost. A positive referral and impressive website/social media profile ranked third and fourth, respectively. Same gender was ranked fifth, followed by same race and same sexual orientation.

Conclusions: A considerable portion of the public, men, and women alike, reported preferences regarding plastic surgeon gender; however, it was not among the most important factors when selecting a plastic surgeon.

The No Surprises Act: What Plastic Surgeons Need to Know

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Introduction: Out-of-network, or "surprise" bills, have grown common in recent years and have raised a substantial degree of concern for patients and policymakers. Congress recently enacted the No Surprises Act (NSA), effective on January 1, 2022, ending the majority of out-of-network bills for privately insured patients. Currently, it is unclear how this new legislation will impact the network status of plastic surgeons, as well as rates of reimbursement. The aim of this review is to briefly summarize the history of surprise billing, describe the regulations of the No Surprises Act, and examine the impact this legislation will have on the field of plastic surgery.

Methods: Medline and Google Scholar were queried for articles pertaining to surprise billing, anti-surprise billing legislation, and the NSA from 2000-2022.

Results: Surprise billing occurs when privately insured patients unknowingly receive care from an out-of-network provider resulting in "surprise" medical charges. Under the NSA, privately insured patients are protected from surprise medical bills in emergency and non-emergency settings, and uninsured or self-pay patients must be provided a good faith estimate of service fees prior to receiving non-emergent care. Providers may consent patients to receive out-of-network bills if consent is obtained at least seventy-two hours prior to rendering a non-emergency service. Several provider groups have already filed lawsuits against the NSA due to unfair insurer advantages, as insurance companies play a central role in determining provider reimbursement under this new law. This reimbursement is often decided through the insurer-provider independent dispute resolution, a process that can be time-consuming and costly. Plastic surgeons may further be incentivized to contract their services at reduced rates to avoid this time-consuming process. Conversely, plastic surgeons may choose to venture out-of-network as a result of diminished reimbursement rates, resulting in less in-network plastic surgeons. This may ultimately impede equitable patient access to plastic surgery care, as well as impact physician consolidation and increase long-term healthcare costs.

Conclusions: The No Surprises Act protects patients from excessive charges and improves transparency of healthcare costs. However, this new legislation may have adverse effects for plastic surgeons. Plastic surgeons will only get paid in-network fees while providing care to patients unless consent is properly obtained in a non-emergent setting. Expensive, time-consuming services may be required by plastic surgeons to be reimbursed for more than in-network fees. As time progresses, further examination of the No Surprises Act within plastic

surgery will be necessary to better assess how this Act impacts surgeon reimbursement and network status.

An Update on Gender Bias and Sexual Harassment in Plastic Surgery Training

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Background: Gender bias and sexual misconduct persist in plastic surgery training and disproportionally affect women. In a survey conducted between 2018 and 2019, women trainees were more likely to experience sexual harassment, felt uncomfortable challenging attitudes about gender inequality, and perceived barriers to career advancement compared to men. This study aims to re-evaluate the current landscape to identify whether any change has occurred since then and identify areas of improvement.

Methods: Plastic surgery residents and fellows across the United States of America were administered a validated survey adapted for plastic surgery. The survey included questions about experiences with professionalism, gender bias, sexual harassment, and sexual conduct within the workplace. Results were analyzed using chi-squared and fisher's exact tests. A p-value of <0.05 was considered statistically significant.

Results: A total of 114 respondents completed the survey for a response rate of 14% (114/827 total US-based residents and fellows). Sixty percent of respondents identified as female, 36% identified as male, and 4% identified as neither. The majority (59%) identified as White/Caucasian. Female surgeons had higher odds of feeling gender bias played a negative role in their career advancement (OR = 7.17, 95% CI [2.7, 18.7], $p<0.01$), lower odds of feeling comfortable challenging gender inequality (OR = 0.25, 95% CI [0.07, 0.92], $p=0.034$), and had higher odds of having diminished career ambitions as a result of gender bias (OR = 17.15, 95% CI [2.19, 134.45], $p<0.001$) compared with their male counterparts.

Over half of all respondents reported hearing derogatory references about their gender (OR for women = 3.2, 95% CI [1.4, 7.1], $p<0.01$), 41% reported sexual jokes that made them uncomfortable (OR for women = 2.4, 95% CI [1.1, 5.5], $p=0.055$), and 13% reported being given lowly tasks because of their gender (OR for women = 11.2, 95% CI [1.4, 89.6], $p<0.01$).

Thirteen percent of respondents report being inappropriately touched, 3% report witnessing a coworker indecently exposing themselves, and 20% reported hearing sexual comments about their body (no difference by gender).

Conclusions: Gender bias and sexual misconduct continue to negatively affect trainees, particularly female trainees, and their attitudes towards career advancement. Continued work must be done to improve the culture in plastic surgery training.

Patient Preferences for Utilization of Telemedicine in Aesthetic Surgery

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Purpose: Telemedicine, in which patient encounters are conducted via phone or video call, has been increasingly utilized by plastic surgeons since the start of the COVID-19 pandemic. Telemedicine visits minimize time, costs, and viral exposure compared to in-person visits. However, patient comfort level with and preference for telemedicine visits in the aesthetic surgery perioperative period remains unknown. The purpose of this study was to evaluate patient comfort and preferences regarding perioperative telemedicine visits for aesthetic surgery.

Methods: An IRB-approved cross-sectional survey was conducted in January 2022 on Amazon's Mechanical Turk (MTurk) platform to assess respondents' comfort and preferences regarding periprocedural telemedicine visits. Survey responses were compared using descriptive and multivariate analyses.

Results: A total of 505 participants (54% male, 46% female; mean age 37.7±11.5 years) completed the survey. The majority of respondents reported feeling either very or somewhat comfortable having their initial consult via telemedicine for both aesthetic surgery (72%) and non-surgical aesthetic procedures (74%). Over half of respondents reported feeling either very or somewhat comfortable having an initial telemedicine consult for head and neck procedures. In contrast, roughly one-third of participants reported feeling comfortable with an initial telemedicine consultation for procedures involving the breast and buttocks (breast augmentation 33%, breast reduction 35%, and mastopexy 36% and Brazilian butt lift (BBL) 35%). Preference for having an initial consult in-person rather than via telemedicine significantly increased with age ($p<0.001$). Notably, respondent gender, history of COVID-19 infection, and COVID-19 vaccination status were not associated with preference for telemedicine vs in-person visits. Respondents were significantly more comfortable going on to schedule non-surgical procedures than surgical procedures after a telemedicine consult alone ($p<0.001$). Survey participants were similarly more comfortable with having post-operative telemedicine visits for non-surgical than surgical procedures ($p<0.001$). In regard to sending photos as part of the telemedicine visit, less than half of respondents felt comfortable sending photos to their surgeon via email (42%) and secure message (31%). Participants reported feeling most comfortable sending pictures of their

legs (41%) and least comfortable sending photos of their gluteal region (4.0%) and breasts (2.9%).

Conclusions: Telemedicine visits in the aesthetic surgery perioperative period represent an opportunity to reduce time, costs, and potential viral exposure during COVID-19 surges. Our results suggest that the majority of aesthetic surgery patients are comfortable with having initial consultations via telemedicine. Particularly in young patients seeking non-surgical aesthetic procedures, telemedicine consults alone may be substituted for in-office visits prior to procedural scheduling. However, prior to scheduling of larger operations, and for consultations requiring physical examination of sensitive areas, including the breasts and glutes, in-person visits remain the preferred modality.

A Multidisciplinary Model to Managing Patients with Hidradenitis Suppurativa at a Single-center Wound-care Clinic

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Purpose: A multitude of treatment options exist for hidradenitis suppurativa (HS), however, no single effective therapy has been proven to be most successful in symptom control and wound healing. Single-approach treatments are often inadequate and lead to long-standing disease and recurrence. The purpose of this report is to present the effectiveness of a multidisciplinary care team approach in the treatment of HS at a single-center, comprehensive, wound care center.

Methods: We describe our treatment approach and outcomes of patients with HS seen at our tertiary wound care center. Retrospectively identified the patients at our wound care clinic who had HS managed with a multidisciplinary care team approach. Patient demographics, comorbidities, and disease characteristics were collected. Outcomes assessed included the number of procedural interventions, emergency department (ED) visits, and length of treatment.

Results: Medical optimization is of the utmost priority; diabetic control and smoking cessation are required before surgery. Patients who are sicker, non-compliant, or do not achieve medical

optimization (e.g., continued tobacco use) are managed with a three-month antibiotic course, dressing changes, and expectant management. Surgical decision-making is dependent on a multitude of additional factors, primarily including location of disease and stage. Surgery performed on axillary lesions are often performed first, as lesions in this area are more amenable to surgical closure and have better operative outcomes. Patients with perianal or groin disease are less amenable to surgical wound closure due to the paucity of local tissue and anatomic proximity, and often require more specialized care. Those with perianal disease receive a diverting colostomy. Those with Hurley stage III receive Humira prior to surgery to decrease the size of the operated lesion. Recurrence rates are high, especially among those non-compliant with treatment.

From 2010 to 2021, 196 patients with HS were managed under the care of plastic and reconstructive surgery, general surgery, rheumatology, urology, gynecology, and/or dermatology. There were 140 females (71.4%) and 56 males (28.6%). The mean age at time of initial visit was 38.7 ± 14.7 years and mean BMI was 32.7 kg/m2. 87 patients had a history of smoking (44.4%), and 39 patients had diabetes (19.9%). 60 patients (30.1%) had a history of ED admission for HS-related complications, with a median of two inpatient admissions per patient (IQR=1,6.5, range 1-16). After initial consultation, 133 (67.9%) patients received procedural interventions, with an average number of procedures of 4.18 + 4.92. The remaining patients either did not require surgery for their lesions or were determined poor candidates for surgery. Mean follow-up time was 3.52 ± 2.85 years.

Conclusion: We present the results of using a multidisciplinary team approach to the management of HS. Our results indicated Hurley staging, location of HS lesions, and medical optimization can indicate whether a patient should expect to undergo at least one or more procedures for their HS. We present evidence of a high disease burden and use of emergency services among this population, indicating the necessity for a more methodical approach utilizing multidisciplinary care for appropriate disease management.

Planning and Building an Academic Transgender Medicine Center of Excellence: The Five-Year Johns Hopkins Experience

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Summary: Gender affirming care for transgender and gender diverse (TGD) individuals is a multidisciplinary endeavor that requires organized efforts of many specialized providers. TGD individuals experience many healthcare barriers, among which is the scarcity of multidisciplinary centers formed to coordinate and deliver complex care in an efficient and affirming way. The Johns Hopkins Center for Transgender Health (CTH) was founded by Johns Hopkins Medicine in 2017 with the mission of decreasing health disparities and improving the health of the TGD community. The authors present their experience building the Center around a Service Line model, in which there is one point of contact for patients; they are tracked throughout the care

process; and the multi-departmental providers involved in their care are aligned. This allowed for a patient-centered experience where all involved disciplines were seamlessly integrated and the patient could navigate easily among them. With the structure and mission in place, the next challenge was to develop an infrastructure for culturally competent care. Through competency training and adjustment of systems-based logistics, measures were put in place to prevent traumatic experiences like misgendering, inappropriate vocabulary, and use of incorrect names. Partnerships with colleagues in urology, gynecology, otolaryngology, anesthesia, psychiatry/mental health, internal medicine, endocrinology, fertility, nursing, social work, speech therapy, and pediatrics were all necessary to provide the appropriate breadth of services to care for the TGD patient. Since its inception, the Center has seen steady and continual growth; to date, CTH providers have interacted with over 3,000 patients. By sharing the experience creating and growing a center of excellence, the authors hope to provide a blueprint for others to expand healthcare quality and access for TGD individuals.

A Proposed Screening Process to Streamline Insurance Based Breast Reduction

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Background & Purpose: Breast reductions are one of the most common procedures performed in plastic surgery. Given the high prevalence of symptomatic macromastia, there are many patients who would like to be evaluated for breast reduction. However, the no show rate for new patient visits can be quite high. Therefore, the purpose of this study is to identify a process to streamline the evaluation of potential breast reduction patients.

Methods: This was a retrospective review of patients interested in breast reductions who presented to our academic institution from initiation of the class in March 2015 through August 2021. Demographic data collected included age, BMI, comorbidities, and smoking status. No-show rates were recorded per unique patient for the class, NP visits, and MD visits. Schnur criteria and gram estimates from NP and MD were collected, as well as the final specimen weight from pathology. A t-test statistical analysis was utilized to determine significance in no-show rates and gram estimates. This study was approved by our institutional review board.

Results: 1310 unique patients were identified as enrolled for the class. 973 patients attended the class, resulting in a 36.82% class no show rate. Of these 973 patients, 386 were then offered an in person visit with a nurse practitioner. 82 visits were no showed to the nurse practitioner (20.15%). 212 patients were then scheduled with an attending physician, of which 15 visits were

no showed (7.08%). The reduction in no show rates between the class-NP and the NP-MD visits were both found to be significant ($p<0.01$). There were 330 patients who no showed one visit and 230 additional no shows, a 40.56% rate of repeat offense.

171 patients underwent a bilateral breast reduction (13.05% of overall patients). The average estimated gram reduction by the nurse practitioner was 580 grams. The average Schnur value was 735 grams. On average, the nurse practitioner estimation was 189g less than the attendings' estimation and 306 grams less than the actual resection weight. Attending estimated reduction was on average 110 grams less than pathology. Absolute value differences were also recorded, with MD-path on average 234g different, NP-path 272g different, and Schnur criteria with a difference of 347g.

The average time from completion of the breast reduction class to surgery was 278.15 days. The average time from NP consultation to surgery was 171.48 days, and MD consultation to surgery was 59.51 days.

Conclusion: A nurse practitioner is able to accurately estimate a breast reduction gram reduction, thus decreasing the number of visits and no-show appointments for a surgeon and streamlining the time to surgery for breast reduction patients.

Industry Payments to the Top 1% of Plastic Surgeons Over Time

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Background & Purpose: Since the implementation of the Physician Payment Sunshine Act of 2010, payments received by physicians are readily accessible by the general public. It was found that 1% of plastic surgeons were identified as earning greater than half of all industry dollars paid out. Our study seeks to examine the trends of payments received by the top 1% of industry paid plastic surgeons over time and how the payments compare to receipts by plastic surgeons as a whole.

Methods: The American Society of Plastic Surgeons (ASPS) member directory from 2019 was used to identify corresponding recipients in the Center for Medicare and Medicaid Open Payments Database (CMS OPD). The top 1% of total earners were identified between 2013-2018 and industry payment totals per plastic surgeon annually were compared to overall payment trends.

Results: All ASPS registered plastic surgeons averaged 8.88% of total payments earned in 2013, 17.06% in 2014, 18.36% in 2015, 20.08% in 2016, 16.05% in 2017, and 19.56% in 2018. 318

surgeons received their largest per year income in 2013 (8.88%), 615 surgeons in 2014 (17.06%), 769 in 2015 (18.36%), 702 in 2016 (20.08%), 544 in 2017 (16.05%), and 916 in 2018 (19.56%).

The top 1% of surgeons averaged 9.57% of total payments earned in 2013, 20.38% in 2014, 21.10% in 2015, 22.43% in 2016, 13.33% in 2017, and 13.18% in 2018. One of the 39 surgeons received their largest income year in 2013 (2.56%), eight surgeons in 2014 (20.51%), 3 in 2015 (7.69%), and 9 per year (23.08%) in 2016, 2017, and 2018.

The difference per year in percent of dollars earned between the top 1% and all plastic surgeons was -5.67% in 2013, 4.60% in 2014, -12.21% in 2015, 4.91% in 2016, 9.00% in 2017, and -0.63% in 2018. The difference per year in percent of surgeons receiving maximum payment value was 0.70% in 2013, 3.32% in 2014, 2.74% in 2015, 2.35% in 2016, -2.72% in 2017, and –6.38% in 2018. The average difference overall for each of these metrics was 0.00%.

Conclusion: While the top 1% of industry paid plastic surgeons grossed more than 50% of the industry dollars earned, there was no significant difference in payment trends over time when compared to the general industry payments. This insinuates that the top 1% is not immune to variance in the national and global markets.

Gender-Affirming Surgery in Plastic Surgery In-Service Exams: A Critical Analysis of a Decade of Questions

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Introduction: Plastic surgery residents take annual in-service examinations as part of their surgical education. In-service exams evaluate test-takers' knowledge of established, evidence-based clinical practice guidelines, as well as reflect and set expectations for core competencies for residents in training.1 It is well documented that gender-affirming surgery (GAS) procedures are rapidly increasing annually and are becoming increasingly available at academic institutions.2 The purpose of this study is to evaluate whether plastic surgery in-service training exams adequately reflect the appropriate quantity and quality of content pertaining to GAS in an inclusive and affirming approach to care by our specialty as a whole.

Methods: Past plastic surgery in-service training exam questions from the years 2010 to 2020 were accessed online through the American Council of Academic Plastic Surgeons website. Questions are organized based on subject content topics (i.e., craniofacial, chest wall/abdominal wall, hand, etc.), with a total of 48 content topics. Questions for each year and content topics were analyzed for the presence of GAS-related questions, and identified GAS-related questions

were analyzed for quantity and quality. Data was then analyzed for statistically significant associations.

Results: From the years 2010 to 2020, there were a total of 2,359 questions total for review. Of these questions, 11 GAS-related questions were identified for a total frequency of 0.5%. GAS-related questions were found in a total of three content topics: chest wall/abdominal wall (2/98 total questions, 2%), coding (1/25 total questions, 4%), and genitourinary reconstruction (8/15 total questions, 53%). A majority of these GAS-related questions (6/11, 55%) were also in the incorrect content category. GAS-related questions on the plastic surgery in-service exam mainly covered general topics in transmasculine and transfeminine chest and genital surgery as well as some questions related to the World Professional Association of Transgender Health clinical management guidelines. There were no questions regarding gender affirming facial or body surgery, non-binary/gender fluid individuals, or non-traditional variations of common GAS procedures. Question stems and answer explanations often misgendered patients, used outdated terminology, and gendered patient anatomy.

Conclusion: The overall quantity and quality of GAS-related questions on the plastic surgery in-service exam was lacking. As GAS is an integral part of the field of plastic surgery, it is very important to ensure that it is represented adequately and accurately in educational curriculum. Practical approaches to addressing this issue include augmenting the distribution of current questions as well as increasing the number of questions in general, including questions on gender affirming facial and body surgery, including non-binary/gender fluid individuals, and ensuring affirming language throughout the development of future questions.

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What are Plastic Surgeons Doing? Changes in Procedure Frequency Based on American Society of Plastic Surgeons Member Only Procedural Statistics

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Background: The American Society of Plastic Surgeons (ASPS) records annual Member Only Procedural Statistics based on questionnaires sent to ASPS member surgeons certified by the

American Board of Plastic Surgery.1 Board certified plastic surgeons record the number of patients they treat for each procedure, and these numbers are extrapolated to create projections for the procedures performed by ASPS member surgeons. Procedures fall into two different categories: aesthetic and reconstructive procedures. Aesthetic procedures are further divided into surgical procedures of the breast, body, and face, as well as minimally invasive procedures such as injectables and fillers. Understanding evolving procedural trends can give insight into plastic surgeons' subspecialty focus and influence resident training to prepare them for future practice.

Methods: Cumulative ASPS Member Only projections for both categories were reviewed from 1999 to 2018 in 5-year increments. The number of cases performed for the six most frequent procedures within each category were examined to identify shifts in frequency between the first 5 years of their recording and 2014-2018. Descriptive statistics were performed to identify significant changes ($p<0.05$) in subspecialty focus and procedure trends.

Results: There was a significant increase in the number of aesthetic surgical ($p=0.001$) and minimally invasive procedures ($p<0.0001$) performed by board certified plastic surgeons between 1999-2003 and 2014-2018. In the aesthetic surgery category, there was a significant increase in augmentation mammaplasty (36.15%; $p=0.001$), mastopexy (94.95%; $p<0.0001$), and abdominoplasty (73.41%; $p=0.002$) procedures and a significant decrease in blepharoplasty (30.21%; $p=0.01$) and rhinoplasty (26.58%; $p=0.002$) procedures. In the aesthetic minimally invasive category, chemical peel and laser skin resurfacing procedures increased significantly by 53.12% ($p=0.003$) and 75.17% ($p<0.0001$) respectively. Botox (first recorded in 2000) and soft tissue fillers (first recorded in 2007) increased significantly by 415.93% ($p<0.0001$) and 50.97% ($p=0.0001$) respectively. Intense Laser Pulse treatment (first recorded in 2008) also increased significantly by 20.32% ($p=0.004$). There was a significant decrease in the number of reconstructive procedures ($p=0.04$) between these cohorts, with the number of hand surgery procedures decreasing significantly by 32.84% ($p=0.0009$) in the later cohort. Despite the decrease in reconstructive procedures, breast reconstruction and maxillofacial surgery increased significantly in the later cohort by 36.76% ($p=0.0004$) and 16.60% ($p=0.004$) respectively.

Conclusions: In 2018, 7,030,380 plastic surgery procedures were performed, the highest number over the past 20 years. This is largely due to the rise in popularity of aesthetic minimally invasive procedures such as Botox, which was performed 2,862,378 times in 2018. Aesthetic minimally invasive procedures accounted for only 26.417% of total procedures between 1999-2003, compared to 66.07% of total procedures between 2014-2018. The number of facial aesthetic surgery procedures decreased between these cohorts, while aesthetic surgery procedures of the breast and body increased. This may be due to other specialties expanding their practice to aesthetic facial surgery. Despite the increase in aesthetic surgery procedures between 1999-2018, reconstructive procedures still account for the majority of total surgical procedures performed.

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Rural Plastic Surgery: A Deep Dive into Availability, Motivating Factors, and Scope of Practice

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Introduction: There is currently a healthcare crisis in rural America regarding accelerated closure rates of rural hospitals.1 Complicating the issue is access to specialty doctors. In 2020, the American Healthcare Association launched the Future of Rural Health Care Task Force to help shape the future of rural health care delivery and ensure local access to quality care in rural America. The American College of Surgeons has thus designated this 48% of hospital districts as having a critical shortage of surgeons.2 Plastic surgeons possess a broad scope of practice that facilitates treatment of various pathologies. However, little is known about their availability, motivating factors, and scope of practice in rural settings.

Methods: Plastic surgeons from all states within the United States were identified online, and the American Society of Plastic Surgeons (ASPS) "Find a Surgeon" page was used to confirm their membership. Inclusion criteria included practice location in a community less than 50,000 people not located in a metropolitan statistical area. The identified locations were cross-referenced with the Office of Management and Budget (OMB) metropolitan and micropolitan statistical area maps. Those without emails listed on ASPS "Find a Surgeon" page were attempted to be reached by office phone to acquire contact information. Surveys were distributed and analyzed via Qualtrics.

Results: 116 plastic surgeons across 36 states were identified. Surveys were sent to 111 individuals, and 59 (53.2%) responded to the survey. There were 48 males and 11 females with a mean age of 54. The primary route of exposure to rural plastic surgery was growing up in rural areas (47.5%). 27.1% of respondents entered plastic surgery through integrated programs and have had their rural practice for 14.0 years on average. 89.8% of respondents claimed to be happy or very happy with their practice, and 89.8% plan to stay in a rural setting long-term. The primary motivating factors for practicing in a rural setting included the broad scope of practice (25%) and lifestyle (22.97%). Lack of hospital support was considered the primary limitation to practicing in rural areas, and most respondents believe increasing external affiliation would aid in solving this issue. Most (59.3%) did not pursue subspecialty training following plastic surgery residency, but 55.9% believe that hand fellowship would be most useful in rural settings.

Aesthetic (41.6% on average), skin (22.6% on average), and breast reconstruction (22.2% on average) were the top 3 procedural categories performed by respondents.

Conclusions: There is a need for plastic surgeons to practice in rural areas. A rural setting provides a rewarding career albeit with a unique set of benefits and challenges. Raising awareness of limitations to plastic surgeons paves the avenue for solving healthcare issues that exist in rural America.

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Public Perceptions of Climate Change and Plastic and Reconstructive Surgery

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Background: The healthcare industry has a major impact on climate change and surgery is one of the most energy-intensive practices in the hospital. Although most people believe climate change is happening, little is known regarding public awareness of the role of healthcare in climate change. This study aimed to assess public perceptions of climate change and plastic surgery and elucidate public support for climate change-mitigating measures.

Methods: A cross-sectional survey was administered to adults in the United States using Amazon Mechanical Turk in December 2021 to assess public perceptions of climate change, healthcare, and plastic surgery. Incomplete survey responses were excluded. Respondents were provided information about the impact of healthcare on climate change. "Experienced" respondents were those who knew someone who/personally worked in healthcare or had any surgery. Remaining respondents were "naïve." A multivariable logistic regression model was used to identify predictors of responses.

Results: There were 890 complete responses. Respondents had a mean age of 38 years and were mostly male (54%), White (83%), insured (89%), and had an associate degree or higher (ADH) (87%). At baseline, the majority of respondents strongly agreed/agreed that climate change is

happening (89%) and that healthcare has an impact on climate change (62%), with significantly greater odds among ADH respondents (OR 2.28, $p<0.01$ and OR 2.8, $p<0.001$, respectively).

After information was provided about the impact of healthcare on climate change, most respondents indicated that they were more concerned about the impact of surgery on climate change (60%), with significantly greater odds for Hispanic (OR 1.71, $p=0.01$) and ADH respondents (OR 1.58, $p<0.05$), and significantly lower odds for privately insured respondents (OR 0.71, $p<0.05$). Notably, there was no difference between "naïve" and "experienced" respondents ($p=0.37$). Most respondents also indicated that they were more worried about the effects of cosmetic surgery on climate change (64%). Respondents who identified as having ADH had significantly greater odds of being more worried about the effects of medically necessary surgery on climate change (OR 3.26, $p<0.001$).

When asked which climate change-mitigating measures respondents would be willing to undergo if receiving cosmetic plastic surgery, less than half would be willing to share rooms for overnight stays (32%) and opt for telehealth visits, if possible (40%). Notably, respondents indicated that they would be willing to pay a higher professional fee for cosmetic surgery in order to support sustainable hospital practices, such as use of wind/solar power (40%), nuclear energy (42%), and sustainable devices (41%).

Conclusions: While most of the general public believes climate change is happening, fewer believe healthcare has an impact on climate change. Awareness that healthcare has an impact on climate change may raise concern for the impact of surgery on climate change and make patients more worried about the effects of medically necessary and cosmetic plastic surgery on climate change. Patients may be willing to undergo personal climate change-mitigating measures and elect for higher professional fees to support sustainable surgical practice.

Trends in Clostridium difficile Infection Rates Among Plastic Surgery Procedures: A NSQIP Database Analysis of 16,146 Cases from 2015-2019

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Purpose: Clostridium difficile associated infection (CDAI) is a feared hospital-acquired complication with potentially morbid outcomes. Risk factors that predispose patients to CDAI postoperatively have been investigated in literature, but there remains a paucity of information on the most predictive comorbidities for CDAI development after plastic surgery procedures. [1]

The objective of this study is to provide a comprehensive analysis of a national database to identify predictors of CDAI in the plastic surgery population and trends over time.

Methods: A retrospective review of patients undergoing any plastic surgery procedures was conducted using the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) database from 2015 to 2019. Patients were analyzed in 2 groups: CDAI versus no CDAI. Postoperative complications and patient comorbidities were extracted and statistically analyzed using univariate analysis and multivariate regression models ($p<0.05$).

Results: A total of 16,146 cases of CDAI were retrieved from the NSQIP database from 2015 to 2019. CDAI cases were stratified into plastic surgery procedure type using CPT codes: craniofacial (223; 1.38%), breast (130; 0.81%), flap (83; 0.51%), graft (533; 3.30%), hand (28; 0.17%), wound care (102; 6.37%), abdominal wall reconstruction (457; 2.83%), and other miscellaneous (13,633; 84.62%) procedures. C. diff incidence of craniofacial, breast, flap, graft, hand, wound care, and abdominal wall reconstruction procedures differed significantly (all $P<0.05$). Flap procedures had the highest incidence (0.58%), while hand procedures had the lowest (0.04%). Stroke, renal failure, and hypertension were most predictive in craniofacial ($P<0.05$); dialysis, weight loss >10% in the last 6 months (WL), and steroid use in breast ($P<0.05$); WL, steroid use, and stroke in graft ($P<0.05$); stroke and congestive heart failure in hand ($P<0.05$); ASA class >4, stroke, and WL in both wound and AWR ($P<0.05$). Factors significantly associated with CDAI development across all procedures were readmission within 30 days, reoperation within 30 days, and hospital stay >30 days ($P<0.001$). Concurrent complications associated with CDAI development were blood transfusion, superficial surgical site infection, pneumonia, intubation, pulmonary embolism, ventilator >48 hours, urinary tract infection, stroke, sepsis, and septic shock ($P<0.001$).

Conclusions: The rate of CDAI infections decreased overall from 2015 to 2019 for craniofacial, graft, flap, and wound, and stayed consistent for breast, hand, and abdominal wall reconstruction. Although CDAI is considered a rare occurrence among plastic surgery procedures, identifying risk factors predictive of development of CDAI can prove to be beneficial for long term patient management to minimize mortality and morbidity. This study demonstrates that patient comorbidities and complications associated with CDAI may be risk factors in plastic surgery procedures.

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Shopping on Social Media For a Cosmetic Surgeon? The Impact that Truth in Advertising Laws Have Had on Who Is Behind the Most Popular Social Media Accounts That Are Advertising Cosmetic Surgery Practices

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Summary: As the demand for cosmetic surgery has continued to rise, there has been an increasing rate of non-board-certified plastic surgeons (NBCPS) choosing to open cosmetic surgery practices under the guise of claimed board certifications outside of the American Board of Medical Specialties (ABMS). To combat this, many states have chosen to enact "Truth in Advertising Laws" (TIALs).1 A previous study utilized popular search engines (i.e. Google) to determine the frequency that these aforementioned practices appear in a search for "plastic surgeon [major city]".1 The results of the study showed that there was no difference in the incidence of these practices based on the presence of TIALs.1 Studies have shown that those with a negative self-image who spend increasing time on social media viewing cosmetic surgery-related material have an increased likelihood of undergoing cosmetic procedures in the future.2 With 59-70% of plastic surgery patients believing that social media is a credible source for evaluating surgeons and researching procedures, one can infer that the selection of a cosmetic surgery practice may result from a social media search.3 To date, the board certifications and procedures advertised by the most popular cosmetic surgery social media accounts have yet to be compared in states with TIALs versus those without TIALs.

Methods: To simulate the searches of a potential cosmetic surgery patient 20 frequently used plastic surgery related hashtags across Facebook, Twitter, Instagram, and TikTok, were searched. The first 20 "top" or "most relevant" posts in English and from surgeons within the United States were included. Initial information regarding the account's follower count, practice location, and any board certification were obtained. The ABMS was referenced after reviewing the accounts and the procedures offered, to determine which accounts were advertising NBCPS who were practicing out-of-scope (OOS). OOS providers were then separated into two groups based on the presence of TIALs. The percentage of providers who offered common cosmetic surgery procedures, as well as the board certifications of these providers, were compared using Z-tests for two population proportions.

Results: A total of 239 accounts met inclusion criteria. States with TIALs had more cumulative followers (26,557,140) compared to states without TIALs (4,514,480) and a higher mean followers per account. There were 96 (40.2%) accounts tied to NBCPS, split evenly between states with TIALs and states without TIALs. There were 22 (45.8%) NBCPS accounts advertising out-of-scope (OOS) services in states with TIALs and 27 (56.3%) in states without TIALs. The majority of OOS NBCPS were trained in general surgery, otolaryngology, oral and maxillofacial surgery, and obstetrics and gynecology. Of the OOS NBCPS accounts, 28 (58.3%) advertised non-ABMS certifications. There was no statistically significant difference found between states with TIALs and without TIALs regarding any variable included in this study. TIALs have not resulted in a statistically significant difference in the number of providers who are advertising as cosmetic surgeons on social media and who are practicing OOS. Interrogation of the current TIALs and drafting of new legislation may be necessary to prevent NBCPS from advertising OOS practices on social media.

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Gender-Affirming Chest Reconstruction: Does Hospital Volume Influence Admission Charges?

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Background: While several national databases are well equipped to analyze postoperative outcomes, there has been a paucity of research with nationally representative datasets analyzing the evolving landscape of insurance coverage and admission cost for gender-affirming surgery. The purpose of this study was to provide a descriptive analysis of the financial implications of undergoing gender-affirming top surgery.

Methods: Retrospective cohort study was conducted of gender-affirming chest reconstruction performed between 2016 and 2019 using the Nationwide Ambulatory Surgery Sample. This is the largest all-payer surgery database of outpatient procedures performed in the United States. Financial data was adjusted for inflation and represented in 2020 US Dollars. High volume hospitals were defined as the 90th percentile of cases performed during the study interval, and highest volume hospitals were defined as the 95th percentile of cases performed during the study interval. Patients concurrently undergoing both top and bottom surgery were excluded.

Results: During the study interval, 15272 patients underwent gender-affirming top surgery, of which 82.7% (n=12634) were trans male and 17.3% (n=2638) were trans female. There were 691 hospitals performing gender-affirming top surgery over the last four years, with a median case volume of only 3 procedures. High volume hospitals at the 90th percentile performed 59

procedures over the study interval, and highest volume hospitals at the 95th percentile performed 104 procedures over the study interval.

Hospital admission charges for top surgery have been slightly increasing over the years ($p<.001$, $\rho=+0.165$). High-volume hospitals ($p<.001$, \$28304 vs \$26458) and highest-volume hospitals ($p<.001$, \$28476 vs \$26836) charged significantly more than lower volume hospitals, however this trend has reversed in the last fiscal year.

There is significant difference in charges between regions of the country ($p<.001$), with the Midwest having the lowest (median \$24918) and the West having the highest (median \$29679). Transmale procedures were charged significantly higher admission charges than transfemale procedures ($p<.001$, \$28311 vs \$25718). While we are uncertain why this might be the case, this trend was seen in all four regions of the United States.

Academic hospitals charge significantly more than nonacademic hospitals ($p<.001$, \$27946 vs \$23007). Urban hospitals charged over twice as much as rural hospitals for gender-affirming top surgery ($p<.001$, \$27953 vs \$10755). Over the last four years, the percentage of self-pay patients significantly decreased from 9.1% to 4.3% ($p<.001$). Despite recent updates to CMS coverage guidelines, the percentage of patients utilizing government insurance for gender-affirming top surgery has been decreasing from 35.0% to 29.9% ($p<.001$), while the percentage of patients with commercial insurance coverage has significantly increased from 52.5% to 63.4% ($p<.001$). Patients with commercial insurance were billed significantly more for gender-affirming top surgery than patients with government insurance ($p<.001$, \$29593 vs \$26319).

Conclusions: High-volume and highest-volume hospitals charged patients significantly more than lower volume hospitals for gender-affirming chest surgery, however this trend has reversed in the last fiscal year. Rural hospitals charged patients significantly less than urban hospitals. Patients are increasingly seeking commercial insurance to undergo gender-affirming top surgery rather than government insurance.

Malpractice Claims in Plastic Surgery: Descriptive-Comparative-Predictive

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Summary: Plastic Surgeons face unique issues with professional liability claims due to the nature of plastic surgery practice, in particular the mix of both reconstructive and cosmetic procedures. The relatively rare occurrence of a malpractice claim for any individual plastic surgeon makes it unlikely that techniques to reduce malpractice risk are evident. In this analysis we looked at ten-years of malpractice claims filed against plastic surgeons insured through The Doctors Company Group (TDCG).

All claims and suits filed against TDCG insured plastic surgeons from 2009 to 2021 were analyzed and compared with claims against surgeons in other specialties over the same time frame. Data was stratified according to several different variables including patient demographics, case type, injury, and contributing factors/risk management issues. A logistic regression analysis was performed to identify those variables associated with medical malpractice payments.

Results: Of the 1,708 claims against plastic surgeons, 90% were on behalf of female patients, and the average age of a claimant was 45 years old. Comorbidities of claimants included smoking in 6.9% and obesity in 6.4%. Ninety-two percent of claimants had ambulatory surgery or a procedure. The top three surgeries in claims were breast reduction (21.8%), breast augmentation (17.2%), and breast reconstruction (11.8%). When compared to 7,202 non-plastic surgery claims, plastic surgery claims were more likely to concern the surgery itself (53.8% v 41.3%, $p<.001$), or the performance of a procedure (9.4% v 4.7%, $p<.001$). Non-plastic surgery claims were more likely to be diagnosis related (11.3% v 1.8%, $p<.001$). Cosmetic injury was most common in cosmetic breast surgery claims - augmentation (33.3%), and lift (28.1%), compared with reconstructive breast surgery claims - reconstruction (19.4%), and reduction (14.8%). Need for additional surgery was most common in claims involving breast reconstruction (52.7%).

Contributing factors including selection of procedure or therapy, poor technique, and known complications were present in 86% of the plastic surgery claims compared with 91% of the non-plastic surgery claims ($p<.001$). In 38.8% of plastic surgery claims patients sought other providers due to dissatisfaction with their surgeon, a factor in only 17.1% of non-plastic surgery claims ($p<.001$). Factors that might have helped to preclude the bringing of a lawsuit typically involving communication with patients and family, were more common in plastic surgery claims (59.4%) than in non-plastic surgery claims (36.6%, $p<.001$). Specifically, there were unmet expectations in 14.4% of plastic surgery claims, but in only 3.8% of non-plastic surgery claims ($p<.001$). A similar percentage of non-plastic surgery claims closed with no indemnity payment (26.6%) as plastic surgery claims (25.3%) but there was a 3.7 times greater likelihood of a plastic surgery claim closing with payment when a documentation issue was present.

Conclusion: This analysis points to the issues confronting plastic surgeons when considering malpractice risk reduction. Managing patient expectations is critical, especially when patients undergo cosmetic surgery. Breast surgery is the most litigious group of procedures plastic surgeons perform, and good documentation is more likely to result in no payment being made when there is a claim.

Fertility & Childbearing Outcomes of Female Plastic Surgeons: How Far Have We Come in 25 Years?

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Background: Plastic surgeons face challenges in fertility and childbearing due to a rigorous training and career. Women now represent a third of plastic surgery residents and 19% of active and candidate members of the American Society of Plastic Surgeons (ASPS).1,2 Despite more women entering the field, it is unclear whether plastic surgeons' fertility and childbearing outcomes have meaningfully improved. This study compares current data on fertility and childbearing to historical data from 25 years ago to ascertain whether meaningful change has occurred.

Methods: An IRB-approved survey was sent to female plastic surgery residents, fellows, and members of the American Society of Plastic Surgeons in 2018-2020. The results were compared to historical data from a 1995 investigation of plastic surgery trainees and attendings.3

Results: There were 351 respondents with a response rate of 26%. Exactly half had children, which was unchanged from 1995 (50% vs. 54%, p=0.45). The percentage of women who had their first child during training was similar, 56% compared to 46% in 1995 (p=0.08). Miscarriage affected 40% of women, a rate twice as high as 1995 (18.9%, p=n/a). The prevalence of abortion was 13%, significantly lower than 1995 (26%, $p<0.005$). The rate of obstetrical complications was similar to that of 1995 (52% vs. 57%, p=0.38). The rate of infertility was 54%, significantly higher than 1995 (33%, $p<0.005$).

Conclusions: Since 1995, the incidence of miscarriages among plastic surgeons has nearly doubled and the rate of infertility has increased. Additionally, the rate of obstetrical complications and the percentage of women having children during training have stayed the same since 1995. There is a disappointing trend in the lack of progress in fertility and childbearing outcomes among female plastic surgeons. The comparison to 1995 shows that there is still a critical need for awareness and change in order to improve the lives of surgeon mothers.

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Hard to Deny It: Preauthorization Inconsistencies Prevail in Reduction Mammaplasty

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Background: Reduction mammaplasty is one of the most common procedures performed by plastic surgeons in the United States (US) with nearly 100,000 cases performed annually, of which approximately 64,000 are considered reconstructive. Despite evidence documenting the physical and psychological benefit of breast reduction, preauthorization approval remains a cumbersome process. In recent years, preauthorization criteria have become increasingly complex and stringent. These changes parallel increasing denial rates across time. While researchers have created guides for useful clinical documentation to include with preauthorization submission, overarching recommendations can miss subtle policy differences resulting in either denial or delay of treatment. The objective of this study was to assess preauthorization criteria for reduction mammaplasty among major US insurance carriers to inform surgeons, clinical staff, and office administrators on the nuanced requisites to obtain approval for surgery and receive reimbursement.

Methods: Market research identified representative private insurance companies with the highest patient representation across the US, including Aetna, United Health Care, Cigna, Blue Cross Blue Shield (BCBS) of New York, and BCBS of Florida. Medical necessity criteria for reduction mammaplasty (CPT 19318) were retrieved for each company by conducting a web-based query to obtain the entire publicly available policy. Various data points were extracted from each policy including content, requirements, and structure of the policies. Microsoft Excel (Version 7, Seattle, WA) was used for performing descriptive statistics.

Results: All policies had been updated more recently than January 2020. Policies ranged from 995 to 5672 words in length (mean 2982.8) and cited anywhere from 6 to 84 references (mean 36.8) from the primary literature to support their policies. All policies described case coding with variable specificity and detail. Only 60% of the companies specifically stated what documentation was required for approval of the procedure. Photo documentation was only required for 40% of carriers, while an additional company stated it may request photographs in certain cases after initial review. Policies required either 1 or 2 symptoms, and required symptom duration was varied widely (6 weeks to 1 year). One company did not explicitly mention a numerical requirement for symptoms needed for approval. All companies reported a tissue resection estimate threshold for approval, which varied in its cutoff based on patient body surface area. Preoperative mammography was only mentioned in one policy. All policies stated that reduction mammaplasty by liposuction alone does not meet approval criteria for coverage.

Reduction mammaplasty as a symmetrizing procedure is more frequently covered in cases of mastectomy (80% of companies) versus lumpectomy (40% of companies).

Conclusions: Wide variability exists in medical necessity criteria for reduction mammaplasty policies among major US insurance carriers. These nuances introduce inefficiencies for plastic surgery practices contributing to high denial and appeal rates while simultaneously delaying surgical care for patients. Surgeons with variable payer mixes must recognize the nuances of these policies and provide appropriate documentation based on the patient's health insurance.

Charge Capture in the BICU: Increasing Revenue by Improving Documentation

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Background: Proper documentation is the key to capturing the value that a physician provides. However, patient encounters can be under-coded at a level of service that is not reflective of provider work if adequate levels of Medical Decision Making (MDM) are not present in a given note; thus, leading to a loss of potential revenue. Researchers at the Timothy J. Harnar Burn Center at Texas Tech University Health Sciences Center speculated that deficiencies in documentation (particularly with MDM) were leading to a sizeable proportion of encounters being billed at inadequate and inaccurate levels of service, culminating in poorer revenue for the unit.

Objective: To improve the levels of MDM in physician documentation at the Timothy J. Harnar Burn Center and consequently, increase the numbers and levels of billable encounters in the unit with an accompanying increase in revenue.

Methods: In order to improve documentation, two resources were created and implemented. A pocket card was to be used during rounding and morning report to prevent missed details and diagnosis(es) when documenting patient encounters later in the day. An EMR template, to be used by all providers rotating through the unit, was designed to auto-populate relevant fields, as well as provide dropdown menus to allow providers to select frequent (and often neglected) issues associated with burn patients/victims. Beginning in July 2021, existing attending faculty, fellows, and residents were trained on the use of the card and EMR template, and a training is provided during the orientation for new residents rotating in the unit. Additional resources regarding proper documentation technique were also generated and provided and feedback from the assigned medical coder was regularly given to rotating residents. Data collection was

concluded October 2021, and a comparison was made between the 4-month periods of July-October 2021 and December 2019-March 2020 (the most recent 4-month period before the COVID-19 pandemic).

Results: Based on the encounters provided by residents and one fellow under one provider, the inpatient codes showed an average increase in billable subsequent encounters of 390% between the compared periods. Upon implementation of the intervention, subsequent visit codes 99231, 99232, and 99233 increased by 138%, 709%, and 322%, respectively. This led to a 95% increase in total charges for 2021 compared to 2020, a substantial improvement from the 21% increase in charges from 2019 to 2020.

Conclusion: We found that since implementation of the intervention, billable encounters have replaced the once-dominate global encounter, 99024, realizing an increase in billable inpatient services. Though obtaining buy-in from providers proved a significant challenge, consistent training and feedback allowed for an improved understanding of billing processes within the unit. These findings indicate that focused effort to improve documentation offers a promising method to yield potentially significant improvements in a unit's profitability.

The Impact of COVID-19 on a Plastic Surgery Chief Resident Clinic and Resident Education

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Introduction: Chief resident clinics play a vital role in the education of plastic surgery residents by offering senior residents increased operative autonomy and surgical experience. During the COVID-19 pandemic many elective cases were either postponed or cancelled, significantly impacting the surgical case load of plastic surgeons as a whole. Our hospital system was operating in code red or yellow status for most of 2021 and 2022 with significant impact on elective and semi urgent procedures. The purpose of our study is to determine if the COVID-19 pandemic had a negative impact on resident education and Plastic Surgery Chief Resident clinic billing by decreasing the case volume seen through our chief resident clinic.

Methods: A retrospective review of billing data from the Plastic Surgery Chief Resident clinic at Spectrum Health Michigan State University was performed from January 2017 to December 2021. Select cases were classified into the following categories based on common procedural terminology (CPT) codes: nasal reconstruction, body contouring, head and neck, upper limb, and breast. Cases were also categorized as being performed inpatient, outpatient or in the emergency room. All statistical analyses were performed using Microsoft Excel or Tableau.

Results: Our chief resident clinic experienced a steady year-over-year increases in billing from 2017 to 2019. With the onset of COVID-19, our clinic saw a significant decrease in billed CPT codes in 2020 where we experienced a 24.33% decrease compared to the previous year. Although billing rebounded in 2021 in comparison to 2020, it still remained 18% below 2019 billing.

Our three largest areas of service through our chief residency clinic determined by volume of billed CPT codes include outpatient, inpatient, and emergency room. Procedure visits in all places of service declined in 2020 and 2021 in comparison to 2019. The most significant decline occurred in 2020 when we experienced a 40.6% decline in ER visits. Only inpatient billing numbers have rebounded to be close to 2019 numbers.

All procedure categories analyzed experienced an overall decrease in volume during the COVID-19 pandemic years 2020 and 2021, except for breast. The volume of breast procedures performed through the chief resident clinic steadily rose throughout the pandemic at an average year-over-year growth of 17.77%.

Conclusion: Our chief resident clinic experienced a significant decrease in case volume in 2020 and 2021 as a result of the COVID-19 pandemic. Decreased billing volume was seen in inpatient, outpatient, and emergency room procedures, and none have returned to levels seen in 2019. Only the breast surgery numbers were unaffected and actually showed growth in comparison to pre pandemic years. Most breast surgery completed out of our clinic is for cancer reconstruction, and the completion of these cases were not affected by COVID-19. The impact of the COVID-19 pandemic has resulted in fewer educational and clinical opportunities for our plastic surgery chief residents. Further, and more long-range studies will need to be completed to see if this temporary decrease in clinical volume has affected our chief residents' ability to practice plastic surgery safely and competently.

Streamlining and Consistency in Surgery: Lean-Six-Sigma to Improve Operating Room Efficiency

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Introduction: Improving peri-operative efficiency helps reduce unnecessary surgical expenditure, increase operating room (OR) throughput, improve patient safety, and enhance staff

and patient satisfaction. Lean Six-Sigma (LSS) is a quality improvement model that has been successfully applied to eliminate inefficiencies in the business sector but has not yet been widely adopted in medicine. This study investigates the adaptation of LSS improving operative efficiency for plastic surgery procedures.

Methods: The authors followed the Define, Measure, Analyze, Improve, and Control (DMAIC) phases to implement LSS. The key outcome measures gathered were operative times, including the cut-to-close time and the total time the patient spent in the operating room.

Results: The study included a total of 181 patients who underwent immediate bilateral DIEP flap breast reconstruction between January 2016 and December 2019. The LSS interventions were associated with a decrease in total operative time from 636.36 minutes to 530.35 minutes, and a decrease in the time between incision to closure from 555.16 minutes to 458.85 minutes for a bilateral mastectomy with immediate DIEP flap breast reconstruction.

Conclusion: This study demonstrates that Lean-Six-Sigma is useful to improve peri-operative efficiency during complex plastic surgery procedures. The workflow of the procedure was improved by determining the optimal spatial positioning and distinct roles for each surgeon and preparing surgeon-specific surgical trays. Two process maps were developed to visualize the positioning of the surgeons during each stage of the procedure and depict the parallel workflow that helped improve intraoperative efficiency.

Greening the Plastic Surgery Operating Room: Strategies for Waste Reduction in Plastic Surgery Procedures

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Introduction: Among developed nations, the United States is disproportionately one of the largest producers of landfill waste compared to population size. (1) Seven states are estimated to run out of landfill space within the next five years. The healthcare industry represents the second largest industrial contributor to landfill waste, producing 4 billion tons annually. Of this, operating rooms and labor/delivery rooms are responsible for approximately two thirds of the landfill waste generated within hospital systems. (2) As much of operating room waste consists of single use disposables and recyclable materials, there is ample opportunity to decrease waste production. Additionally, hospital systems absorb the cost of many disposable items, creating financial waste. Here we aim to measure the waste produced during typical plastic surgery procedures and then develop and implement strategies to reduce waste production. Focusing on gender surgery, we then measure the difference in waste generated after implementation as well as financial savings.

Methods: Waste production was measured for multiple procedures including breast reductions, deep inferior epigastric perforator flaps (DIEP), facial mass excisions and penile inversion vaginoplasties. This included landfill waste, laundry, and recycling. Lists of items included in standardized purchased case packs as well as instrument trays were then reviewed. We then developed specialized case packs and instrument trays for penile inversion vaginoplasties with an emphasis on removing extraneous disposable items and instruments.

Results: For the procedures studied, an average of 17.49±1.54lbs of waste was generated per case during breast reductions, 44.50±3.75lbs during immediate DIEPs, 59.9±2.41lbs during delayed DIEPs, 21.26±1.77lbs during penile inversion vaginoplasties, and 7±3.44lbs during removal of benign facial masses. New vaginoplasty case packs had 16 less individual items and the quantities reduced of an additional 4 items. These changes along with the development of case-focused instrument pans are projected to result in $17,280 annual savings and result in 240lbs of solid waste diverted from landfill annually for a single surgeon's vaginoplasties.

Conclusion: A large amount of surgical waste results from reliance on single-use items and instrument trays in which large pluralities of items go unused. Identifying and eliminating these items from case setups reduces the solid waste produced in the plastic surgery operating room. This approach to waste reduction is easily applicable across surgical divisions and provides a financially and environmentally friendly blueprint for surgical practice.

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Assessment of Adverse Event Risk in Combined Plastic Surgery Procedures Utilizing the Tracking Operations and Outcomes for Plastic Surgeons (TOPS) Database

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Purpose: Combining several surgical procedures into one operative session is widespread in the field of plastic surgery; however, the implications of this practice are not fully understood. There are several benefits that should be taken into consideration when deciding whether to combine plastic surgery procedures. First, combining procedures reduces the number of times a patient

must undergo anesthesia. Additionally, the patient benefits from a lower cost burden and single postoperative recovery. However, these benefits must be weighed against any potential increased risk for the patient. This study aimed to evaluate the rates and characteristics of adverse events associated with combining plastic surgery procedures in a single session as compared with similar outcomes of index procedures alone.

Methods: A retrospective cohort analysis was performed utilizing data between January 2016 and December 2020 from the TOPS database. The three most frequent combinations for each of the five most commonly performed plastic surgery procedures (augmentation mammaplasty, reduction mammaplasty, trunk liposuction, mastopexy, and abdominoplasty) were selected for analysis. The rate of 30-day adverse events, as defined by the TOPS database, served as the primary outcome. Chi-square analyses were to compare adverse event percentages. Chi-square, Kruskal-Wallis and Fisher's exact tests were used as appropriate to compare patient characteristics.

Results: Of the total 35,157 patients analyzed, 12,373 (35%) underwent multiple concurrent procedures. Double or triple procedure combinations were found to have higher rates of 30-day adverse events compared to index procedures (8.7% and 7.7% compared to 4.2%, $p<0.001$, respectively). Rates of adverse events for double and triple procedure combinations remained elevated compared to index procedures throughout the five-year analysis ($p<0.05$). The 30-day adverse event rates were significantly higher for the three most common combinations for augmentation mammaplasty compared to index (4.3% and 2.3%, respectively, $p<0.001$), trunk liposuction combinations compared to index (13% and 2%, respectively, $p<0.001$), and reduction mammaplasty combinations compared to index (14% and 7.1%, respectively, $p<0.001$). Adverse events were not significantly different for the three most common combinations for mastopexy compared to index (4.7% and 4.5%, respectively, $p=0.8$), and abdominoplasty combinations compared to index (11% and 8.7%, respectively, $p=0.066$). A sub-analysis comparing patients coded for abdominoplasty, panniculectomy, or both was performed. Patients coded for both procedures had a higher rate of adverse events (12%) compared to abdominoplasty or panniculectomy alone (8.7% and 9.1%, respectively $p=0.012$). However, patients coded for panniculectomy alone were found to have the highest rates of diabetes (10%), hypertension (16%), and ASA class 5 status (9.2%) compared to patients coded for abdominoplasty alone or both procedures.

Conclusions: The findings from this study help elucidate the impact of combining procedures. These results serve to inform shared surgical decision making in multi-procedure planning and contribute to patient safety.

Recent Evolutions in Epidemiologic Practice Patterns of Gender-Affirming Surgery

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Background: Gender-affirming surgery has been gaining traction among the surgical practice of plastic surgeons due to increased awareness and insurance coverage for these procedures. The purpose of this study is to investigate the epidemiologic trends of gender-affirming surgery across the country over the past six years.

Methods: The ACS NSQIP database was queried for gender-affirming procedures performed between 2015 and 2020. Professional surgical society guidelines, insurance reimbursement policies, and literature was reviewed in-depth to compile an elegant list of procedure code combinations to define subtypes of gender-affirming procedures. Demographics and epidemiologic trends were analyzed among procedures with appropriate statistics.

Results: During the study interval, 4491 patients underwent gender-affirming surgery. These were 71.1% (n=3221) transmale procedures and 28.3% (n=1270) transfemale procedures, and this proportion has stayed stable over the past six years (p=.705). However, the incidence of gender-affirming procedures significantly increased over the years from 0.030% (n=265 of 885,502) in 2015 to 0.121% (n=1092 of 902,968) in 2020 across 719 participating hospitals, representing a four-fold increase when accounting for overall changes in practice volume across all surgical specialties.

Age of patients has been decreasing undergoing transgender procedures overall ($p<.001$, $\rho= -.091$, 30.0 to 27.0 years), including those undergoing transmale ($p<.001$, $\rho= -.092$, 28.0 to 25.0 years) and transfemale procedures ($p=.126$, $\rho= -.043$, 33.5 to 32.0 years). Patients undergoing transmale procedures were significantly younger than those undergoing transfemale procedures ($p<.001$, 22.0 vs 32.0 years). Patients undergoing top surgery were slightly younger than those undergoing bottom surgery ($p<.001$, 27.0 vs 29.0 years). White patients were significantly more likely to undergo transmale procedures than transfemale procedures ($p<.001$, 58.6% vs 45.0%), black patients were significantly more likely to undergo transfemale procedures ($p<.001$, 17.4% vs 9.3%), and hispanic patients were significantly more likely to undergo transfemale procedures ($p<.001$, 14.3% vs 7.8%).

Among transmale patients, 68.8% (n=2216 of 3221) underwent top surgery and 32.4% (n=1044 of 3221) underwent bottom surgery, including 1.2% (n=39 of 3221) who underwent both top and bottom surgery during the same procedure. Among transfemale patients, 60.6% (n=769 of 1270) underwent top surgery and 41.7% (n=529 of 1270) underwent bottom surgery, including 2.2% (n=28 of 1270) who underwent both top and bottom surgery during the same procedure. There were significant differences across all of these comparisons, such that transmale patients were more likely to undergo top surgery ($p<.001$), transfemale patients were more likely to undergo bottom surgery ($p<.001$), and transfemale patients were more likely to undergo simultaneous top and bottom surgery ($p=.013$).

Conclusions: As the cultural, political, and financial climate has made gender-affirming surgery more accessible, the age of patients undergoing these procedures has significantly decreased over the past six years. Transmale patients are ten years younger than transfemale patients. There is significant racial difference in white patients more likely undergoing transmale procedures, whereas black and hispanic patients are more likely to undergo transfemale procedures. Further research will be needed to elucidate the specific disparities in access to these procedures within racial, socioeconomic, and regional differences across the country.

Examining Linguistic Disparities In Patient Experiences With Telehealth In Craniofacial Care

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Purpose: Prior studies have found that the use of telehealth magnifies demographic disparities in patient access to care and satisfaction.1,2 However, its impact on non-English-speaking families in pediatric craniofacial clinics remains poorly defined. This quality improvement analysis sought to identify disparities between English- and Spanish-speaking patients in rates of access to care, satisfaction, and attendance at appointments.

Methods: All English- and Spanish-speaking patient families who had video appointments at the UCSF Craniofacial Center from March 2020 to December 2020 were identified. Chart review was utilized to collect demographic and clinical information, including non-attendance at scheduled appointments. All patients were contacted by telephone, and respondents completed a satisfaction survey that was administered over the phone. Univariate statistics were generated with Chi-Square tests, and multivariable statistics were generated with multiple logistic regression models.

Results: Of the 338 patients with scheduled telehealth appointments in the study period, 114 (33.7%) missed at least 1 appointment. Univariate analysis showed that non-attendance was associated with Medicaid insurance (50.3% vs. 19.6%, $p = 0.00003$), non-White race (42.3% vs. 24.8%, $p = 0.02$) and Spanish as the primary language (51.1% vs. 28.2%, $p = 0.0001$). Multiple logistic regression showed that Medicaid insurance was the only independent predictor of missing at least one appointment (OR: 2.0, 95% CI: 1.2-3.4, $p = 0.005$). Of the 104 patients' families surveyed, 34 preferred Spanish as their primary language, whereas 70 preferred English. 32 Spanish-speaking patients (94.1%) utilized virtual interpreters during their appointments. Similar proportions of patients in each group reported annual household incomes below $50,000 (Spanish-speaking 26.5% vs. English-speaking 20.0%, $p = 0.37$), though Spanish-speaking families were less likely to have completed high school (38.2% vs. 87.1%, $p = 0.0000004$). On

multivariable analysis, families who preferred Spanish were more likely to lack access to telehealth technology (OR 12.4, 95% CI: 3.1-64.3, p = 0.0008) and require assistance logging onto the telehealth platform (OR 10.7, 95% CI: 3.0-44.7, p = 0.0004), independent of income and education level (p > 0.05). However, after receiving the necessary assistance from clinic staff, equivalently high rates of both English- and Spanish-speaking families were "satisfied" or "highly satisfied" with their visits (94.3% vs. 100%, respectively, p = 0.55).

Conclusions: Insurance status, not primary language, predicted non-attendance at virtual appointments. However, technology access and literacy remain a barrier to care in non-English speaking populations. Nonetheless, telehealth is an effective means of delivering craniofacial care across diverse linguistic populations when patients have access to assistance with audiovisual equipment and interpreter services. Future work should examine whether improved care coordination and outreach to marginalized groups, such as those with Medicaid insurance, increases attendance at scheduled video appointments.

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Does The Camera Type Matter to Our Patients? An Analysis of Patient Opinions in Office Photography

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Purpose: Photography is an essential part to plastic surgery in terms of procedural planning and documentation. Numerous papers have examined standardization in photographic technique and patient positioning in plastic surgery, yet none have investigated the effect of the camera type on the patient's perception of the office visit. With the increasing weight placed on a positive online presence, no aspect of the office experience can be neglected. Therefore, in this study we aim to investigate the impact of using a traditional DSLR style camera versus a smartphone in office-based patient photography.

Method: An anonymous survey was distributed and completed by patients following routine office visits to assess their level of comfort with the office photography. Key points were included regarding number of visits with this provider, overall comfort with office photographic

experience, the camera type used (DSLR type versus smartphone), patient's identified sex, and age decade.

Results: Forty-seven patients had photographs taken with a DSLR style camera and 52 with a smartphone. No statistical difference in patient comfort between traditional camera and smartphone use was observed with regards to patient comfort overall or when data was stratified to account for age, sex, or number of previous visits.

Conclusion: Current smartphone camera systems produce images that offer comparable quality to DSLR style cameras in the office setting. The patients in this study were equally comfortable with their photographic experience when the provider used either style of camera. Given the convenience of smartphone cameras in the increasingly busy office setting, the added layers of security offered by password protection and ability to remotely erase modern smartphones, they should be regarded as a suitable alternative for office use without fear of invoking negative perceptions in patients.

Work Relative Value Units and Operative Time – Defining the Relationship for Subspecialties of Plastic and Reconstructive Surgery

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Purpose: Work relative value units (wRVUs) are intended to consider physician time and expertise and are closely tied to clinical reimbursements. Recent work has begun characterizing the relationship between wRVUs and operative time in plastic and reconstructive surgery (PRS).1,2 However, this relationship among PRS subspecialties has not been elucidated. This analysis compares wRVUs and operative time across subspecialties.

Methods: The 2015-2018 National Surgical Quality Improvement Program (NSQIP) database was queried for all single CPT cases completed by plastic surgeons with assigned wRVUs and a positive operative time. Only the 100 most performed procedures (by CPT code) were included. These codes were assigned one or more subspecialties, including micro-, craniofacial, breast, hand/nerve, and general reconstructive surgery. This assignment was completed independently and agreed upon by two authors (JBC and RSM). Other subspecialties were not assessed due to

their low prevalence in NSQIP. Per procedure, the median operative time and assigned wRVUs were captured. wRVUs/hour were calculated for each subspecialty. Linear regressions and correlations were computed between operative time, wRVUs, and wRVUs/hour for each subspecialty.

Results: Of the queried CPTs, there were 15 micro-, 11 craniofacial, 19 breast, 38 hand/nerve, and 20 general reconstructive surgery procedures. There were moderate to strong positive correlations between operative time and wRVUs for micro- (R2=0.84), craniofacial (R2=0.68), breast (R2=0.57), hand/nerve surgery (R2=0.66), and general reconstructive surgery (R2=0.51) procedures. Each additional procedural hour was associated with an additional 4.68, 6.54, 5.50, 6.31, and 6.76 wRVUs for micro-, craniofacial, breast, hand/nerve, and general reconstructive surgery, respectively ($p<0.01$). The mean (SE) for wRVUs/hour was 7.12 (0.65) for micro-, 9.37 (0.74) for craniofacial, 9.07 (0.63) for breast, 8.95 (0.37) for hand/nerve, and 7.39 (0.89) for general reconstructive surgery. There were weak to very weak negative correlations between operative time and wRVUs/hour for micro (R2=0.28), craniofacial (R2=0.20), breast (R2=0.22), and hand/nerve surgery (R2=0.20). This relationship was negligible for general reconstructive surgery. Each additional procedural hour was associated with 0.54, 2.20, and 3.18 less wRVUs/hour for micro-, breast, and hand/nerve surgery, respectively ($p<0.05$). There were numerous outliers between operative time and reimbursement for all subspecialties. For example, under breast surgery, mastectomy for gynecomastia receives 5.31 wRVUs whereas this procedure should obtain 10.87¬ wRVUs based on the typical operative time for breast cases (78 minutes).

Conclusion: Operative time and wRVUs tend to be positively correlated, whereas operative time and wRVUs/hour tend to be negatively related across PRS subspecialties. How¬ever, the strengths of these relationships differ by subspecialty, suggesting that the degree of reimbursement discrepancies also differs. Further, each subspecialty has numerous outliers from the relationships between surgical time and reimbursement, suggesting that current wRVU assignments may not be optimal across PRS subspecialties.

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The Impact of Double vs. Single-Blinded Review on Plastic Surgery Authorship

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Purpose: Academic productivity remains an important metric in plastic surgery for promotion. However, opportunities for research, such as publication in peer-reviewed journals, may be inequal. In orthopedics, articles are significantly more likely to be accepted when famous authors and prestigious institutions are known at review time (single-blinded)1. No study to date has investigated the impact of peer review methodology on plastic surgery authorship. We aim to compare author characteristics of plastic surgery articles with single- and double-blinded review to identify potential disparities in publication opportunities.

Methods: Articles from all issues, excluding supplements, of Plastic and Reconstructive Surgery (PRS), Aesthetic Surgery Journal (ASJ), Aesthetic Plastic Surgery (APS), and Journal of Plastic, Reconstructive and Aesthetic Surgery (JPRAS) from September 2019 to September 2021 were reviewed. PRS and JPRAS use single-blinded review. ASJ and APS use double-blinded review. Original articles, viewpoint articles, review articles, case reports/series, and CME articles were included. Per article, the name and institution of first and senior author were recorded. Author genders were determined using the Gendorize.io as previously described^2. Doximity 2021 reputation rankings for integrated plastic surgery residency programs were utilized to estimate institutional prestige. Institutional plastic surgery division/department NIH funding was calculated by summing all rewards for full-time faculty as listed on the NIH RePORTER database.

Results: Overall, 2502 articles met inclusion criteria, with 1644 (65.7%) published after single-blind and 858 (34.3%) after double-blind review. Articles reviewed by a double-blinded process tended to have higher rates of male first authors (74.9% vs. 67.4%, $p < 0.001$), and first (71.2% vs. 50.7%, $p < 0.001$) and senior (70.3% vs. 49.6%, $p<0.001$) authors from non-US institutions than single-blinded. Geographic locations of the first and senior authors were also significantly associated with degree of blinding ($p < 0.001$). Articles reviewed by single-blinded processes tended to have first (10.2% vs. 2.7%, $p < 0.001$) and senior authors (10.9% vs. 3.7%, $p = 0.009$) affiliated with institutions with significantly more NIH funding than those that were reviewed double-blinded. Interestingly, while there was a trend of articles published in single-blinded journals having higher proportions of first (23.9% vs. 10.8%, $p = 0.060$) and senior authors (26.5% vs. 12.2%, $p = 0.061$) coming from institutions with Top 20 integrated programs, this just missed statistical significance.

Conclusion: Single-blinded review tended to accept more articles authored by women, US institutions, and those with higher NIH funding. While this portends important strides towards gender equity in plastic surgery academia, international authors and those from smaller, less funded, and reputable plastic surgery divisions/departments are still disadvantaged. This should signal careful consideration to current peer-review processes to make research opportunities more equitable.

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Into The Unknown: Plastic Surgery Residency Program Websites Lack Basic Information on Didactic Education

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Background: Non-operative plastic surgery education is poorly described in the literature. Fisher et al surveyed program directors and found heterogeneity in didactic offerings, and deficits in simulation training, didactic lectures based on national curricula, and exam preparation (1). Plastic surgery applicants cite didactic offerings as "the most important information…in a residency website", but a 2014 and 2020 study found that 40.1% and 19.3% of program websites contained zero didactics information (2,3,4). No studies examine specific didactic components listed on program websites.

Methods: A list of all English-language US and Canadian plastic surgery residency program websites was obtained. Didactic components were adapted from Fisher et al including protected academic time, weekly lectures, lecture and simulation components, and special topics(1). The presence or absence of didactic components on websites was recorded.

Results: Of 83 American and 11 English-language Canadian programs. 14.4% and 9.1% had no information on didactics. Canadian programs were significantly more likely to not have a didactics page (90.9% vs 43.3% absent, p=0.003). It took 0.9 clicks on average to navigate from the main page to the didactics page, if present.

Weekly didactics were offered by 74.7% of programs, including faculty-led (48.4%) and resident-led (43.2%) lectures. 27.7% of US and 45.5% of Canadian programs offered an average of 3.4 hours and 6.0 hours of protected educational time, respectively (p=0.090). For basic didactic components, 23.2% offered lectures based on international curricula, 44.2% offered oral

boards practice (3-12x annually), 24.2% offered written boards practice, and 30.5% offered hand surgery lectures.

For simulation, 45.3% offered cadaver labs, 40.0% offered microsurgery, 4.2% offered cleft lip/palate, and 6.3% offered craniomaxillofacial trauma. Canadian programs were significantly more likely to offer simulation (72.7% vs 26.5%, p=0.002).

For "special topics", 61.1% offered morbidity/mortality conferences, 67.4% offered journal clubs, 22.1% offered resident research conferences, and 8.4% offered routine resident-leadership group meetings. US programs were significantly more likely to offer visiting professor lectures (53.0% vs 18.2%, p = 0.031).

There was no significant difference in any offering by size of program or presence of fellowships.

Conclusions: Program websites lack critical information about didactic offerings. Given the role of this information for applicants, we propose that residency programs include a dedicated, standardized page describing didactic offerings and their frequency, and that a standardized format should be created by program directors or an international plastic surgical organization.

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Policy Implications on Payment and Regional Shifts in Gender Affirming Surgery

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Purpose: Important changes have occurred in healthcare policy relating to gender-affirming care in the past decade, including the end of the Medicare ban on gender-affirming surgery (GAS) and Medicaid coverage expanding to gender-affirming care in many states. While insurance coverage has increased, little is known about how GAS has been affected.

Methods: Data for patients undergoing GAS was extracted from National Inpatient Sample for the years 2008-2017. Multivariate logistic regression models were built over three time periods bridging major policy changes – 2008-2013, 2014-2015, and 2016-2017 - to identify shifts in associations between undergoing GAS and patient/hospital factors.

Results: 603 cases of GAS were identified. In 2008-2013, self-pay was more common than Medicare, Medicaid, or private insurance (OR: 0.015, 0.018, 0.291, all $p < 0.001$), but by 2016-2017, there were no significant differences in payer. Medicare, Medicaid, and private insurance were 42.33, 70.78, and 6.75 times more likely to be used for GAS in 2016-2017 than 2008-2013, respectively. GAS was more common in the Western United States than other regions throughout the time period studied, but cases were 5.21, 3.59, and 5.79 more likely to occur in the Northeast, Midwest, and South in 2016-2017 compared to 2008-2013.

Conclusions and Relevance: Major changes have occurred in federal and state law surrounding insurance coverage of gender-affirming care. We found that increases in GAS followed implementation of non-discrimination policies and identified a shift toward government and private insurance usage. Policies supportive of insurance coverage for gender-affirming care have likely expanded access to GAS.

Searching Hospital Websites for Aesthetic Breast Surgery: Where Are the Plastic Surgeons?

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Background: Patients increasingly use online platforms such as hospital websites to evaluate hospitals and physicians. Over recent years, there has also been an alarming number of non-plastic surgeons (general surgeons, gynecologists, dentists) performing aesthetic breast surgery. This study examines the representation of plastic surgeons when searching for aesthetic breast surgery on major hospital system websites in the United States.

Methods: The search engines on websites for the top 20 U.S. medical centers according to the U.S. News and World Report's Hospital Rankings from 2020-2021 were used to search for: "breast reduction", "reduction mammoplasty", "breast augmentation", "breast implants", "mastopexy", "breast lift", and "gynecomastia". Data reviewed for search results included gender, if they were a physician, specialty, medical school, and residency attended.

Results: Across 1,810 search results, a total of 1,525 allopathic trained (M.D) physicians were identified, averaging 259 (range 58-492). Nearly all M.D.'s attended medical school (88%) and residency in the U.S. (100%). Approximately half of search results were male (51%) and female representation was highest for the term "gynecomastia" at 59% and lowest for the term "mastopexy" at 28%. Plastic surgeons represented only half (49%) of search results. Plastic surgeons accounted for 60% of the results when searching for the term "breast augmentation" and 83% when searching for "breast lift". Plastic surgeons were a minority in the search results when querying "breast implants" (40%) and for "gynecomastia" (15%). Other surgeons and obstetricians/gynecologists represented 7% and 5% of all search results, respectively. Non-surgeons accounted for 32% of resulting providers. Across all institutions and procedures, plastic surgeons on average appeared earlier on search result lists than non-plastic surgeons, 17th to 57th, respectively ($p<0.001$).

Conclusion: The plastic surgeon's presence is diluted amongst other providers when searching hospital websites for aesthetic breast surgery procedures. Such difficulties in quickly discovering a plastic surgeon introduces a delay in care and may cause patients to seek care with non-plastic surgeons or at other institutions. Although plastic surgeons appear higher on search results than non-plastic surgeons, the high number of extraneous results may cause plastic surgeons to be overlooked by patients when searching for a plastic surgeon. Plastic surgeons should work with hospital administration and information technology teams to refine and optimize search recommendations. These findings suggest that hospital websites currently list surgeons who are not plastic surgeons such as general surgeons, oncologic breast surgeons, trauma surgeons and obstetricians/gynecologists when searching for aesthetic breast surgery. It is possible that these non-plastic surgeons are performing aesthetic breast surgery as was discussed at the 2021 American Society of Plastic Surgeons' President's panel. It is paramount that advocacy efforts to preserve plastic surgery's scope of practice are made both at the surgeon level and on the administration/systems level to preserve our specialty and provide appropriate patient care and safety.

How Do “Gender Centers” Define Themselves? Service Line, Physician, And Provider Analysis of Self-Described “Gender Centers”

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Background: Many new gender-affirming healthcare centers (GAHCs) were created after the Medicare coverage ban reversal of 2014. While GAHCs report offering comprehensive gender-affirming medical care, no governments, or professional organizations like the World Professional Association for Transgender Health (WPATH) offer definitive criteria for services GAHCs must offer. To develop criteria, a formal needs assessment and current practice data are necessary. However, no publications exist that examine the distribution of physicians and nonphysicians represented or medical/surgical services offered across GAHCs.

Methods: A list of GAHCs was obtained from the Transgender Legal Defense and Education Fund (TLDEF). GAHCs were classified as adult or pediatric. GAHC websites were used to identify physician board certification, non-physician providers and ancillary staff, medical and surgical services provided, and website ease of use. Institutions were excluded if their websites did not offer ≥2 surgical and medical services, did not list ≥2 surgeons and non-surgeon physicians, or did not have definitive information regarding offerings online. Trends were characterized with descriptive statistics. Differences between centers were assessed with the 2-tailed Mann-Whitney U test.

Results: Of 85 institutions on the TLDEF list, 5 pediatric and 32 adult GAHCs were included. Most websites (73%) were considered "easy to navigate" by study members.

Most programs had board-certified plastic surgeons (92%) and gynecologic surgeons (73%). At least ½ of all centers had board-certified endocrinologists, family physicians, internists, pediatricians, and psychiatrists. At least ¼ of centers had board-certified otolaryngologists (nonsurgical), infectious disease specialists, and reproductive endocrinologists. Few programs had pediatric surgeons (14%), general surgeons (8%), or dermatologists (8%). Fewer than ½ of programs had dedicated nurses, midlevel providers, speech therapists, social workers, or patient navigators. Almost no programs had a research coordinator (8%) or ethicist (5%).

At least ¾ of programs offered services in hormone therapy (89%), primary care (78%), breast augmentation (84%), and mastectomy (81%). At least ½ of programs offered services in pediatrics, fertility preservation, psychotherapy, voice therapy, general facial feminization, vaginoplasty, phalloplasty, and hysterectomy/oophorectomy. At least ⅓ offered pubertal suppression, sexual health services (STI screening, PrEP, etc.), hair removal, social/nonmedical programs, facial masculinization, tracheal shave, metoidioplasty, and body contouring. Few programs offered sex therapy (PT/OT), hair transplant, voice surgery, nonbinary chest surgery,

or "zero-depth" vaginoplasty/vulvoplasty. No websites listed non-binary genital affirmation procedures such as vagina-preserving phalloplasty or nullification.

Included programs had a mean of 11±3.3 physician/provider specialties and 14±4.4 service lines, while excluded programs had a mean of 5±2.7 physician/provider specialties and 6±3.0 service lines ($p<0.001$). There were no significant differences in number of specialties or service lines between pediatric and adult programs ($p > 0.14$). Adult programs were significantly more likely to have a plastic surgeon ($p=0.005$); and to offer primary care services ($p=0.025$). Pediatric programs were significantly more likely to have a dedicated nurse ($p=0.046$), patient navigator ($p=0.025$), or research coordinator ($p=0.004$).

Conclusions: There is no clear definition for GAHCs. However, at least half of self-titled GAHCs offer gender-affirming face, chest, and genital surgery; and primary care, pediatrics, psychotherapy, hormone therapy, fertility preservation, and voice therapy.

Perioperative Misgendering Experiences in Patients Undergoing Gender-Affirming Surgery: A Call for a Gender-Inclusive Surgical Environment

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Purpose: Transgender individuals have long experienced discrimination and exclusion from medicine, leading to inadequate care and poor health outcomes.1 Misgendering is defined as referring to an individual using a gender or address incongruent with their identity.2 It further contributes to their exclusion from the medical system and harms physician-patient relationships. We evaluate the incidence of misgendering at any time during the perioperative period for patients seeking gender-affirming surgery (GAS), with the goal of identifying areas for quality improvement, continued education, and overall enhancement in the care provided to transgender and gender non-binary patients.

Methods: Following IRB approval, patients diagnosed with gender dysphoria who underwent GAS by the senior author (G.A.D.) were contacted to complete a survey evaluating instances of misgendering while in the hospital for their procedure. Descriptive statistics were used to summarize study results.

Results: Of 471 patients contacted, 182 (38.6%) completed the survey. Mean age at time of GAS was 33.8+12.1 years, with most patients being Caucasian (n=122, 67.8%). Commonly cited gender identities included trans female (n=51, 27.9%), female (n=37, 20.2%), trans male (n=35, 19.2%), and non-binary (n=28, 15.3%). Most underwent a legal name change prior to GAS (n=121, 66.1%). GAS most commonly included chest (n=86, 47.8%) or genital/reproductive (n=84, 46.7%) procedures, followed by head or neck procedures (n=13, 7.2%). Most patients reported experiencing respect for their gender identity (n=102, 60.4%) and preferred name (n=129, 76.8%) during their perioperative experience. Thirty-seven patients (22.0%) cited triggering experiences during their hospital stay, and 26 (15.4%) reported interactions with healthcare employees that caused them to reach out to a support system (e.g., therapist, family, friend). The most common misgendering experience reported was incorrect use of patients' preferred names and/or pronouns (n=50, 86.2%). Incorrect questioning by hospital staff regarding genetic sex-related conditions commonly included the possibility of pregnancy (n=10, 31.3%) or the patient's last menstrual period (n=6, 18.8%). Surgical check-in was the most common location of misgendering (n=10, 45.5%). On a 10-point Likert scale (0=uncomfortable, 10=very comfortable), patients rated great comfort with the clinical team regarding their gender identity (9.1+1.4). Common recommendations to help avoid misgendering and improve patients' hospital experience included name tags with preferred names and pronouns (n=4, 50.0%) and updated names and gender identities in electronic medical records (n=4, 50.0%).

Conclusions: Until now, the exact incidence of misgendering among patients seeking GAS has not been well established. While most patients in our study were satisfied by their perioperative experience, a large proportion still reported serious instances of misgendering, despite being seen by a GAS-specific service. The surgical experience must be further improved to reduce these instances and allow patients to feel supported by their clinical team during the sensitive period surrounding their gender transition.

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Patient Perspectives on Selecting an Aesthetic Surgeon: A Qualitative Interview Study

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Purpose: The last two decades have seen substantial growth in the aesthetic surgery marketplace, both in the number of procedures performed and the variety of practitioners performing these procedures.1,2 Patients therefore have many factors to consider when selecting an aesthetic surgeon, including training background and board certification. This study aims to characterize how patients select an aesthetic surgeon and to identify knowledge gaps in this decision-making process.

Methods: A qualitative interview study of aesthetic surgery patients was conducted between November 2021 and February 2022. A semi-structured interview guide was developed in collaboration with content and methodology experts, then refined through pilot testing. Patients presenting for a post-operative visit following aesthetic surgery were included. A purposive sampling approach was used to maximize representation regarding surgeon, surgery type, and demographic characteristics. Constant comparative grounded theory was used to construct a codebook, which was then applied to interview transcripts for identification of emergent themes.

Results: 24 patients were interviewed to achieve thematic saturation. Intercoder reliability was high ($\kappa > 0.8$). Participants reported that undergoing aesthetic surgery was a significant life event due to the financial investment (n=10, 41.7%) and the risk of an unsatisfactory outcome (n=15, 62.5%) or complications (n=16, 66.7%) given baseline health. When selecting a surgeon, participants frequently identified bedside manner (n=24, 100%) and referrals from a friend or other physician (n=16, 66.7%) as important factors. Participants demonstrated knowledge gaps regarding medical training, licensure, and board certification. No participant had prior knowledge that any licensed physician can offer aesthetic surgery, and nearly all participants expressed discomfort with this lack of regulation (n=23, 95.8%). Specifically, participants reported an absence of specialized training as concerning (n=23, 95.8%). There was considerable variation in how participants viewed board certification, with some ascribing it high importance (n=8, 33.3%) while most did not consider it in their decision (n=16, 66.7%). Although some participants distinguished between "plastic" and "cosmetic" surgery (n=6, 25.0%), most conflated the two (n=18, 75.0%). Among resident cosmetic clinic patients (n=6), almost all demonstrated an incomplete understanding of a chief resident's training level (n=5, 83.3%).

Conclusions: Patients most value interpersonal elements such as bedside manner and referrals from trusted sources when evaluating provider suitability, relying less on objective indicators like board certification. This study demonstrates a lack of public understanding regarding medical training and aesthetic surgeon qualifications. Given the high degree of consumer discretion within the aesthetic surgery marketplace, public education and legislative initiatives should promote increased transparency to ensure patients can make wise, informed decisions.

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The Continued Obscurity of Hospital Pricing: A Review of the CMS Price Transparency Act in the Context of Plastic Surgery Procedures

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Background: In an effort to increase the accessibility of healthcare procedure pricing to consumers, the Centers for Medicare and Medicaid Services (CMS) have mandated that hospitals post-consumer-friendly and publicly available pricing data for procedures offered at their hospital by January 1st, 2021. Pricing data is required to be digitally searchable and include the gross, discounted cash, insurance payer-specific, and de-identified minimum and maximum prices for all standard charges offered at a hospital and at least 300 shoppable services. We set out to understand the quality of pricing information available to plastic surgery patients, many of whom undergo elective procedures and could choose their healthcare facility based on price if desired.

Methods: 54 public and private hospitals were randomly chosen. Hospital compliance with CMS price transparency guidelines was evaluated using pricing information for 15 common plastic surgery-related procedures.

Results: Over a year after the CMS price transparency mandate, only 13.0% of surveyed hospitals were fully compliant with CMS requirements. The majority of hospitals (70.4%) reported prices using Current Procedural Terminology (CPT) codes and did not consistently report whether or not anesthesia, perioperative services, or physician charges were included in posted prices. Within the domain of oncoplastic breast reconstruction, which is coded for by combining mastopexy (CPT 19316) and breast reduction (19318) with adjacent tissue transfer (ATT; 14000, 14001, 14301, or 14302), 27.8% of hospitals surveyed reported the price for mastopexy and breast reduction. There was a wide range of gross prices reported for mastopexy and breast reduction, ranging from $2,236 to $26,769 and $3,166 to $29,031.48, respectively. The range of gross price for ATT also ranged greatly. For instance, CPT 14000 (ATT trunk <10 SQ CM), had gross prices ranging from $405 to $21,322, with an average gross price of $4,659 and an average discount cash price of $4,276. Compared to the surveyed free and pedicled TRAM flaps or non-flap related breast procedures, the rate of reporting the price for ATT was

significantly higher ($p<0.05$), averaging 32.4% while flap procedures averaged 10.7% and non-flap breast procedures averaged 25.0%.

Conclusions: Despite CMS's price transparency mandate, the inconsistencies and the poor quality of reported procedures prevent patients from reliably and realistically estimating their surgical costs. Rates of reporting common plastic surgery procedures are low and display a surprisingly wide range of gross prices. This is likely due to the lack of clarity regarding the inclusion of physician, facility, anesthesia, and perioperative service fees in the reported price. The findings of this study demonstrate the need for more stringent reinforcement of the price transparency mandate and serve to encourage patients to independently seek out financial education and counseling prior to choosing a facility for their procedure.

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A Race with No End: Research Productivity Does Not Predict Residency Placement of Successful Plastic Surgery Applicants

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Purpose: Plastic surgery program directors heavily weigh research output when considering prospective applicants: 80% rate its importance as 4.2/5.0 on the Likert scale in determining whom to interview. According to the National Resident Matching Program student survey, U.S. allopathic seniors who matched into integrated plastic surgery programs in 2020 produced an average of 19.1 abstracts, presentations, and publications by the time of application submission. While many studies have explored the average number of publications for successful plastic surgery applicants, none have evaluated their predictive value in matching into highly ranked programs. Additionally, few studies have explored applicant qualities outside of research

productivity that may predict residency placement. Therefore, the aim of this study is to identify factors that may provide predictive value for resident matriculation into reputable and research-focused plastic surgery programs.

Methods: Integrated plastic surgery interns between 2019–2021 were identified. Demographics such as attending a top 40 NIH-funded medical school, medical school affiliation with a top-quartile plastic surgery program (ranked by reputation), pre-residency publication count, and the quartile of their matriculating residency program rank were recorded. Univariate and multivariate logistic ordinal tests were used to identify the demographics that may predict matching into the top quartile of plastic surgery programs ranked by either program reputation or research output. These rankings were based on those provided by the Doximity Residency Navigator.

Results: A total of 509 interns across 78 programs were included. Despite an increasing yearly trend in the number of pre-residency manuscripts, multivariate analysis revealed that publication count did not significantly predict matching into a top plastic surgery program ranked by either reputation (OR 1.05 95% CI: 0.99–1.13; p=0.14) or research output (OR 1.01 95% CI 0.95–1.07; p=0.68). Attending a medical school affiliated with a top-quartile reputable plastic surgery program (OR 2.01 95% CI 1.21–3.34; p=0.007) and having top 40 NIH funding status (OR 2.16 95% CI 1.39–3.37; p<0.001) were significant predictors of placement into a top quartile reputable plastic surgery program. Attending a medical school within the top 40 NIH-funded institutions (OR 1.57 95% CI: 1.07–2.31; p=0.02) or one that is affiliated with a top-quartile reputable plastic surgery program (OR 2.50 95% CI: 1.56–4.03; p<0.001) also significantly predicted placement into a top quartile plastic surgery program based on research output.

Conclusions: These findings suggest that applicants from lesser-funded medical schools are less likely to match into top quartile plastic surgery programs, and that pre-residency publication count may not be weighed as heavily as other factors. This is pertinent as students from lower-ranked medical schools may find it increasingly difficult to match into top programs now that USMLE Step 1 has transitioned to a pass/fail scoring system.

Public Perception of Household Risks for Pediatric Burn Injuries

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Introduction: Children are uniquely vulnerable to injury because of near-complete dependence on caregivers. Unintentional injury is leading cause of death in children under the age of 14. Burns are one of the leading causes of accidental and preventable household injuries, with scald burns most commonly in younger children and flame burns in older ones. Education is a key tool to address burn prevention, but unfortunately these injuries persist. Critically, there is a paucity of literature investigating adult comprehension with respect to potential risks of household burns. To date, no study has been performed to assess management readiness for these types of injuries without seeking medical care.

Methods: Qualtrics™ surveys were distributed to laypersons via Amazon Mechanical Turk. Demographics were self-reported. The survey was divided into two parts, management knowledge, and risk identification. The management part involved a photograph of a first-degree pediatric burn injury and required identification of the degree of injury and three potential initial managements. The risk-identification section required correctly identifying the most common mechanisms of burn injury for different age groups followed by general identification of 20 household burn risks. Survey responses were analyzed using two-tailed Student's t-tests and chi-square analyses, univariate and multivariate analysis, and linear regression.

Results: Of the 467 respondents, the mean age was 36.57 years, and was 59.7% (279) male. Only 3.2% of respondents were able to correctly identify all 20 potential risks listed in our survey. Additionally, only 4.5% of respondents correctly identified all three appropriate initial management options (cool water, sterile gauze, and over-the-counter analgesics) without misidentifying incorrect options. For image-based injury classification, the most common response was incorrectly second-degree with 216 responses (42.2%) and the second-most common response was correctly first-degree with 146 responses (31.3%). Most respondents claimed they would not seek medical attention for the injury presented in the photograph (77.7%). When comparing the responses of individuals with children to those without, there were no statistically significant differences in ability to assess household risks for pediatric burns. For the entire population of respondents, the mean score for correctly identifying risks was 38%.

Conclusion: This study revealed a significant gap in public awareness of household risks for pediatric burns. Furthermore, while most individuals would not seek medical care for a first-degree pediatric burn injury, they were readily available to identify proper initial management methods. This gap in knowledge and understanding of household pediatric burn injuries should be addressed with increased burn education initiatives and more parental counseling opportunities.

Residency Applicant Evaluation Process: is it Effective?

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Purpose: Plastic surgery training has rapidly evolved over the past few decades. With matched applicants having substantially higher than average USMLE step scores, research experiences, and rates of AOA membership, it is considered a highly competitive specialty.1 However, there is little consensus regarding the ideal criteria and process for evaluating prospective residents.2 We aimed to explore whether our program's evaluation of applicants through the interview process could predict overall performance at the conclusion of the applicant's residency training.

Methods: All full-time plastic surgery faculty members at our institution (UT Southwestern Medical Center) were sent a RedCap survey, asking them to evaluate residents who had graduated from our integrated and independent plastic surgery residency programs between 2010 and 2020. Faculty who had not spent at least two years with any resident graduate on the survey were excluded. Faculty were asked to rate each resident's overall performance at the conclusion of residency on a scale of 1 to 5 (1 being "unsatisfactory", 5 being "exceptional"). Faculty were also asked how they would have ranked each resident at the time of application if they had fore-knowledge of the resident's actual performance at the conclusion of residency. Residents were grouped into three categories based on responses: (1) consistently good (over 80% of survey responses in the top 2 choices per question), (2) consistently poor (over 80% of responses in the bottom 2 choices per question), and (3) inconsistent (all others). Inter-rater reliability was analyzed using the intraclass correlation coefficient (ICC).

Results: The survey was distributed via RedCap to 14 faculty members and was completed by 12 for a response rate of 86%. Fifty-two graduated residents were evaluated. Of the 52 residents, 9 and 3 residents were classified as "consistently good," 2 and 8 were "consistently bad," and 41 residents were classified as "inconsistent" for the first and second survey questions, respectively. Inter-rater reliability was low, with 10 of the 12 faculty having mean ICC scores equal to or less than 0.5 for both questions.

Conclusions: In our program, applicant evaluation at the time of interviews is not well correlated with resident evaluation at the conclusion of residency training. Furthermore, faculty members at our program have low agreement regarding resident performance, even at the conclusion of the full period of residency training. Additional study is necessary to identify applicant characteristics that can predict "consistently good" and "consistently bad" residents with high positive and negative predictive values.

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Legal Ramifications of Publishing Patient Photographs; A Review of Legal Cases

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Background: The utilization of patient photography and videography is an essential part of a plastic and reconstructive surgeon's practice. Before and after photos are often utilized by plastic surgeons for documentation, education, and even online promotion. The purpose of this study is to analyze the potential legal ramifications associated with publishing patient photos online.

Methods: The Lexis+ tm legal database was searched for cases that involved the dissemination of patient photographs or videos by surgeons. Inclusion criteria included civil cases in which the defendant was a surgeon being sued for the improper use of patient photos. All criminal cases were excluded.

Results: Of the 23 cases that met our inclusion criteria, all but two involved plastic surgeons. The remaining two cases listed an otolaryngologist and anesthesiologist as defendants. Nearly all cases included a single plaintiff (n=19). On average, 2.13 defendants were listed per case. This often included the accused surgeon and their employer. Additional defendants included media companies and other individuals or entities that assisted in disseminating the patient photos. Patient photos were published on a variety of platforms including print (n=9), professional websites (n=8), personal devices (n=3), television (n=2), and social media (n=1). In 69.57% (n=16) of cases the defendants obtained consent prior to photographing and/or videotaping the plaintiff. All but three of these cases ruled, at least partially, in favor of the plaintiff often due to out-opt portions of the consent forms and human error. In all 7 cases where the defendant did not obtain consent, the court either ruled in favor of the plaintiff or the parties reached an undisclosed settlement.

Conclusion: While not a common occurrence overall, disseminating patient photos is significantly more prevalent in the field of plastic and reconstructive surgery than other surgical subspecialties. There are several commonalities among litigation cases including opt-out consent forms and clerical error. Given the associated financial liability involved with litigation cases, we suggest taking several steps to mitigate expose risk. This includes establishing two separate photo consent forms for internal and external use and establishing an auditing process whenever publishing patient photos external to the electronic medical records.

The Instagram Effect: A Google Trends Analysis

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Background: Instagram has become a popular means of advertisement for aesthetic surgery procedures, influencing patients' likelihood of undergoing a procedure.1 As providers increasingly rely on social media marketing, analyzing Google search terms can provide practical information pertaining to aesthetic surgery procedures. This study aims to explore public interest in aesthetic procedures before and after the Instagram platform began to obtain popularity via Google Trends, a platform which previously demonstrated utility for tracking interest in surgical procedures.2 We hypothesize that as a result of increased medical marketing on Instagram, there is an increase in public interest in plastic surgery elective procedures.

Methods: Trends in the USA for given search terms and volumes were gathered via Google Trends between April 2004 to January 2022. Search terms included popular aesthetic procedures based on the 2020 Aesthetic Plastic Surgery National Data Bank Statistics.3 The search volumes were normalized, and a bivariate regression analysis of panel data was then applied to the aggregate trendlines to determine if a statistically significant change in search volume occurred following the increase in user traffic of the Instagram platform. April 2012 was selected as a proxy for increased Instagram usage following its acquisition by Facebook.

Results: We found significant variations in search volume for plastic surgery procedures before and after April 2012. Abdominoplasty ($p<0.000$), blepharoplasty ($p<0.000$), Botox ($p<0.000$), brachioplasty ($p < 0.000$), breast implant removal ($p<0.000$), breast reduction ($p<0.000$), brow lift ($p < 0.000$), butt lift ($p<0.000$), hair transplantation ($p<0.000$), lip augmentation ($p<0.000$), male breast surgery ($p<0.000$), mastopexy ($p < 0.000$), mentoplasty ($p < 0.000$), otoplasty ($p < 0.000$), platysmaplasty ($p < 0.000$), rhinoplasty ($p<0.000$), and thighplasty ($p<0.000$) had statistically significant increases in search volume while buccal fat removal ($p = 0.003$) had a statistically significant decrease in search volume after April 2012.

Conclusion: We observed a significant increase in public interest in both surgical and non-surgical aesthetic procedures after Instagram gained popularity in April of 2012. As more plastic surgeons engage in social media marketing, understanding, and utilizing these trends could help increase practice awareness for potential patients and social media engagement. Moving forward, continued examination of the trends for specific elective procedures will provide increased insight into the consumer mindset as it relates to aesthetic surgery and what effect, if any, social media platforms may play on the public's interest in pursuing these procedures.

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Top Plastic Surgeons on Instagram: A Study on Top Influencers, Content, and User Engagement

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Background: Plastic surgeons are increasingly integrating social media into their practices to interact with patients and educate the public. Patients routinely use social media to locate providers, review before-and-after photographs, and discuss experiences, making it a powerful marketing tool with an elevated return on investment.1 While Instagram has become a popular tool for plastic surgeons, few studies have systematically evaluated plastic surgery app content. Our study aims to analyze engagement levels and content posted by top plastic surgeon influencers on Instagram.

Methods: We conducted a cross-sectional study to identify the top ten global plastic surgeons on Instagram in February 2022. Influencers were ranked based on number of followers and their latest twenty posts were analyzed. A total of two hundred posts were categorized by two independent trainees (DG and TT) as one of the following: marketing, education, personal, and miscellaneous. Specifically, marketing included endorsements and advertisements; educational posts explained a condition or procedure; and personal posts depicted the physician's personal life. Of note, personal posts were subcategorized as friends/family, accomplishments, political and/or advocacy, ancillary businesses, and miscellaneous. The number of likes was recorded as a proxy for engagement and average engagement for each category was calculated.

Results: The top ten identified plastic surgery influencers on Instagram had an average of 854,000 followers and 1,498 posts. Only three are female surgeons. Nine practices in major US metropolitan areas, with a predominance in California and Florida, while one practices in Colombia. All ten influencers work primarily in private practice focusing on aesthetic procedures.

Out of two hundred categorized posts on Instagram, marketing posts had the greatest presence (64.5%), followed by personal (20%), miscellaneous (22%), and educational (4.5%). Within the personal category, friends and/or family (35%) and ancillary businesses (35%) had the highest prevalence, followed by accomplishments (17.5%), and advocacy (12.5%). More still images were posted (56.5%) than videos (43.5%).

Differences in engagement level were found between content categories. Highest average engagement was for personal content, followed by educational, miscellaneous, and marketing ($p = 0.005$). No significant differences in engagement levels were found between photo and video content ($p = 0.23$). However, when considering individual categories, miscellaneous content had greater engagement in still picture form ($p = 0.023$).

Conclusion: This study shows that the top plastic surgeons on Instagram have large audiences with substantial engagement levels. While most content posted relates to marketing efforts, many influencers are using social media to post about their personal lives and promote their ancillary businesses. Although marketing content was most common, engagement levels were highest for personal and educational content, and no significant differences in engagement were found between videos and photos. These results represent a valuable tool in designing social media strategies for plastic surgeons.

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An Analysis of Peyronie's Disease Insurance Coverage

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Background: Peyronie's disease is a fibroproliferative disorder that causes an abnormal curve of the penis resulting in pain, discomfort, and erectile dysfunction.1 Potential management options include correctional surgery, penile external/internal devices, extracorporeal shock wave therapy (ESWT), or collagenase clostridium histolyticum injections (CCH).2 The insurance coverage of these treatment options varies greatly and has yet to be discussed in the current literature,

however, one study notes that reasons for treatment discontinuation for CCH included lack of insurance coverage.3

Methods: The authors performed a cross-sectional analysis of the top US insurance policies for coverage of Peyronie's disease. Companies were chosen based on their market share and enrollment. Their policies were identified through a Web-based search and telephone interviews, and their medical necessity criteria were extracted.

Results: Of the one hundred companies examined, only 54% of companies had a policy that addressed the treatment coverage for Peyronie's disease. The most covered treatment was CCH injections with 37 companies providing unanimous coverage (n =37, 100%). Within this category, the most common requirement was a palpable plaque by 36 companies (n =36, 97.3%). Additionally, external/internal devices provide unanimous coverage within 18 companies (n =18, 100%). Surgical treatment was covered by 8 companies and 6 companies denied coverage (n =8 vs. n =6, 57.1% vs. 42.9%). The least covered treatment option was ESWT which was universally denied by 19 companies (n =19, 100%).

Conclusion: CCH has the most representation in terms of coverage while also providing unanimous coverage whereas surgical coverage and ESWT have a lower representation of coverage. This variability may present a barrier for patients to receive adequate treatment for Peyronie's disease.

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Reconstruction Abstracts

Diversity in the Leadership Pipeline Among Microsurgery Fellowship Graduates

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Background: While the representation of women and ethnic minorities among medical schools has increased in recent years, there continues to be significant discrepancies among plastic surgery residents and faculty.1 The appointment of female and ethnic minority surgeons to leadership positions lags far behind their white male counterparts, despite comparable scholastic achievements.2,3 Additionally, minority trainees are less likely to receive mentoring than their nonminority peers, and their mentors are less likely to be of the same demographic background.3 It is unclear, however, how these discrepancies manifest within the field of microsurgery. The goal of this study is to assess the state of gender and ethnic diversity among microsurgery fellowship graduates and to evaluate areas of deficiency along the microsurgical leadership pipeline.

Methods: US-based microsurgery fellowship programs provided contact information of fellowship graduates from 2006-2020. An anonymous electronic survey was distributed to fellowship graduates and fellowship directors. Demographic, training background, mentorship, and career path data were collected.

Results: 74 fellowship graduates and directors completed the survey, for a 23.1% response rate. Respondents were 45.9% male and 44.6% female (9.5% no response). The race/ethnicity of respondents were White (52.7%), Asian/Asian American (21.6%), Middle Eastern (6.8%), Black (2.7%), and Hispanic/Latinx (2.7%). 8.1% of respondents identified as first generation, low income. 41.9% of respondents were within 5 years of fellowship graduation. Female surgeons and ethnic minority surgeons had lower odds of having a demographic-concordant mentor (OR=0.18, $p<0.01$ and OR=0.07, $p<0.001$, respectively). Female and male surgeons had similar odds of obtaining an academic job out of fellowship (OR=0.63, p=0.089) and similar perceived opportunities for leadership/professional advancement (78% vs 82%, p=0.952). In contrast, ethnic minority surgeons had lower probability of holding an academic position directly after fellowship as compared to white surgeons (OR=0.63, p=0.049), as well as fewer perceived opportunities for leadership/professional advancement (61% vs 92%, p=0.006). When controlling for experience level (years out of fellowship), women were as likely as men to hold a leadership position in their current job (OR=0.662, p=0.260); similarly, ethnic minority surgeons in their current job were as likely as white surgeons to have a leadership position (OR=1.009, p=0.122).

Conclusion: Demographic-concordant mentorship among women and ethnic minority microsurgeons is lacking. Ethnic minority surgeons have fewer perceived opportunities for professional advancement and are less likely to hold academic positions directly out of fellowship. Despite these barriers, leadership rates are similar among minority and nonminority surgeons when controlling for experience level. Efforts to enhance diversity representation within academic microsurgery should target early-career minority surgeons, particularly those in fellowship and directly out of fellowship.

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Under the Blade: A Deep Dive into Recreational Boating Propeller Injuries

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Background: Boating is a popular recreational activity in the U.S. with almost 11 million mechanically propelled boating vessels registered as of 2020.1 According to the U.S. Coast Guard (USCG), boating activity significantly increased during the COVID-19 pandemic as gauged through boat sales, new insurance policies, insurance claims, and towing assistance calls.1 From 2019 to 2020, the American Boating Association reported an increase in recreational boating accidents, injuries, and deaths by 26.3%, 26.4%, and 25.1%, respectively.2 Propeller-related trauma is a complex reconstructive problem; the sharp propeller blades rotating at high speeds result in deep lacerations, fractures, and mutilation. Propeller injuries are under-reported and injury severity is often underappreciated. This retrospective review looks at the incidence and outcomes of propeller-related trauma.

Methods: We analyzed injury data from the USCG Boating Accident Report Database (BARD). A systematic review was also conducted summarizing all English-language papers that reported on incidence and outcomes of propeller injuries. Lastly, we reviewed our prospectively collected institutional Level 1 trauma center database to identify all patients treated for watercraft propeller injury.

Results: The BARD database reports that between 2005-2020, the accident type "person struck by propeller" resulted in 956 accidents involving 1007 vessels, 926 injuries, and fifty-seven deaths, conferring a 5.96% risk of death and 96.9% risk of serious injury. Literature review showed ninety-five reported cases of propeller injury, the most common being to lower

extremities with a significant amputation rate. One in twenty boating accidents were estimated to involve propeller injury with a fatality rate of 15-23%. In our Level I trauma center between 2010-2021, 216 patients were treated for watercraft injuries, and nine patients (4.2%) had propeller injuries. Patient ages ranged from 19 to 66 years, and injuries included shoulder (1), upper extremity (1), and lower extremity (10). In our institutional series, eleven limbs were injured, of which 6 resulted in amputation (54.5%). There were two major vascular injuries and two major nerve injuries. Surgical factors that favored amputation over limb salvage included extensive nerve damage, septic shock, and muscle necrosis. Patient factors that favored amputation included desire for earlier mobility, avoidance of long hospital stays, and avoidance of potential chronic wounds from limb salvage. Hospital LOS ranged from 1 to 77 days.

Conclusions: Recreational boating propeller accidents are a significant source of severe injuries with extensive soft tissue, osseous and neurovascular damage resulting in a high amputation rate. The hallmark of these extremity injuries is the multiple parallel chop wounds seen on the body, but these injuries are likely underreported. Treatment is challenging and requires increased awareness and a multidisciplinary approach. The reconstructive surgeon plays an important role in advising the patient and care team in successful recovery and rehabilitation, whether it results in amputation or limb salvage, and thus would benefit from greater understanding of these injuries.

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Mineralocorticoid Inhibition Speeds Healing and Modulates Glucocorticoid Activity on Healing Burn Wounds

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Purpose: Key to prevent hypertrophic or dystrophic scars is the balance between 1) achieving the minimum necessary fibroproliferative activity for durable wound closure and 2) not exceeding the threshold for extracellular matrix deposition (ECM) that cannot be readily remodeled. Most anti-fibrotic agents, such as glucocorticoids, must be carefully timed or dosed

to minimize their deleterious effects against wound healing, because of the interconnectivity of pathways involved in inflammation, fibroproliferative activity, and wound maturation and resolution. The mineralocorticoid receptor (MR), which shares both mineralocorticoid and glucocorticoid signaling activity, is a cell-specific mediator of the wound healing cascade. We previously evaluated the efficacy of MR-inhibition with or without mineralocorticoid stimulation in an immunocompromised model, noting that MR-inhibition was sufficient to enhance gross and histologic evidence of scar resolution with diminished collagen content in mature scars. Given the strong overlap between MR-signaling and leukocyte activity in organ fibrosis, we sought to determine the efficacy of our approach in an immunocompetent model and identify if the inhibition of MR receptor could similarly help modulate the effects of glucocorticoids on wound healing.

Methods: Female C57Bl/6 mice sustained bilateral 1 cm full-thickness thermal injury and were stratified into either a) vehicle, b) spironolactone, c) dexamethasone, or d) spironolactone and dexamethasone (combined). Spironolactone and/or dexamethasone delivered intraperitoneally thrice weekly. No debridement was performed after the burn injuries. Mice were followed photographically for 6 weeks prior to sacrifice for histologic evaluation. Time to re-epithelialization and ultimate scar area were measured and compared longitudinally. After the sacrifice wound biopsies were collected for gross analysis with H&E and Movat's Pentachrome to assess collagen, fibrin, and elastic fibers. All groups compared by ANOVA with Tukey's post-hoc HSD.

Results: By day-10, initial burn eschars had completely detached in the spironolactone-only group and the underlying granulation tissue was revealed. Notably, eschars remained present through day fourteen in the control mice and through day 21 in the dexamethasone only-group. Open wound area was significantly smaller in the spironolactone-only group vs. control and dexamethasone-only by day-7 (ANOVA; $p<0.05$) – this relationship remained significant through day-14 after which all spironolactone-treated wounds were closed. At day-21 open wounds were noted in 50% of the dexamethasone-only mice whereas, 17% of the mice receiving the combined treatment. Interestingly, by day-21, scar area was noted to be significantly diminished in both the spironolactone-only and combined groups vs. both control and dexamethasone-only groups (ANOVA; $p<0.05$). Histologic evaluation confirmed evidence of rapid scar resolution in the spironolactone group.

Conclusion: These results corroborate our prior findings of the efficacy of MR-inhibition in improving scar resolution in immunocompromised animal. Interestingly, in the immunocompetent animals, rapid eschar detachment, wound closure and epithelialization were noted with spironolactone therapy. Similarly, the deleterious effects of dexamethasone could be mitigated but not completely abrogated at the doses evaluated. Our results in the immunocompetent animals progressed the idea that MR manipulation is a useful novel therapeutic approach in the treatment of burn scars with a possible ECM-modifying mechanism involving immunologic mediators.

Amputations as a Sequel Of Electrical Burns: a Retrospective Analysis at a Burn Unit in Addis Ababa, Ethiopia

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Introduction: Burn injuries are a global public health problem and continue to be one of the leading causes of unintentional death and injury around the world. The World health organization reports close to 180,000 deaths resulting from burns annually and the majority of these occur in low- and middle-income countries (LMICs), such as Ethiopia. Electrical injuries are a relatively rare cause of burns, but the incidence as well as mortality in electrical burns is reportedly higher and continues to increase with the rapid industrialization, especially in LMICs. Electrical burn injuries can result in the death of the patient in the acute phase while those that survive may end up with severe complications in the various organ systems as well as major limb amputations.
Objective: To describe the epidemiology, the rate of amputations and identify risk factors for amputations in patients with electrical burns

Methods: A facility-based, retrospective, cross-sectional study was conducted to assess the clinical profile, rate of amputation and associated risk factors in electrical burn injuries among burn patients at Addis Ababa Burn Emergency and Trauma Hospital from September 2016 to August 2021.

Results: The sample included 50 patients with an amputation due to electrical burns. Majority (59.2%) of the patients were adults 18- 65 years while 40.8% were less than 18 years. Males were primarily affected with electrical burns that ended up with amputations (62%). A fallen electrical wire coming in contact with the patients was the cause of the electrical burns in 50% of the cases. Upper limb amputations were done for 65.3% of the patients while 34.7% had lower limb amputations. As indicators of morbidity, 89% of patients stayed in the hospital for more than 30 days and had an average of 3 surgeries during their stay (SD = 1.2). The mortality in these series of patients was 8.2%.

In the identification of significant risk factors for level of amputation, total body surface area (TBSA) was larger for major amputations (Mean = 25.04, SD = 14.18) than for minor amputations (Mean = 11.82, SD = 8.42), $t(45) = 3.64$, ($p < .001$). Major amputations were more likely to occur when the entry site was through the hand, while minor amputations were more likely to occur when the entry site was through the scalp ($p=0.005$). Upper limb amputations were more likely to occur when the entry site was through the hand, while lower limb amputations were more likely to occur when entry site was through the scalp ($p = .005$).

Conclusion: Younger and male patients were identified as victims of electrical burns that resulted in amputations. Hands accidentally coming in contact with fallen wires were the

commonest presentation resulting in major amputations of limbs. Electrical burns resulted in substantial morbidity and mortality of patients. TBSA and entry site being the hand significantly affected the level and site of amputation in patients with electrical burn.

Should the Microsurgery Pendulum Swing from Fasciocutaneous to Muscle Free Flaps in Peripheral Vascular Disease Patients? An Analysis of Outcomes in the Comorbid Limb Salvage Population

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Objective: Free tissue transfer (FTT) is critical in complex lower extremity (LE) limb salvage to prevent progression to amputation. Common FTT flap compositions include (1) fasciocutaneous, which comprise skin, subcutaneous tissue, and fascia, and (2) muscle, which comprise vascularized muscle without skin. It is theorized that use of fasciocutaneous flaps may compromise wound healing in the setting of peripheral vascular disease (PVD), due to reduced arterial runoff and high resistance at the skin capillary level. Comparatively, muscle flaps confer a low resistance, high outflow system that may be more amenable to healing in PVD patients.1 We evaluate our institution's surgical outcomes following fasciocutaneous versus muscle LE FTT among PVD patients.

Methods: A single institution retrospective review identified PVD patients who underwent FTT between 2011 and 2021. All angiograms and vascular interventions were performed by a single vascular surgeon (C.M.A.) and all FTT by the senior author (K.K.E). Patients were divided into fasciocutaneous and muscle flap groups. Primary outcomes included postoperative complications, flap success, post-reconstruction vascular interventions, limb salvage, and ambulatory status. Statistical analysis included chi-square, Fisher's exact, student's t-test, and logistic regression where appropriate.

Results: A total of 212 patients underwent LE FTT during this time period, of which 113 were identified as having PVD based on preoperative arteriogram and were included in our analysis. Of these patients, 60.2% received fasciocutaneous flaps (n=68) and 39.8% received muscle flaps

(n=45). Mean age and body mass index were 60.3 years and 29.0kg/m2, respectively. Forty-two patients (37.2%) underwent preoperative endovascular interventions. The anterolateral thigh (ALT) was the most commonly used fasciocutaneous flap (n=65, 95.6%), while the vastus lateralis (VL) was the most utilized muscle flap (n=39, 86.7%). Flap success rate was 98.2% (n=111). Overall complication rate was 41.2% following fasciocutaneous flaps compared to 24.4% following muscle flaps (p=0.067). Fasciocutaneous flap patients had higher odds of ulceration requiring repeat angiogram within one year of reconstruction compared to those who underwent muscle flaps (p=0.039; OR 5.1, [1.1-23.7]), and higher odds of requiring repeat angiogram overall (p=0.039; OR 3.4 [1.1-10.9]). The proportion of patients requiring revascularization procedures in the operated limb within one year of surgery were similar in both groups (p=0.155). At mean follow-up 20.6+19.7 months, overall limb salvage and ambulatory rates were 87.6% and 89.4%, respectively, with a mortality rate of 8.9%.

Conclusion: This is the first study comparing revascularization rates among PVD patients who underwent fasciocutaneous versus muscle flap reconstruction for LE wounds. Fasciocutaneous flaps demonstrated a higher need for repeat arteriogram following reconstruction due to ulceration of the limb and trended towards higher postoperative complication rates, possibly due to the increased resistance in fasciocutaneous versus muscle flaps.1 These findings suggest muscle flaps should be considered as the first choice for FTT in PVD patients. Larger, multi-institutional studies are needed to further evaluate outcomes of flap composition choice in PVD patients.

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Autologous Fat Grafting A Novel Protocol In Acute Burn Wound Management

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Background: Substantial progress has occurred in burn wound management like temporary skin substitutes, cultured epithelial autografts (CEA), and others, these alternatives improved survival and functional status, however, they are expensive, and their use should be rationalized. Multiple recent studies have demonstrated the positive effect of fat grafting on chronic wounds, different vascular ulcers and significant healing qualities scarred tissue after radiotherapy.
Piccolo et al studies showed improvement in shorter time frames of burn wounds that have shown no apparent healing within 3 weeks or more by using fat grafting, also Fredman et al studied the positive effect of fat grafting upon the problematic burn scars and the improvement of the neuropathic pain.

Methods: Our study is a prospective, open-label, single-arm trial that included patients suffering superficial and deep dermal burns admitted to our burn unit from March 2019 to March 2020. Cases were treated by fat grafting underneath the burn wound and nano-fat was used topically as a dressing. We included patients aged between 14 – 50 years, both genders, affected TBSA 10% - 30% and are fit for surgery and anesthesia, we excluded patients aged beyond the study protocol, TBSA <10% or >30%, patients with comorbid conditions that may affect the results or the eligibility for surgery e.g., D.M, renal insufficiency, hepatic insufficiency, etc., also patients with inhalational injury were excluded.

Histological examination of tissue biopsies was done, and the nano-fat was subjected to flowcytometric analysis.

Results: A total of 50 patients were included with mean age 26.2±9.6, 60% of patients were males and 40% females, mean BSA affected 15.9±2.6%, 70% were flame burns, 20% were scald burns, 12% mixed burns, different body areas were affected e.g., head and neck, anterior trunk, posterior trunk, upper and lower extremities, the mean amount of lipoaspiration in cc was 420±188.4, mean amount of fat grafted in cc was 177.2±62.8, mean number of times to the OR was 1.3±0.6, 78% of the cases needed no opioid analgesics, 90% of the cases used no other topical creams or ointments other than the nano-fat, 80% of the cases needed no skin grafting, mean total time of hospital stay was 12.6±3.8, 80% of the cases had a smooth scar texture, 90% had no contractures. Clinically there was an obvious improvement of the treated cases over a short time frame, also there was a noticeable stem cell positive effect and homing in form of regenerating the burned NAC completely. Histologically by light microscopy, there was a new epidermis formed and arranged in several layers within 14 days post-treatment. Flow cytometric analysis of the cell surface markers of the nano-fat showed 53.85% CD90 positive cells, 93.55% CD45 (hematopoietic marker) positive cells, and 48.6% CD73 and CD34 positive cells. Also, there was increased collagen organization, accelerated keratinocyte differentiation process.

Conclusion: Fat grafting and nano-fat dressing as a minimally invasive technique proved to be beneficial with positive effects on the burn wound management, with much better healing qualities in a shorter time frame, less scarring, and contractures, with less hospital stay and is a cost-effective method.

A Systematic Review of Lower Extremity Muscle Synergies During Gait: Identifying Potential Nerve and Tendon Donors for Functional Reconstruction

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Purpose: Technical advances in functional tendon and nerve transfers, most recently in the lower extremity, have improved patient outcomes following limb salvage. However, rigorous research defining and comparing clinical outcomes for the multiple available surgical options remains lacking. In the absence of such data to guide surgical decision making, we aim to gain a better understanding of the neuromuscular organization of gait (i.e. muscle synergies) to glean insights into donor-recipient pairings for functional lower extremity reconstruction aiming to restore walking.

Methods: A MEDLINE search (2000-2020) was performed using terms such as "motor module", "synergy", and "walking". Studies with extractable data on muscle synergies in healthy human subjects during a walking gait were included.

Results: Thirty-eight studies were included, incorporating data from 416 participants. Muscle activity was measured using surface EMG in all but two studies. Muscle synergies were extracted using several computational techniques, including non-negative matrix factorization, principal component analysis, torque decomposition, and factor analysis. Each study identified between three and seven muscle synergies, with an average of 4.5 +/- 0.9. 82% of studies reported four or five synergies. The synergies observed across studies could be reclassified into four temporally independent synergies. Synergy A was active at weight acceptance and included vastus lateralis (reported in 63% of studies), rectus femoris (63%), gluteus Medius (58%), vastus medialis (53%), and gluteus maximus (39%). Synergy B, active during late stance, included soleus (87%), medial (79%) and lateral (53%) heads of the gastrocnemius, and peroneus (37%). Synergy C, active at early swing, included tibialis anterior (84%), rectus femoris (41%), erector spinae (32%), and adductors (27%). Synergy D, active at late swing, included biceps femoris (86%), semitendinosus (65%), semimembranosus (24%), and tibialis anterior (22%).

Conclusions: This is the first study to systematically review the neuromuscular organization of gait and apply these findings to surgical decision making. In cases of quadriceps weakness, obturator to femoral nerve transfers have been described with favorable reliability in outcomes.1,2 The obturator nerve plays an important role in hip stabilization and thus fires synergistically in early stance with the quadriceps during synergy A. In deficiencies of plantar flexion, the ankle cannot stabilize against natural dorsiflexion in late stance. The peroneus, providing ankle stability and firing synergistically with plantar flexors in synergy B, may serve as a donor nerve/tendon to reconstruct injuries of the superficial posterior compartment. Even in the absence of obvious synergies, built-in redundancy in lower extremity function provides several expendable donors that may restore range of motion and stability; these data inform which pairings are least antagonistic and most likely to be successful. For example, while transfers of the tibialis posterior,3 FDL/FHL,4 and gastrocenemius5 have been described in cases of foot drop, we prefer simultaneous nerve/tendon transfer of the lateral gastrocnemius because it is expendable, leaving the medial head and soleus intact, and less antagonistic than other transfers, allowing the tendon to more naturally and effectively dorsiflex. Surgical plans aiming to restore the four basic synergies identified herein could allow for restoration of independent gait following significant lower extremity injury.

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The Impact of Repeated Bladder Surgery on Successful Bladder Neck Closure in The Exstrophy-Epispadias Complex: The Role of Interposing Rectus and Gracilis Muscle Flaps

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Introduction: The exstrophy-epispadias complex (EEC) is a rare spectrum of congenital ventral wall malformations including classic bladder exstrophy (CBE) with a pubic diastasis and open bladder, to cloacal exstrophy (CE) with complete exposure of abdominopelvic organs. After bladder closure, the goal of reconstruction is to provide urinary continence, often requiring multiple soft-tissue procedures including bladder neck reconstruction. If patients remain incontinent thereafter, bladder neck closure (BNC) is considered. Muscle flaps may be utilized to reinforce BNC; however, routine use is avoided due to the number of abdominal procedures these patients undergo while the rectus abdominis muscle is wider and attenuated. For reconstructive surgeons, it is important to understand the risk factors for BNC failure and utility of muscle flaps in this patient population. The study aimed to 1) evaluate predictors of BNC

failure and 2) identify which patients may benefit from reconstruction with a pedicled rectus abdominis or gracilis muscle flap (RAMF, GMF).

Methods: Patients who underwent BNC were reviewed for potential risks for failure such as osteotomy during exstrophy closure and number of previous bladder mucosal violations (MV). MVs were defined as procedures when bladder mucosa was opened or closed such as exstrophy closure, repeat closure(s) or bladder neck reconstruction. Success was defined as BNC without fistula formation. Risk factors were evaluated using Chi-squared or Fisher's exact test and predictors of fistula development were evaluated using multivariate logistic regression.

Results: Of the 226 patients included in this study, 6.2% (n=14) underwent BNC with concurrent muscle flap reconstruction and 93.8% (n=214) underwent BNC alone. In patients who underwent combined procedures, 14 RAMFs were utilized. Of the 214 who underwent BNC alone, 16.4% (n=35) experienced fistula formation. Average age at BNC was 10.8±5.0 years; 65.9% were male. Patients with a wider pubic diastasis ($p<0.05$), or previous failed exstrophy closure ($p<0.05$) were more likely to develop a fistula. A greater proportion of CBE patients with 3 or more MVs before BNC developed a fistula (65.2% vs. 23.8%, $p<0.05$) and CE patients with 2 or more MVs developed a fistula (80.0% vs. 20.0%, $p=0.06$). On multivariate analysis, MVs were associated with an increased likelihood of fistula, with a per-violation odds ratio of 5.1 (95% CI 2.26-11.54, $p<0.05$). CBE patients were more likely to develop a vesicourethral (n=12) or vesicocutaneous fistulas on the lower abdominal wall (n=6); CE patients most frequently developed a vesicoperineal fistula (n=9). Of the 35 patients who failed BNC, 57.1% (n=20) successfully underwent muscle flap reconstruction, with 19 RAMFs and 3 GMFs used.

Conclusions: Increased MVs confer an increased risk of fistula formation after BNC in this patient population. The RAMF is preferred as its' arc of rotation allows coverage of the antero-inferior bladder and pelvic floor to prevent urethral, cutaneous, and perineal fistula formation; the GMF only reaches the pelvic floor to prevent urethral and perineal fistula development. CBE patients with 3 or more MVs, and CE patients with 2 or more MVs may benefit from prophylactic muscle flap reconstruction to decrease fistula formation.

Effectiveness of Erector Spinae Plane block for Patients Undergoing Chest Masculinization Surgery

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Background: Erector Spinae Plane (ESP) block is a regional block that can provide analgesia to various spine levels. Previous studies have shown its ease of administration, safety, and effectiveness in post-operative pain control in oncologic breast surgeries.1,2 However, the utility of this block in the setting of chest masculinizing surgery has not been well studied to this date. This study aims to compare the effectiveness of post-operative pain control between ESP block and field block for patients who are undergoing bilateral mastectomy with or without free nipple grafting.

Methods: Retrospective chart review identified a total of 46 individuals who underwent chest masculinizing surgery at an outpatient surgery center and a tertiary academic hospital from May 2020 to January 2022. All patients who underwent such procedure at an outpatient surgery center received field block while those who underwent the same procedure at a tertiary academic center received ESP block. The same senior author performed all surgeries. Image guided ESP blocks (Ropivacaine) were administered pre-operatively by an anesthesiologist. Field blocks were administered intraoperatively by the senior surgeon (0.25% bupivacaine) around the surgical site. Intraoperative and post-operative data were reviewed and their post-operative visual analog scale pain score (0-10), perioperative and post-operative narcotic pain medication requirement in morphine milligram equivalents (MME), and post-operative complications were analyzed.

Results: A total of fifty-four patients who underwent chest masculinizing surgery were identified. Among those, thirty-five received surgeon-administered field block while nineteen received ESP block by anesthesia team pre-operatively. Field block group received significantly greater amount of intraoperative narcotic pain medication (117.1 MME vs. 37.3 MME). Field block group had higher average pain score both at 1- and 4-hours post-op (3.8 vs 1.9 and 3.2 vs. 2.4). Despite higher average amount of prescribed post-op narcotic pain medication (155.6 MME vs. 127 MME), field block group had significantly higher rates of significant pain at bolster removal (post-op day 5, 14.3% vs. 0%) and narcotic pain medication refill (14.3% vs. 0%). Field block group also showed higher rates of post-op complications including hematoma requiring return to the OR (2.9 % vs. 0%), seroma (5.7% vs. 0%), and surgical site dehiscence (3.7% vs. 0%) with higher number of average post-op phone call (4.5 vs. 2.8) and ED visits (3 visits vs. 1 visit).

Conclusion: When compared to field block, ESP block may provide better pain control post-operatively and help reduce both intraoperative and post-operative narcotic pain medication requirement for patients who are undergoing chest masculinizing surgery. Additionally, ESP block patients showed less post-operative complications including hematoma, seroma, and surgical site dehiscence when compared to field block patients.

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Single Surgeon Comparison Of Midline Versus Overlapping Locoregional Flap Closure Following Spinal Instrumentation

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Introduction: In recent years, plastic surgeons have increasingly become involved in the closure of spine surgeries through the use of paraspinous and other locoregional muscle flaps. Compared to simple layered closures, complex closure using muscle flaps has resulted in decreased incidence of complications such as dehiscence and infection. Previous research has described a technique in which closure is achieved through tension-free mobilization of the muscle flaps and meticulous preservation of lateral perforators, followed by midline approximation. However, it is unclear whether a technique in which the perforators are more aggressively dissected to allow for overlapping of the flaps at the midline is superior to the previously described method. As such, we seek to compare the surgical outcomes in patients who undergo complex closure using overlapping muscle flaps compared to those who undergo closure using flaps approximated at the midline.

Methods: An IRB-approved retrospective analysis was conducted on all patients who underwent spine surgery, followed by locoregional muscle flap complex closure performed by a single surgeon between January 2016 and July 2021. Patient baseline demographics and factors relating to the surgery were recorded from the patient records. Outcomes of interest included: dehiscence, infection, skin necrosis, seroma, and hematoma. Patients were divided into two groups based on which closure method was employed. Chi-square analyses and Student's t-tests were performed to identify whether there was a difference in outcomes between the two groups.

Results: In our cohort, a total of 116 patients underwent spinal instrumentation followed by plastic surgery-assisted closure. Sixty-two (53%) underwent closure using the overlapping technique, compared to 54 (47%) using the midline technique. There were no significant differences in baseline demographics such as age ($p=0.20$), gender ($p=0.80$), and presence of comorbidities including hypertension ($p=0.83$) and diabetes ($p=0.14$). There were significantly more smokers in the overlapping group than the midline group (15% vs 0%, $p= 0.006$). Notably, a significantly greater proportion of patients in the overlapping group underwent surgery due to neoplasm (52% vs. 17%, $p<0.001$) compared to the midline group, resulting in a significantly greater rate of post-operative radiation (40% vs. 17%, $p=0.009$). Despite this difference, the

incidence of infection (13% vs 9.4%, p=0.77), skin necrosis (4.8% vs 5.6%, p=0.29), dehiscence (8.1% vs. 5.6%, p=0.87), hematoma (6.5% vs. 3.7%, p=0.81), and seroma (18% vs. 17%, p=1.0) did not differ between the groups. Lastly, the duration of the closure was significantly longer in the overlapping group compared to the midline group (79 vs. 62 minutes, p<0.001).

Conclusion: The present study demonstrates that overlapping muscle flaps is a safe and effective strategy for locoregional closure of spinal wounds. However, it is not superior to midline closure, as it requires more time to achieve and more extensive perforator dissection, the latter of which may place the muscle at greater risk. Midline closure is similarly safe and effective, yet significantly faster than the overlapping technique, without increased concern for dehiscence. Overall, within our cohort, both techniques appear to be equally effective.

Free Flap Chest Wall Reconstruction: Is it Time for A Paradigm Shift in the Reconstructive Ladder?

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Background: Acquired chest wall defects occur via numerous mechanisms, such as oncologic resection, infection, and trauma. Chest wall defects place a significant burden on patients and are associated with significant morbidity, with up to 27% experiencing respiratory failure. Extensive chest wall defects require surgical reconstruction to restore anatomy, protect vital organs, and maintain respiratory function. Operative planning traditionally follows a reconstructive ladder advocating for regional pedicled flaps as the preferred method of reconstruction with microvascular free flap methods mostly pursued when the patient lacks regional soft tissue or pedicled flap options, for larger defects, or when previous pedicled flaps have failed. As modern advancements in microsurgical techniques improve free flap reconstruction outcomes, a paradigm shift in the reconstructive ladder may be warranted in which free flaps are the preferred method for chest wall reconstruction. The purpose of this study was to report a case series of microvascular free flaps to determine if such flaps should be considered first line options in chest wall reconstruction given their favorable rates of morbidity, flap failure and mortality.

Methods: A retrospective review was performed on all patients that underwent free flap chest wall reconstruction between 2017 and 2021 at a single, level one trauma hospital. Patient demographics and comorbidities were abstracted via review of the electronic medical record.

The Charlson Comorbidity Index (CCI) was recorded for all patients as a measure of the comorbid disease burden and associated mortality. Operative indications and details, resection characteristics, post-operative complications, flap outcomes, post-operative follow-up time and mortality were also abstracted. Descriptive statistics were utilized.

Results: A total of nine patients (56% female) with an average patient age of 57.3 years were identified. The mean CCI was four with the most common comorbidities being history of thrombosis in six patients (67%), coagulopathy in four patients (44%), and hypertension in 4 patients (44%). Reconstruction was indicated following oncologic resection in seven patients (78%), traumatic and infectious indications occurred in one patient (11%) each. Full thickness resections with removal of one or more ribs was required in eight patients (89%). Deep inferior epigastric perforator flaps were the most common flap at 55% followed by anterolateral thigh flap at 33%. Complication rate was 33% with one small pneumothorax, one ventilator-associated pneumonia and one donor site infection. There were no flap failures or flap-related reoperations. Mean hospital stay was 11.7 □ 8.6 days. Patients were followed on average for 15.5 months with two patient deaths occurring within 13 months of free flap reconstruction. Both deaths were attributed to rare events including oropharyngeal hemorrhage and hepatic insufficiency, unrelated to chest wall reconstruction.

Conclusion: Microvascular free flap chest wall reconstruction is associated with low complication rates and moderate mortality unrelated to the reconstruction. Our outcomes are superior as it relates to flap related complications compared to prior reports. While surgical planning of chest wall reconstruction should remain individualized to each patient, modern microsurgical free flap methods may serve as efficacious first-line options for a more extensive array of patients than the reconstructive ladder suggests.

The Last Chance to Restore Function: Highlighting Spare Parts Surgery as a Viable Option for Limb Salvage in Injuries Threatening Multiple Limbs

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Background: Spare parts surgery involves the use of viable tissue from an amputated part to reconstruct a separate defect. Successful reports of spare parts surgery have previously been reported involving salvaging tissue from unsalvageable amputated defects to reconstruct other

parts of the injured hand. Scavenging skin, nerve, bone, vein or arterial grafts is common. Transposition of entire amputated digits into adjacent locations is also a well-described example of spare parts surgery in the setting of acute trauma.

The spare parts surgery concept can be applied to multi-limb surgery beyond the setting of acute trauma. In this case series, we describe our experience utilizing spare parts surgery in three cases of semi-elective extremity reconstruction utilizing tissue from amputated parts as free flap reconstruction for other limbs. This series includes two patients with vasopressor-induced multi-limb gangrene and in one patient requiring thumb reconstruction after previous traumatic amputation several years prior.

Methods: We retrospectively reviewed electronic medical records for clinical presentations, operative details, and long-term functional outcomes of patients undergoing spare parts surgery at our tertiary referral center.

Results: Three patients underwent spare parts surgery for limb salvage utilizing tissue from multiple extremities to achieve optimal functionality. Two patients presented with vasopressor-induced gangrene of multiple extremities. One patient underwent bilateral upper limb salvage utilizing an anterior tibial artery-based myocutaneous flap of the ankle and dorsal foot from the amputated tissue of their bilateral below-knee amputations, which has not been previously reported in spare parts surgery. The second patient underwent limb salvage of the hand utilizing amputated tissue from their contralateral, transradial amputation. In the third case, the hallux and first metatarsal were salvaged from the patient's ipsilateral below-knee amputation and used for reconstruction of the right thumb, which was amputated years prior. Abductor hallucis muscle was included as a functional muscle transfer to replace absent thenar musculature and restore opposition. Those with vasopressor-induced limb ischemia avoided amputation of their hand after successful reconstruction with scavenged tissue from other limbs, while the third received a fully reconstructed, dexterous thumb.

Conclusion: Spare parts surgery is a technique that can be applied in the setting of multi-limb surgery effectively. Below knee amputations and transradial amputations routinely discard valuable tissues. These tissues can be salvaged as free tissue transfer to preserve limb length on adjacent limbs, reconstruct absent parts, and avoid the morbidity of additional free flap harvest sites.

A Review Of 559 Sternal Wound Reconstructions at a Single Institution: Indications And Outcomes For Combining an Omental Flap With Bilateral Pectoralis Major Flaps in a Subset of 17 Patients With Infections Extending Into The Deep Mediastinum

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Background: Sternal wound infection (SWI) and dehiscence following median sternotomy from cardiac surgery remain challenging clinical problems with high morbidity. Bilateral pectoralis major myocutaneous (PMM) flaps are excellent for most sternal wounds, but do not reach deeper mediastinal infections, including cases involving aortic grafts and other mediastinal prostheses deep to the sternum. The omental flap may be a useful adjunct for addressing these deeper mediastinal infections.

Methods: Records of 593 sternal wound reconstructions performed by a single surgeon (JAA) from 1996-2022 at a high-volume cardiac surgery center were reviewed. Common surgical indications were SWI and dehiscence. At the time of surgery, patients underwent sternal hardware removal, thorough debridement, and closure with bilateral PMM flaps. Pedicled omental flaps were used as well when vascularized tissue was also required in the deeper mediastinum. Patients undergoing closure with both PMM, and omental flaps were selected for analysis.

Results: Complete data were available for 559 sternal wound reconstructive procedures performed by the senior author during this period. Bilateral pectoralis and omental flaps were mobilized in 17/559 (3.04%) patients. Common initial cardiac surgery procedures included repair or replacement of diseased aortic roots (9/17; 52.94%), aortic valves (8/17; 47.06%), and mitral valves (6/17; 35.29). At the time of sternal reconstruction, the mean age and BMI were 59.88 ± 14.64 years and 29.37 ± 6.28 kg/m2, respectively. The mean ASA classification grade was 3.56 ± 0.51. Preoperative morbidity included culture-positive wound infection (12/17; 70.59%), dehiscence (15/17; 88.24%), wound drainage (11/17; 64.71%), sternal click/instability (6/17; 35.29%), and inability to close the chest following the original sternotomy due to hemodynamic instability (6/17; 35.29%). Pre-operative medical interventions consisted of negative pressure therapy (6/17; 35.29%), wet-to-dry dressings (4/17, 23.53%), and IV antibiotics (14/17; 82.35%).

Complications immediately preceding sternal surgery were common, with SIRS/sepsis in 10/17 (58.82%) patients, AKI in 9/17 (52.94%), and pneumonia in 4/17 (23.53%). Vasopressors were administered intraoperatively to 13/17 (76.47%) patients. Delayed extubation was observed in 10/17 (58.82%) patients. Intraoperative deep mediastinal or bone cultures were positive in 8/17 (47.06%) patients, with Pseudomonas aeruginosa encountered most frequently (3/8; 37.5%). Post-operative complications included partial dehiscence (2/17; 11.76%), skin edge necrosis (1/17; 5.88%), seroma (1/17; 5.88%), abdominal hernia (1/17; 5.88%), and recurrent infection (3/17; 17.65%). Three patients (17.65%) died within 30 days of the sternal surgery.

Conclusions: Patients undergoing combined pectoralis major and omental flap closure frequently had a history of aortic root and valve disease, and other significant preoperative morbidities, as reflected in their elevated ASA class. However, post-operative complications after combined flap closure were relatively low. We thus found combined pectoralis major and

omental flap reconstruction to be an effective intervention in patients with sternal wounds extending into the deep mediastinum.

Preliminary Postoperative Patient Reported Outcomes following Penile Inversion Vaginoplasty in a Single-Center Prospective Study

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Purpose: Vaginoplasty is the most commonly pursued genital surgery among the transgender and nonbinary (TGNB) population (2015 US Transgender Survey). Several prospective studies have noted significant improvements in psychosocial functioning and patient-reported outcomes (PROs) following gender-affirming surgery; however, these studies commonly exclude genital surgery and often rely on ad hoc measures not validated for use in this population. As part of an ongoing prospective study assessing outcomes following penile inversion vaginoplasty (PIV), we evaluated early post-operative psychosocial functioning, pain, body image, and depression/anxiety.

Methods: This ongoing prospective study recruits TGNB individuals seeking PIV surgery at a university-based plastic surgery clinic. Those individuals with prior genital surgery are excluded. Surveys are completed at three time points: preoperatively, and at three- and twelve-months postoperatively. These questionnaires include a demographics assessment, the Generalized Anxiety Disorder 7-Item Scale (GAD-7), the Patient Health Questionnaire-9 (PHQ-9), BODY-Q Social Function and Body Image Scales, PROMIS Pain Intensity and Interference Scales, and the Gender Congruence and Life Satisfaction Scale (GCLS). All instruments utilized were previously validated, and the GCLS is validated specifically for use in transgender populations. Pre- and post-operative measures are scored and compared utilizing Wilcoxon Signed-Rank Test.

Results: Over a two-year recruitment period, a total of 45 TGNB individuals were recruited and successfully completed the preoperative survey. A total of thirty-nine individuals have undergone surgery and completed the initial three-month post-operative survey, with 26 of these individuals completing the final twelve-month post-operative survey. Pre-operatively, 77% of patients screened positive for mild to severe depression (PHQ-9=7.11±5.6) and 65% screened positive for mild to severe anxiety (GAD-7=6.7±5.0). At 12 months after surgery, we observed

significant reductions in both anxiety (GAD-7=4.4+/-4.5, p=0.02) and depression (PHQ-9=5.1+/-4.9, p=0.01) scores. BODY-Q Social Function (pre: 50.1±19.5; 3-months: 54.0±20.7; 12-months: 59.2±16.2, p=0.009) and Body Image (pre: 39.0±28.5; 3-months: 59.7±20.0; 12-months: 62.7±22.5, p=0.002) Scales both significantly improved after surgery. In addition, GCLS Genitalia (pre: 2.2±0.85; 3-months: 4.3±0.69; 12-months: 4.4±0.62; p<0.001), Social Gender Role Recognition (pre: 2.9±0.57; 3-months: 3.37±0.60; 12-months: 3.5±0.48; p<0.001), and Psychological Functioning (pre: 3.6±0.77; 3-months: 3.92±0.58; 12-months: 4.1±0.66; p<0.001) Factors improved significantly in the early and late postoperative periods. At twelve months after surgery, patients were experiencing similar levels of pain as compared to their preoperative state as evident in relatively unchanged PROMIS Pain Intensity (pre: 47.2±11.4; post: 48.1±10.3; p=0.78) and Pain Interference Scores (pre: 50.15±11.6; post: 48.7±8.4; p=0.96).

Conclusions: As early as three months post-operatively, TGNB individuals undergoing PIV had significant improvement in multiple measures of body image, psychological, and social functioning. These effects were found to persist at one year after surgery. Significant postoperative improvements were also noted in the severity and frequency of anxiety and depression in this patient cohort. Despite this study's single-surgeon limitations, these clear improvements in multiple aspects of quality of life lend further support to the benefits of PIV that persist beyond the early post-operative period.

Soleus Muscle Flap for Reconstruction of Lower Extremity Trauma. Work Horse or Glue Factory?

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Background: Soleus muscle flaps have traditionally been a workhorse choice for lower extremity reconstruction. In the modern era, many surgeons prefer free flaps. The purpose of this study is to evaluate the trends and outcomes of soleus reconstruction after lower extremity injury in a large cohort at a Level 1 trauma center.

Methods: This is an IRB-approved, retrospective chart review that was undertaken at LAC+USC Medical Center from 2007 to 2021. Patient demographics and outcomes, Gustilo-Anderson fracture classification, and flap characteristics were collected and analyzed. Outcomes

of interest included failure rates, postoperative complications, and postoperative ambulatory status.

Results: Out of 187 lower extremity local flaps, 69 (36.9%) were soleus flaps. Eighty-three percent of the soleus flaps were performed before 2015. Flap loss rate for soleus flaps was 0%. Of the patients who received soleus flaps, average age was 39.9+16.7 years, average BMI was 27.9+5.1 kg/m2, 55.0% smoked tobacco, and 66.7% reported at least one comorbidity. Mechanisms of injury included auto versus pedestrian accidents (50.0%), motorcycle crashes (10.2%), falls (8.5%), and gunshot wounds (8.5%). Forty-eight patients also had a coinciding open fracture, which were most commonly classified as Gustilo-Anderson type IIIB in 28 patients, followed by type II in 18 patients, and type IIIC in two patients. Sixteen (23.2%) flaps demonstrated at least one postoperative complication, which included eleven patients with osteomyelitis/hardware infection, six patients in need of flap revision, and two patients who required limb amputation. Long-term follow-up demonstrated 37.5% of patients could ambulate independently after an average of 7.5±7.2 months with the remainder needing either a wheelchair or walking-assistance device.

Conclusion: This study examines outcomes of over 14 years of experience with lower extremity reconstruction employing soleus flaps at a Level 1 trauma center. Although flap loss rate in this cohort was 0%, the findings demonstrate higher than expected infectious complications. Additionally, our data demonstrates a decrease in the number of soleus flaps performed at our institution after 2015. Future studies should evaluate the difference in outcomes based on flap-type and evaluate the impact of patient comorbidities and demographics on wound healing and recovery towards full ambulation.

Efficacy Of Immediate Lymphatic Reconstruction in Prevention of Breast Cancer Related Lymphedema

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Introduction: Breast cancer related lymphedema (BCRL) is a chronic condition resulting in the accumulation of interstitial fluid that can negatively affect the quality of life of breast cancer survivors. Immediate lymphatic reconstruction (ILR) at the time of axillary lymph node dissection (ALND) is emerging as a technique for the prevention of BCRL, though definitive clinical studies are still underway. This study compared the incidence of BRCL in patients who received ILR and those who were not amenable to ILR at the time of ALND.

Methods: Patients, retrospectively identified through a prospectively maintained database, were referred to the Multidisciplinary Lymphedema clinic for ILR at the time of ALND between 2016 and 2021. At the time of surgery, some patients were deemed non-amenable to ILR due to a lack of visualized lymphatics or anatomic variability (e.g., spatial relationships or size discrepancies). Descriptive statistics for sociodemographic and clinical risk factors and complications of surgery were conducted, with significance determined by independent t test and Pearson's □2 test. Bivariate and multivariable logistic regression models were created to assess the association between lymphedema and ILR. To account for the high mismatch in the number of patients having undergone ILR and those who had not, a loose age-matched subsample was created for sub-analysis.

Results: 281 patients were included in this study (252 patients who underwent ILR and 29 patients who did not). The patients had a mean age of 53 □ 12 years and BMI of 28.6 □ 6.8 kg/m2. The incidence of developing lymphedema in patients with ILR was 4.8% compared to 24.1% in patients without ILR ($p = 0.001$). Patients who did not undergo ILR had significantly higher odds of developing lymphedema compared to those who had ILR (OR 6.4 [2.3 – 17.8], $p < 0.001$). When the patients were matched by age, the patients without ILR still had higher odds of getting lymphedema (OR 14.2 [2.6 – 77.9], $p < 0.001$).

Conclusions: Our study showed that ILR was associated with a lower rate of BCRL. Further studies are needed to determine which factors place patients at highest risk of developing BCRL.

Retrospective Review of Eighteen Free Fibula Flaps for Limb Salvage in Pediatric Patients: A Critical but Imperfect Method for Limb Reconstruction in Kids

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Objective: The free fibula flap based on the peroneal artery was first described by Taylor et al. and has become an important component of long bone reconstruction.1 The transfer of the fibula with its physis based on the anterior tibial artery as described by Innocenti in 1998 has allowed for the transport of a growing bone and restoration of an articular surface. 2 Limb reconstruction with these techniques offers patients a functional outcome when severely degenerative or

malignant processes put the patient at risk for amputation. An important challenge to consider in the pediatric population is normal growth of long bones and how limb reconstruction can emulate this process. The purpose of this study was to analyze the clinical characteristics of fibular free flaps performed for upper and lower limb salvage at a major children's hospital and evaluate their perioperative outcomes.

Methods: We performed a retrospective chart review of all free flaps performed at Phoenix Children's Hospital from January 2014 to December 2021. Patients who underwent free fibula flap reconstruction of the upper limb, pelvis, and lower limb with at least 2 month follow up were included in the study. Mandible reconstructions were excluded. Variables analyzed included location of limb reconstruction, indication for procedure, procedure type (peroneal artery and anterior tibial artery-based flaps, with or without allograft adjunct), length of follow up, flap survival, incidence of complication, peroneal nerve recovery and need for revisionary surgery. These findings were compared to published series in the literature.

Results: A total of 78 free flaps were identified with 18 fibula free flap reconstructions performed on 17 patients. 33% of the 18 flaps were physis transfers for articular reconstruction: 3 for the humerus, 2 for the ulna and 1 femur. Mean age was 8.6 years (1-17). Mean follow up time was 25 months. Etiology for reconstruction included sarcomas (56%), pseudoarthrosis (33%), and nonunion (11%). Overall, 94% of flaps survived, with one flap lost to infection (6%), and all limbs were salvaged. Complications included hematoma (11%), revision anastomosis (11%), hardware failure requiring revision (11%), with an overall complication rate of 39%. Secondary procedures have been needed in 33%.

Conclusion: The free fibula flap is a versatile reconstruction element for limb salvage in pediatric patients that has a high success rate and allows for further growth of long bones. Our findings support published results that physicians should anticipate patients have a high success rate but also a high complication rate and require secondary procedures and revisions in limb salvage with fibula free flap grafting. These findings augment the limited number of small case series in the literature and lend support to this tool as a critical but imperfect method of pediatric limb salvage.

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Outcomes of Free vs. Local Flaps for Reconstruction of the Middle Third Leg in Lower Extremity Trauma

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Background: Trauma to the middle third leg often requires tissue coverage to enhance wound healing and restore form and function. Local or free flaps are utilized based on size and shape of the injury coupled with the expert opinion of the surgeon. The purpose of this study is to evaluate outcomes of local versus free flaps for lower extremity trauma to the middle third of the leg in a large cohort at a Level 1 trauma center.

Methods: This is an IRB-approved, retrospective chart review that was undertaken at LAC+USC Medical Center from 2007 to 2022. Patient demographics and outcomes were collected and analyzed in an internal database. Patient demographics, history, Gustilo-Anderson fracture classification, and flap characteristics were evaluated. Outcomes of interest included failure rates, postoperative complications, and postoperative ambulatory status. Statistical analysis was conducted using a chi-squared test.

Results: Out of ninety-eight lower extremity flaps placed on the middle third leg, 68 (69.4%) were local flaps and 30 (30.6%) were free flaps. Of the local flap cohort, average age was 38.7±16.2 years, average BMI was 29.7±10.1 kg/m2, 43.5% smoked tobacco, and 61.3% reported at least one comorbidity. Most common mechanisms of injury (MOI) included auto versus pedestrian accidents (29 cases, 46.8%), motorcycle crashes (10 cases, 16.1%), and motor vehicle accidents (10 cases, 16.1%). Fifty-two patients had coinciding open fractures and were classified as Gustilo-Anderson type IIIB in 57.7%, type II in 30.8%, and type IIIC in 5.8%. Of the 30 patients who received free flaps, average age was 41.5±14.3 years, average BMI was 28.2±4.9 kg/m2, 44.0% smoked tobacco, and 52.0% reported at least one comorbidity. Most common MOI included auto versus pedestrian accidents (10 cases, 40.0%) and motorcycle crashes (5 cases, 28.0%). Twenty-one patients suffered concurrent open fractures, of which nineteen cases were Gustilo-Anderson type IIIB (90.5%) and one case was type IIIC (4.8%). Regarding postoperative complications, nine (13.2%) local flaps developed osteomyelitis or hardware infection as compared to one (3.3%) of the free flaps (p=0.136). Other postoperative complications among local flaps included five cases needing flap revision and four case with partial flap necrosis. Free flaps were complicated by partial flap necrosis in four cases and flap revision in three cases. Flap loss rate was 98.5% for local flaps as compared to 90.0% for free flaps (p=0.0492)

Conclusion: This study examines outcomes of over 15 years of experience with lower extremity reconstruction of the middle third leg at a Level 1 trauma center. Free flaps had significantly more cases of flap loss and trended more cases of flap revision and necrosis, while local flaps demonstrated trends of higher infection rates. Future studies should evaluate the impact of patient comorbidities and demographics on wound healing and recovery towards full ambulation.

Donor-Site Morbidity Following Microvascular Fibular Transfer for Head and Neck Reconstruction

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Background: Continuous refinement in head and neck reconstruction requires a thorough evaluation of donor-site morbidity of established workhorse flaps. Regardless of the favoritism bestowed on the free fibular flap (FFF) for head and neck reconstruction by most microsurgeons, the donor-site morbidity associated with harvesting remains a controversial and concerning issue. In fact, the perioperative donor-site complication rate following FFF harvest ranges between 2% to 38%. The objective of this study is to analyze surgical and postoperative factors that contribute to donor-site morbidity in patients undergoing FFF transfer for mandibular and/or maxillary reconstruction of oncologic defects.

Methods: We conducted a prospective single-institutional investigation to analyze complications and assess their effect on the postoperative status of the ankle, great toe, and gait in fifty-three patients who underwent reconstruction of maxillary and/or mandibular defects with the FFF. We used the American Academy of Orthopaedic Surgeons foot and ankle questionnaire (AAOS-FAOQ), X-ray of ankles, and clinical examination (pain, paresthesia, claw toe deformity, and range of motion) to evaluate postoperative outcomes one, three, and six months after surgery.

Results: Forty-six males (86.8%) and seven females (13.2%) were finally included. The mean age was 50.18 years (range, 22-75). The mean tourniquet time was 74.25 minutes. The mean length of the segment of fibula harvested was 12.85 ± 1.1 cm, while the residual mean distal and proximal fibula segment length were 6.6 cm (range, 6-8) and 6.7 cm (range, 6-8) respectively. The mean size of the skin paddle harvested was 53.2 cm2 (range, 36-64 cm2). Flap failure secondary to venous congestion was seen in 2 cases. The most common acute donor site complications recorded were edema of the ipsilateral foot (11.30%) and delayed wound healing (9.4%). Additional complications reported included partial graft loss (7.5%) and wound infection (7.5%). Three of the four grafts that were partially lost, had signs of infection (75%). Spontaneous recovery was observed in the 3 partial graft loss cases (75%) whereas 1 patient (25%) required an additional STSG. Long-term claw toe deformity was observed in 1 patient (1.8%) who had required excision of the flexus hallucis longus. Nerve alterations were present in the form of paresthesia (39.6%) and superficial peroneal nerve sensory loss (18.9%). The overall rate of perioperative donor site complications was 35.8%. Significant improvement in the average AAOS-FAOQ score was observed at 6-months when compared to 1-month results ($p<.001$). Dorsiflexion ($p=0.923$) and plantarflexion ($p=0.913$) did not significantly improve at

different time points. Complications did not affect range of motion for dorsiflexion (p=0.759) or plantarflexion (p=0.254) at 6-months. A larger residual fibular stump (≥8cm) did not significantly affect postoperative ROM for dorsiflexion (p=0.232) or plantarflexion at 6-months. A large skin paddle area resulted in an increase in incidence of complications. (p <.001).

Conclusion: Although FFF is associated with a high complication rate and postoperative reduction in lower limb performance, these findings do not challenge the reliability of this versatile flap. A larger flap's skin paddle increases the rate of donor-site complications. Future studies focusing on refinement of harvest technique are anticipated.

Social and Systemic Barriers to Transition-Related Surgical Procedures for Transgender and Gender Diverse Individuals

Abstract Presenting Author:
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Background: Transgender and gender diverse (TGD) individuals in the United States are known to face disproportionate barriers to health care access. This study sought to compare characteristics of individuals who have undergone gender confirmation surgery to those who have not with the goal of identifying social and systemic barriers to transition-related surgery.

Methods: Data were from the United States Transgender Survey (USTS), a cross-sectional nonprobability sample detailing the experiences of 28,000 TGD adults, including demographics, health care access, and surgical status. The primary outcome was having undergone gender confirmation surgery, based on type of transition-related procedures. Multivariable logistic regression models were fit to construct a predictive model with selected covariates evaluated on univariate correlation and included based on model robustness. A subgroup analysis was performed of underinsured and insured patients to explore differences by insurance types regarding coverage of surgical procedures and presence of in-network providers.

Results: In total, 6,009 (21.7%) participants underwent a transition-related surgical procedure. Factors significantly associated with increased odds of accessing surgery were increasing age in years (OR=1.05; 95%), living full-time in congruent gender (OR=6.88; 95%), higher levels of education (OR=2.2; 95%), and higher income (OR=1.05; 95%). Variables associated with decreased odds of surgery were: being assigned male sex at birth (OR=0.27), age of first recognizing TGD status (OR=0.98; 95%), living in a state without trans-protective health laws (OR=0.85; 95%), distance from a transgender-knowledgeable healthcare provider (OR=0.33; 95%), and nonbinary status (OR=0.36; 95%). Participants with Medicaid (OR=0.74; 95%) and no insurance (OR=0.70; 95%) were less likely to have undergone surgery than privately insured individuals. Subgroup analysis of insured patients revealed that living in states without trans-protective health laws was associated with increased denials of surgery (OR=1.4; 95%). Black (OR=1.4; 95%) and Latinx (OR=1.4; 95%) individuals were significantly likelier to face health

equity-related barriers to surgery (uninsured, Medicaid, recent insurance denial, or no in-network providers) than white TGD individuals.

Conclusions: Access to gender confirmation surgery is differentially distributed across demographic factors, and across modifiable equity-related factors amenable to interventions. Efforts are needed to address shortages of transgender health-competent providers, improve TGD legal protections, broaden TGD health insurance policies, and increase access to health insurance for minority TGD individuals, who are disproportionately under/uninsured.

Out-of-State Travel for Gender-Affirming Surgery in the United States: A Comparison of Two States

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Background: Access to gender-affirming surgery (GAS) is made difficult by the dearth of surgeons in the US who offer GAS, especially for genital GAS which is available in only 20 states.1 Additionally, many states have poor protections for transgender people and lack health insurance coverage for GAS.2 These factors limit GAS access in several parts of the US, forcing many patients to travel out of state to seek GAS. New York and Florida are two states with high volume GAS but differ in state insurance policy for coverage of GAS, presenting an opportunity to examine the extent of and factors associated with out-of-state travel for GAS.

Purpose: To characterize the extend of out-of-state travel for GAS in two representative, high-volume states with (NY) and without (FL) a state GAS insurance policy, and to identify factors associated with out-of-state GAS.

Methods: We queried the 2016 HCUP State Inpatient Databases and State Ambulatory Surgery and Services Databases for New York and Florida to identify GAS patients. We used data from 2016 as this was just prior to the reversal of policies and insurance coverage for many transgender patients. We defined our cohort using ICD-10-CM diagnosis codes for gender dysphoria and procedure codes for GAS relevant to chest and genital surgery. Patient characteristics were examined using multivariate analysis for categorical and continuous variables as appropriate.

Results: A total of 880 GAS encounters were included (FL: n = 506, NY: n = 374). Patients in Florida were more likely to be under age 34 (79.4%, vs NY 70.9%), female (63.8%, vs NY 54.3%), white (76.1%, vs NY 33.7%), and in the top quartile for household income (21.1%, vs NY 11.8%). GAS cases in Florida were more likely to be ambulatory (94.1%, vs NY 87.7%) and less likely to be genital surgery (11.7%, vs NY 29.4%) compared to New York. Median total charge for surgery was $7,292 in Florida compared to $23,170 in New York. Patients in Florida are 11.58 times more likely to travel from out-of-state ($p<0.001$) with 68.0% of patients from out-of-state compared to 3.5% of patients in New York. Out-of-state patients in Florida were 24 times more likely to be self-pay than use insurance (OR 25.0, 95% CI: 8.15-76.9), and the vast majority of overall cases in Florida were self-pay (89.5%, vs NY 4.8%).

Conclusions: Compared to New York, GAS patients in Florida were more likely to be out-of-state, have ambulatory surgery and chest surgery, self-pay, and be charged significantly less. These results suggest that state policy mandating insurance coverage for GAS helps lower-income, racially diverse, transgender patients access surgery in state, while states without such policy may develop independent ambulatory practices that draw patients with the means to travel from nearby states without GAS resources but may reduce the ability of low-income in-state patients to access GAS. Additional studies including more states are needed to completely understand the travel burden among transgender patients seeking GAS. Initiatives focused on expanding insurance coverage for GAS and increasing the supply of GAS surgeons is essential.

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Reducing Drain Use with Paraspinous Muscle Flaps For Spinal Closures: A Retrospective Cohort Study

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Introduction: Paraspinous muscle (PSM) flaps are a frequently utilized option for spinal coverage after neurosurgical instrumentation. The PSMs can either be mobilized with superficial undermining and lateral release of the thoracolumbar fascia, deep undermining and medial release of the transverse processes and ribs, or a combination of the two approaches. Most published techniques report the necessity of using postoperative drains. The objective of this study was to compare different PSM flap techniques and their effect on drain use, retention, and complication rates.

Methods: A retrospective chart review was performed for all patients who underwent spinal coverage with PSM flaps at a single institution from April 2020 to June 2021. Patient demographics, preoperative comorbidities, surgical technique, drain usage, and postoperative complications were collected. Descriptive statistics, t-test, analysis of variance (ANOVA), and multivariate logistic regressions were performed to compare the effect of different surgical techniques on postoperative drain use and complications. Significance was defined as $p < 0.05$.

Results: A total of sixty patient cases were included. The mean patient age was 49.2 ± 21.4 years, and the mean BMI was 28.0 ± 9.4. There were no significant differences between the groups for most preoperative characteristics, including gender, smoking history, hypertension, prior radiation or infection, or presence of hardware. The most common indication for the need for muscle flap coverage was prior back surgery (82%). Both superficial and deep releases were performed in half (47%) of the cases, while the other half was split between superficial (25%) and deep (28%) releases. Drains were utilized less frequently for the deep release (35%) than the superficial (93%) or both releases (96%, $p < 0.01$). The deep release also had a shorter mean drain retention time (5.8 ± 2.1 days) and number of drains used (0.35 ± 0.49 drains) than the superficial (30.3 ± 11.7 days, 1.00 ± 0.38 drains) or both releases (24.8 ± 14.7 days, 1.14 ± 0.45 drains, $p < 0.01$). There were no significant differences between the techniques for any postoperative complications, including hematoma, seroma, infection, dehiscence, flap necrosis, reoperation, or mortality. Specifically, for the deep release, the use of drains was not associated with a reduction in complications (odds ratio 0.91 [0.84 – 0.98], $p = 0.97$). Therefore, the drainless closure did not increase the risk of postoperative complications.

Conclusions: The use of a "deep release only" technique when mobilizing PSM flaps may allow for the possibility of drainless spinal closure without an increased risk of seroma or other postoperative complications. Avoidance of drains may improve patient care by reducing the need for postoperative antibiotics and improving patient comfort and mobility.

Seroma Reduction with a Novel internal Negative Pressure System in Prepectoral Breast Reconstruction

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Purpose: The objective of this study is to evaluate the safety and effectiveness of the Interi System in an expanded group of prepectoral breast reconstruction patients compared to standard drain patients. This is an update to our original study of Interi patients (Plastic & Reconstruction Surgery Journal - Global Open, January 2022).

Methods and materials: Consecutive patients undergoing immediate, prepectoral, implant-based, ADM-assisted breast reconstruction who received the Interi System from September 2020 to February 2022 were included in this study.

Patient records were reviewed, and data on demographics, comorbidities, neoadjuvant therapy use, type of mastectomy, mastectomy specimen weight, type of reconstruction, postoperative complications and manifold duration were retrieved and tabulated. Results for Interi patients were compared to the cohort of standard drain patients in the original study.

The Interi System is an internal negative pressure delivery system. Interi's internal manifold, with four "peel-apart" channel branches, is connected to an external therapy unit to simultaneously deliver continuous negative pressure of 125mm Hg to tissue planes and remove excess fluid, producing immediate, sustained apposition of tissues in this interface. Based on this mechanism of action, it is expected that Interi has the potential to more effectively close internal tissue planes, resulting in reduced seroma, edema, and other complications.

Reconstructive details: After introduction of the prosthesis and ADM, the branches of the Interi manifold were placed in the subcutaneous space to achieve maximal coverage within the breast pocket. The manifold tubing exited the inferior lateral portion of the breast and was attached to a therapy unit. Patients were discharged with replacement therapy units and taught to monitor fluid level and exchange therapy units when full.

Experience: This study includes an additional 36 prepectoral breast reconstruction patients treated with the Interi System, for a total of 59 patients (101 breasts). Interi patients and the cohort of 23 drain patients (39 breasts) were well matched in all demographics, reconstructive and mastectomy variables. The average length of follow-up for all Interi patients is 251 days.

Result: Interi patients had a mean age of 51.8 years with a mean BMI of 27.9kg/m. Diabetes and smoking was uncommon, 20.3% had hypertension, and 32.2% were obese.

Three seromas occurred in the Interi patients representing a significant reduction compared to the drain patients (3.0% vs. 20.5%, $P = 0.002$). The three Interi patients with seroma were high risk having underwent prior partial mastectomies and radiation treatments. There were no significant differences in complications other than seroma between the two groups, although flap revision was lower in the Interi group (5.9%) versus the drain group (15.4%). Complications occurred in 17 breasts (16.8%) in the Interi group, and 14 breasts (35.9%) in the standard drain group, a statistically significant difference ($P = 0.022$). Interi duration was significantly shorter than drains (17.0 versus 19.7 days; $P = 0.004$).

Conclusion: Interi System provides a safe and effective therapy that may offer significant improvement over current standards of care for seroma prevention in prepectoral breast reconstruction. These results confirm the findings from the original study.

Pedicle Extension in Free Flap Reconstruction

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Purpose: Traumatic injuries that demand free tissue flaps for reconstruction may require vascular pedicle extension between the flap and
recipient vessels to form a clear anastomosis. Reports in the literature conflict on the reliability of pedicle extension techniques in free flap surgery. The objective of this study is to systematically assess available literature about outcomes of pedicle extensions in free flap reconstruction.

Methods: A comprehensive search was performed for relevant studies prior to January 2020. Using the Cochrane Collaboration risk of bias assessment tool, a total of forty-nine studies were identified for this investigation. Of these forty-nine, those meeting inclusion criteria underwent data, extraction focusing on demographics, conduit type, microsurgical technique, and postoperative outcomes.

Results: The search ultimately yielded 22 retrospective studies totaling 855 procedures from 2007 to 2018 in which 159 (17.1%) complications
were reported. Overall heterogeneity of articles was high. Free flap failure and thrombosis were the two most prevalent major complications.
Vein graft extensions maintained the highest rate of complications (20%) in comparison to arterial grafts (12%) and arteriovenous loops (17%).
Bone flaps had the most complications per tissue type at 21%. Overall success rate of pedicle extensions in free flaps was 91%.

Conclusion: This systematic review strongly suggests that pedicle extensions of free flaps in high-risk complex settings are practical and
effective options. There may be a benefit to using arterial versus venous conduits, although further examination is warranted given the small
number of reconstructions reported in the literature and the low quality of evidence available.

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Significant Reduction in Length of Stay in DIEP (Deep Inferior Epigastric Perforator) Flap Breast Reconstruction with Implementation of Multimodal ERAS Protocol

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Purpose: Enhanced recovery after surgery (ERAS) implementation achieves earlier recovery, reduced hospital length of stay (LOS) and improved outcomes in patients undergoing Deep Inferior Epigastric Perforator (DIEP) free flaps. We sought to review our ERAS protocols implemented in 2020 and its effect on reduced length of stay (LOS). Our aims were to evaluate the LOS compared to the literature at our institution under our senior author's experience.

Methods: This was a retrospective review of a single surgeon's experience from 2017 to 2021 of patient's undergoing DIEP free flap breast reconstruction analyzing LOS. A discussion of ERAS protocol which achieved an earlier post-operative discharge date is discussed.

Results: A total of 124 patients were identified in this cohort. Length of stay from year 2017 to 2021 under our senior author's care has decreased since the adoption of ERAS protocols based on pre-operative, intra-operative and post-operative management at a rate of 0.303 average decline in LOS per year since 2017, $p<0.001$ adjusted for confounding variables. Adjusted variables included age, BMI, race, flap failure, smoking history, ASA score, diabetes mellitus and prior radiation. Length of stay has routinely decreased from an average discharge date on day 4.17 (Standard Deviation [SD] 1.1, median 4 Inter Quartile Range [IQR] 4-4, range 3-8 days) in 2017 to a discharge day of 2.91 (SD 1.1, median three, IQR 2-3, range 1-5 days) in 2021. 75% of patients in 2021 were hospitalized for 3 or fewer days compared to 75% of patients in 2017 hospitalized for 4 or more days. None of the patients presented a flap failure.

Conclusion: The implementation of our ERAS protocol for DIEP flap autologous breast reconstruction has resulted in a mean LOS lower than contemporary literature. Further refinements to our protocol are still to be developed to provide stronger evidence to support our established protocol. ERAS protocols can efficiently be adopted in microsurgical DIEP breast reconstruction for an earlier discharge date with comparable outcomes to longer LOS.

Reconstruction of Quadriceps Function Using a Single Functional Gracilis Muscle Transfer with an Adductor Longus Nerve to Femoral Nerve Branch of the Rectus Femoris Nerve Transfer

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Background: A femoral nerve injury may result in cutaneous sensory disturbances of the anteromedial thigh and complete paralysis of the quadriceps femoris muscles resulting in an inability to extend the knee. The traditional mainstay of treatment for femoral neuropathy is early physiotherapy, knee support devices, and pain control. Case reports have used the anterior division of the obturator nerve as a donor nerve to innervate the quadriceps femoris muscles; however, a second nerve transfer or nerve grafting is often required for improved outcomes.

Purpose: We suggest a novel technique of combining an innervated, pedicled gracilis transfer with an adductor longus to rectus femoris nerve transfer to restore the strength and stability of the quadriceps muscles.

Methods: This is a case series describing the use of a pedicled gracilis muscle transposed into the rectus femoris position with a concomitant nerve transfer from the adductor longus nerve

branch into the rectus femoris nerve branch to restore quadriceps function following iatrogenic injury (hip arthroplasty) and trauma (gunshot wound).

Results: With electrodiagnostic confirmation of severe denervation of the quadriceps muscles and no evidence of elicitable motor units, two patients (average age 47) underwent a quadriceps muscle reconstruction with a pedicled, innervated gracilis muscle and an adductor longus to rectus femoris nerve transfer. At one year follow-up, the patients achieved 4.5/5 British Medical Research Council (BMRC) full knee extension, a stable knee and the ability to ambulate without an assistive aid.

Conclusions: The required amount of quadriceps strength necessary to maintain quality of life has not been accurately established. In the case of femoral neuropathy, we assumed that a nerve transfer alone and a gracilis muscle transfer alone would not provide enough stability and strength to restore quadriceps function. We believe that restoration of the quadriceps function following femoral nerve injury can be achieved by combining an innervated, pedicled gracilis transfer with an adductor longus to rectus femoris nerve transfer with low morbidity and no donor defects.

Greater Insurance Access Favors Autologous Breast Reconstruction: A Decade-Long Update on the Affordable Care Act's Impact in States that Chose to Expand Medicaid

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Purpose: Disparities in access to health insurance have been correlated to disparities in access to surgical treatment for breast cancer. In 2014, states were given the option to expand Medicaid with federal assistance under the Affordable Care Act. As a result, 32 states (including DC) opted to expand Medicaid eligibility while 19 did not. The unique, state-specific outcome of the Supreme Court ruling on Medicaid expansion provides a natural experiment to study its effects. Given the importance of insurance on health outcomes, and the significant benefits of breast reconstruction, we use a difference-in-difference model to study rates of both implant-based and autologous breast reconstruction before and after 2014 in states that chose to expand Medicaid.

Methods: Seven expansion and six non-expansion states were selected based on available data. The Health Care Utilization Project-State Inpatient Data was queried for breast reconstruction rates (autologous and implant-based) from 2010-2018. A difference-in-difference linear mixed

model was utilized to compare breast reconstruction rates between expansion and non-expansion states before and after 2014.

Results: From 2010 to 2018, change in insurance rate in all persons covered by some type of health insurance after Medicaid expansion was statistically greater in expansion than non-expansion states (p=0.001). When studied independently, the increase in autologous reconstruction rate was statistically greater in expansion vs. non-expansion states (p=0.0098), while the increase in implant-based reconstruction rate was not. There was therefore no significant change in overall breast reconstruction rate (both autologous and implant-based) after Medicaid expansion in states that chose to expand Medicaid.

Conclusions: We update our prior findings with extended data from 2010-2018. The decision to expand Medicaid in 2014 is correlated with a significant increase in autologous, but not implant-based breast reconstruction rates in states that chose to expand Medicaid. Further study is required to elucidate what factors may have influenced patients who newly gained insurance under the ACA's Medicaid Expansion provision to favor autologous over implant-based reconstruction.

Indication-Based Assessment of the Risk Factors for Complications Following Lower Extremity Free Flap Reconstruction: A National Analysis of the ACS-NSQIP Database

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Background: Free tissue transfer remains a valuable surgical option for the reconstruction of a myriad of complex lower extremity defects including coverage of defects following trauma, oncologic resection, vascular pathology, acute and chronic wounds, infection, among several other indications. Currently, there is a paucity of data that examines the risks of complications for each of these unique indications. The primary aim of this study was to elucidate risk factors and predictors for complications following lower extremity free flap reconstruction that occurred within the first thirty postoperative days based on indication and flap type.

Methods: Patients undergoing lower extremity free flap reconstruction from the ACS-NSQIP 2011-2019 database were stratified into groups based on the etiology and indication for free flap reconstruction. These groups included vascular, malignancy, wound-related, trauma, infectious, orthopedic hardware-related, and amputation. Rates of major, surgical wound, and medical complications were compared between flap indications over the first post-operative month. Multivariable logistic regression was used to identify complication predictors based on indication and etiology.

Results: 425 lower extremity free flaps were analyzed. The most common indications for lower extremity free flap reconstruction were wound-related (29%), malignancy (21%), and trauma (17%). Seventeen percent of all free flaps had a major post-operative complication, 9% had a surgical wound complication, and 16% had a medical complication. Those with an indication of malignancy and those who received a musculocutaneous free flap were significantly more likely to have a surgical wound complication compared to the entire cohort ($P< 0.05$). Those requiring free flap reconstruction for orthopedic hardware related concerns as well as those with wound related indications were significantly more likely to have a post-operative medical complication ($P<0.05$). Major complications for those who received lower extremity free flap reconstruction for malignancy were seen significantly later in the post-operative course when compared to other indications ($P<0.05$). Additionally, when controlling for potentially confounding clinical and sociodemographic risk factors, we found that a longer time from operation to discharge was associated with major complications in those with a vascular indication for free flap reconstruction ($P<0.05$). Operative time in the top 25% was associated with increased odds of major complications for all flaps ($P<0.05$).

Conclusion: This is the first study to specifically analyze the risks of complications following lower extremity free flap reconstruction based on the indication for surgery. By assessing the risks of early post-operative complications and reoperation based on indication, surgeons are better able to safely monitor these complex flap reconstructions during these critical periods.

Indication-Based Assessment of the Risk Factors for Complications Following Lower Extremity Free Flap Reconstruction: A National Analysis of the ACS-NSQIP Database

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Background: Free tissue transfer remains a valuable surgical option for the reconstruction of a myriad of complex lower extremity defects including coverage of defects following trauma, oncologic resection, vascular pathology, acute and chronic wounds, infection, among several other indications. Currently, there is a paucity of data that examines the risks of complications for each of these unique indications. The primary aim of this study was to elucidate risk factors and predictors for complications following lower extremity free flap reconstruction that occurred within the first thirty postoperative days based on indication and flap type.

Methods: Patients undergoing lower extremity free flap reconstruction from the ACS-NSQIP 2011-2019 database were stratified into groups based on the etiology and indication for free flap reconstruction. These groups included vascular, malignancy, wound-related, trauma, infectious, orthopedic hardware-related, and amputation. Rates of major, surgical wound, and medical complications were compared between flap indications over the first post-operative month. Multivariable logistic regression was used to identify complication predictors based on indication and etiology.

Results: 425 lower extremity free flaps were analyzed. The most common indications for lower extremity free flap reconstruction were wound-related (29%), malignancy (21%), and trauma (17%). Seventeen percent of all free flaps had a major post-operative complication, 9% had a surgical wound complication, and 16% had a medical complication. Those with an indication of malignancy and those who received a musculocutaneous free flap were significantly more likely to have a surgical wound complication compared to the entire cohort ($P< 0.05$). Those requiring free flap reconstruction for orthopedic hardware related concerns as well as those with wound related indications were significantly more likely to have a post-operative medical complication ($P<0.05$). Major complications for those who received lower extremity free flap reconstruction for malignancy were seen significantly later in the post-operative course when compared to other indications ($P<0.05$). Additionally, when controlling for potentially confounding clinical and sociodemographic risk factors, we found that a longer time from operation to discharge was associated with major complications in those with a vascular indication for free flap reconstruction ($P<0.05$). Operative time in the top 25% was associated with increased odds of major complications for all flaps ($P<0.05$).

Conclusion: This is the first study to specifically analyze the risks of complications following lower extremity free flap reconstruction based on the indication for surgery. By assessing the risks of early post-operative complications and reoperation based on indication, surgeons are better able to safely monitor these complex flap reconstructions during these critical periods.

Timing of Unplanned Reoperation Following Lower Extremity Free Flap Reconstruction: Assessing the Critical Importance of Indication

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Background: Free tissue transfer remains a valuable surgical option for the reconstruction of a myriad of complex lower extremity (LE) defects. Advancements in microsurgery have allowed for the expansion of these techniques into complex lower extremity reconstructions. Recently, clinical indications for free tissue transfer reconstruction in the lower extremity have expanded from primarily traumatic defects limb salvage and amputation prevention to oncologic resection, vascular pathology, acute and chronic wounds, infection, among several others. Despite this, lower extremity flap failures may still lead to amputation rates as high as 18-22%. The current literature on lower extremity free flap failures generally follows a "one size fits all" approach in that the timing and risk factors for flap failure are generally applied to lower extremity free flaps of all indications and etiologies. This project aims to better understand the temporal pattern and risk factors associated with lower extremity free flap failure based on the clinical indication.

Materials and Methods: We analyzed all patients undergoing lower extremity free flap reconstruction from the ACS-NSQIP 2012-2019 prospectively collected data. CPT codes were used to identify patients who underwent vascularized free tissue transfer and cross-referenced with ICD-9 or ICD-10 codes associated lower extremity pathology. These free flaps were stratified by indication (vascular, implant/prosthetic, wound/infectious, trauma, malignancy) type (soft tissue or osseous) and time of reoperation (POD 0-2, 3-10, and 11-30). Weibull survival models were used to compare rates of takebacks among time intervals. Multivariable logistic regression was used to identify independent predictors for unplanned reoperation.

Results: 407 of lower extremity free flaps were identified. Among patients in the cohort, there was a 14.5% rate (59/407) of unplanned reoperation within the first 30 post-operative days following surgery. When stratified by the specific indication necessitating lower extremity free flap reconstruction, patients with an underlying vascular indication had the highest rate of reoperation (40.9%). This was followed by those with an indication related to lower extremity malignancy at 18.3%. Those with implant/ prosthetic and traumatic indications had a reoperation rate of 12.7% each. The reoperation rates were significantly different between indications ($P < 0.05$) The mean daily proportion of patients experiencing reoperation was highest during POD 0-2 (1.47%/day) which dropped significantly during POD 3-10 (0.55%/day) and again during POD 11-30 (0.28%/day) ($P < 0.05$). The trend in reoperation risk also held true when patients were stratified by indication. Race, history of a bleeding disorder, and longer operative time were all associated with increased risk of reoperation on univariate analysis ($P<0.05$). On multivariate analysis, we found that those with hypertension and those of African American/Black race were significantly more likely to undergo unplanned reoperation. Additionally, those with traumatic, implant/prosthetic, and wound/infectious indications were significantly more likely to undergo unplanned reoperation when compared to those with vascular indications.

Conclusions: Lower extremity reconstruction is an important reconstructive option for the coverage of a myriad of defects. Understanding the differences between post-operative reoperation timelines among indication subtypes is important for informing flap monitoring protocols, optimizing ERAS pathways, and correlating dangle protocols.

A Stabilization of Breast Reconstruction Rates: An Analysis From 2005-2017 Using Three Nationwide Datasets

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Background: Previous literature examining trends in breast reconstruction showed increasing breast reconstruction rates; however, a recent update in reconstruction trends is lacking in the literature. Using three national datasets, the aim of this study was to evaluate longitudinal trends in breast reconstruction rates.

Methods: Trends in breast reconstruction rates were evaluated using data provided by the National Surgical Quality Improvement Program (NSQIP), Surveillance, Epidemiology, and End Results program (SEER), and the National Cancer Database (NCDB) from 2005 to 2017. Longitudinal trends were analyzed with Poisson regression and changes in rates were presented as incidence rate ratios (IRR) with 95% confidence interval (CI). Multivariable logistic regression analysis was performed using NCDB data to identify predictors of reconstruction.

Results: We analyzed 1,554,874 female mastectomy patients (NSQIP: 138,791; SEER: 372,586; NCDB: 1,043,497), of which 507,631 patients (32.6% of the total mastectomy patients) received breast reconstruction. Annual breast reconstruction rates per 1000 mastectomies increased significantly in all three datasets from 2005 to 2013 (NSQIP: 7.47%, 95% CI (6.85%,8.10%); SEER: 8.77%, 95% CI (8.01%,9.54%); NCDB: 7.53%, 95% CI (6.71%,8.37%)) with stabilization after 2013 (NSQIP: -0.20%, 95% CI (-0.74%,0.35%); SEER: 0.80%, 95% CI (0.11%,1.49%); NCDB: 0.27%, 95% CI (-0.35%,0.90%)). The majority of patients in all three databases were white (68%-84%) and non-Hispanic (84%-90%). Approximately 67%-69% of patients in the no reconstruction cohorts were between 50-79 years of age, while approximately 63% of patients in the reconstruction cohorts were between the age of 40-59 years. Multivariable

analysis demonstrated that patients who are younger (≤59 years), white, treated at an academic center, have private insurance, are of higher socioeconomic status, with fewer comorbidities, and no prior radiation or neoadjuvant chemotherapy have increased odds of undergoing breast reconstruction (all $p < 0.001$). The odds of undergoing breast reconstruction increased from 2005 to 2013 and decreased from 2013 to 2017. Patients who underwent contralateral prophylactic mastectomy in comparison to unilateral mastectomy had increased odds of undergoing breast reconstruction (OR 9.73, $p < 0.001$).

Conclusions: This study documents a recent stabilization in breast reconstruction rates since 2013. This is the first evidence of stabilization in breast reconstruction rates since the Women's Health and Cancer Rights Act (WHCRA) was passed. The etiology of this recent trend is likely multifactorial. Our multivariable logistic regression analysis demonstrates that undergoing a contralateral prophylactic mastectomy was the strongest predictor of receiving breast reconstruction. Further research is necessary to examine the factors influencing this recent change in practice and its effect on patient reported outcomes.

The First 100 Consecutive Free Flaps as Young Reconstructive Microsurgeons in Developing Country

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Background: In many developed countries like the USA, UK, and Europe, a plastic surgeon needs a proper one up-to two-year additional fellowship training to be a fully competent reconstructive microsurgeon. With the increasing demands of microsurgery cases all around the world, many plastic surgeons in the developing world need to acquire reconstructive microsurgery competency through alternative training methods, as opposed to formal fellowship training. This is a study of one hundred free flaps performed by young microsurgeons from a developing country.

Methods: Alternative microsurgery training pathways and training milestones to acquire competency performing microsurgical reconstruction were described, along with patient data, free flap types, and success rate. Comparison were made of similar publication from developed world.

Results: The 100 flaps were performed in 2 consecutive years following an alternative training pathway in microsurgery. Head and neck microsurgical reconstruction comprises 83% of total cases, followed by 10% of extremity reconstructions. The workhorse free flap was free fibula flap (49%), anterolateral thigh flap (34%), and radio forearm free flaps (8%), with a success rate

of 90%. The remaining 10% free flaps were considered failed after undergoing take-backs and debridement, followed by another free flap. The number of head and necks free flaps and defect locations were compared to young microsurgeons trained from a reputable cancer center in the USA.

Conclusions: The alternative microsurgery training pathways could be an option to acquire skills and learning curves, even compared to fellows who graduated from the business microsurgery centers in the developed world.

Complications And Risk Factors in Gender-Affirming Feminizing Genital Surgery: A National Database Study

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Background: The Medicare ban on gender-affirming surgery coverage was lifted in 2014, resulting in rapid expansion of gender surgery in the US. This has included an increase in both number and type of gender-affirming feminizing genital procedures. The literature now offers retrospective reviews of cohorts of up to 475 patients (1), with studies documenting risk factors for complications (2). However, studies are predominantly limited to penile inversion vaginoplasty, and no large database studies exist. The authors sought to perform a retrospective database review to identify complication risk factors in feminizing genital surgery.

Methods: A retrospective review of the National Surgical Quality Improvement Project (NSQIP) database was performed. Patients were included who underwent any surgery for gender dysphoria from 2013-2019. Patients were excluded who did not undergo feminizing genital surgery. Demographics, comorbidities, and outcomes/complications were analyzed to determine complication risk factors, via univariate and multivariate linear regression.

Results: There were 618 patients with mean age 37.3±13.4, and mean BMI 27.1±6.1. Patients were listed as 61.2% female (n=378), 38.3% male (n=237), and 0.5% nonbinary (n=3). Most patients were white (n=433, 70.1%) followed by Black/African American (n=94, 15.2%) and

"not reported" (n=60, 9.7%); 83 (13.4%) identified as Hispanic. Patients had few comorbidities; 83 (13.4%) were smokers and 63 (10.2%) had hypertension.

Primary CPT codes were listed as 55970 ("intersex surgery: male to female", n=288), 54520 ("orchiectomy, simple", n=175), and 57335 ("vaginoplasty for intersex state", n=117). Other CPT codes included penectomy, urethroplasty, and "construction of artificial vagina". Patients underwent 120 secondary procedures, including diagnostic laparoscopy (49320, n=25), orchiectomy (54520, n=18), fat grafting (20926, n=12), and penectomy (54125, n=11); these secondary codes constitute "unbundling" per CMS guidelines.

Patients undergoing isolated orchiectomy were excluded due to differing expected complication profile, leaving 314 patients. There were 72 complications across 50 patients (15.9%). The most common complications were surgical site complications (10.8%), readmission (3.4%), and reoperation (3.1%). There were no severe systemic complications.

All-cause complications and systemic complications were not predicted by any factor. Surgical site complications were only predicted by diabetes (OR=5.2, p=0.011) and not by smoking or BMI. Readmission rates were only predicted by age >65 years (OR=10.1, p=0.009). Of note, BMI, smoking, and ASA class were not predictive of any outcome.

Conclusions: Patients undergoing genital feminization have gender identity inconsistently recorded. CPT coding remains heterogeneous, and includes unbundling, likely to satisfy insurance company requirements for coverage. Procedures in aggregate have a complication rate of 15.9%, but there were no severe systemic complications. The only risk factor was diabetes; BMI and smoking played no role. Further subgroup analysis is necessary for types of vaginoplasty, isolated vs concurrent orchiectomy, and other feminizing genital surgery.

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Microsurgeon Development, Attrition, and Hope for the Future: A Qualitative Analysis

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Purpose: Autologous breast reconstruction provides psychosocial, well-being, and radiation-associated outcome benefits when compared to implant-based reconstruction.1,2 Yet, microsurgical reconstruction remains less common than implant-based reconstruction, due to barriers such as access to microsurgeons, operating room time, and financial disadvantages.3 Our study aims to qualitatively evaluate microsurgery fellowship-trained surgeons' perspectives on the factors driving attrition and volume.

Methods and Materials: Data for this study represents qualitative interviews with fellowship-trained microsurgeons identified by the American Society for Reconstructive Microsurgery registry, who were invited to participate in a 10-minute interview about their microsurgery training and current practice. Interviews were recorded, transcribed verbatim, and analyzed thematically.

Results: Nineteen interviews were completed (male 53%, female 47%; 5% employed, 5% small group practice, 11% academic/salaried with private practice, 16% solo practice, 16% large group practice, 47% academic). Participants had an average of 11.1 years of practice (range: 2-32). Four themes were identified: exposure and mentorship, training, practice-related factors, and hope for technological advancements. Early exposure in medical school and residency, along with influential mentorship throughout training, impacted recruitment and retention in the field post-fellowship. Fellows at programs with varied and large case volumes felt greater confidence to build a microsurgical practice. Surgeons in solo practice noted challenges sustaining a microsurgery practice, compared to surgeons with multiple partners. Regional variations and local microsurgery saturation influence referral patterns and ease of practice-building. Importantly, low reimbursements and limited access for rural and low-income populations were cited as barriers to expanding practices. Interviewees communicated hope for technological advancements that might reduce time demands and cost of performing microsurgery.

Conclusions: Through qualitative interviews, we have identified four themes affecting the microsurgeon pipeline. Despite an array of barriers, such as low reimbursements and access to care for disadvantaged patients, participants exhibited a passion for this technically demanding field with hope for innovation and continued growth in this subspeciality.

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Reconstruction of Anterior Lower Leg Defects with SCIP Free Flap

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Introduction: In recent years, the progress of anatomical knowledge and microsurgical techniques, in particular the development of perforator flaps, has risen the number of flaps available for leg reconstruction.1,2 However, the anterior lower leg does not contain muscles, and has a thin and limited skin-subcutaneous tissue, it is a region where defects can easily develop and bone structure can be exposed shortly. Local flap options are limited in its reconstruction because of its anatomic limitations.3-5 In this study, we aimed to present reconstruction result of anterior lower leg defects with superficial circumflex iliac artery perforator (SCIP) free flap.

Methods: From December 2018 to January 2021, a total of 17 patients with moderate to large full-thickness soft tissue defects on the anterior lower leg underwent reconstruction with SCIP free flap. After trace and perforator vessels were identified by using hand-held Doppler. Following the meticulous dissection, flap elevation was performed. All of the anastomoses were performed at anterior tibial arteries. Donor sites were closed primarily.

The characteristics of patients and defects, injury mechanisms, complications, and hospitalization were evaluated. The pain, disability and activity limitations of feet, and patient satisfactions were evaluated pre-operatively and 12 months after surgery using foot function index and 5-point Likert satisfaction scales, respectively.

Results: thirteen patients were male and others female. Mean age of patients was 34.6±10.1. The defects were caused by crush injury (n:16) and gunshot (n:3) injuries. Fourteen patients underwent orthopedic surgery due to bone fractures. The size of the soft tissue defects ranged between 5×8 cm to 17×11 cm. Preoperatively severe limitations of feet (mean scores =8.9±0.7) improved normally (mean scores =0.9±0.3) after reconstruction ($p<0.00$). All of the flaps survived completely without any complications. Donor sites healed uneventfully in all patients. All flaps had excellent contour postoperatively and patient satisfaction scores improved statistically (preoperative= 1.3±0.4, postoperative=4.7±0.5). Mean durations of hospitalization were 8±3.3 days after surgery.

Conclusion: SCIP flap is a thin and pliable flap along with advantages such as having a good vascular network and better postoperative aesthetic appearance on the recipient area with

minimal donor morbidity compared to conventional workhorse flaps. The attributed disadvantages such as having a short pedicle and small vessel diameter do not seem to limit variable usage of this flap because of rich perforator vessels on the recipient area of the lower extremity. Reconstruction of the anterior lower extremity using the SCIP flap can be a good surgical option in cases where local flap alternatives are limited.

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Dimethyl Sulfoxide for Nipple-Areolar Complex Ischemia – A Promising Salvage Treatment

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Background: Surgery of the breast, particularly mastectomy with or without reconstruction, can disrupt the underlying blood supply to the nipple-areolar complex (NAC), leading to ischemia and necrosis. Nitroglycerin paste (MGT), a topical vasodilator, is currently considered the gold standard conservative therapy utilized to combat this dreaded complication. However, MGT has been associated with significant side effects, including hypotension, headache, and dizziness and limited efficacy. [1] Dimethyl sulfoxide (DMSO) is an organic solvent that is FDA-approved for the treatment interstitial cystitis[2] and available over the counter in a topical formulation for various skin conditions. Though the use of topical DMSO has been shown to increase tissue perfusion in ischemic free flaps, [3] its use for the salvage of threatened NACs has not been

reported to date. The purpose of this study is to introduce DMSO as an effective treatment for NAC ischemia after breast surgery.

Methods: Four patients that underwent recent breast surgery and developed NAC ischemia were identified in a prospectively maintained database. Each patient had been instructed to apply topical DMSO cream to the affected NAC four times daily until resolution of ischemic changes. Data including patient demographics, medical history, surgical history, treatment of NAC ischemia, and outcomes after treatment were collected from the electronic medical record. Mean duration of time from surgery to development of NAC ischemia as well as time to improvement of NAC ischemia was calculated.

Results: Four patients were analyzed, including ages 48, 57, 39, and 60 in years. One patient had a history of tobacco use, while the other three did not. Three patients underwent mastectomies (2 nipple-sparing, 1 simple) and 1 mastopexy. None of the patients underwent prior radiation therapy. Mean time interval between surgery and clinical determination of NAC Ischemia was 4.8 days (SD 3.3 days) All patients demonstrated improvement or resolution of NAC ischemia after DMSO application. All four patients had improvement/resolution of NAC ischemia. Average length of time until surgeon-determined clinical improvement/resolution of NAC ischemia was 12.5 days (SD 6.2 days).

Conclusions: The threatened NACs of all four patients included in this study were salvaged after serial application of topical DMSO. This study is the first to report NAC perfusion outcomes following topical DMSO application. Given these favorable results, a randomized controlled trial comparing the efficacy of DMSO to MGT are currently underway at our institution. Outcomes will determine NAC ischemia as a potential new indication for this product.

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Abdominal Donor Site Complications Following Breast Reconstruction Using the Deep Inferior Epigastric Perforator Free Flap: a Multi-Institutional Multi-Surgeon Study

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Purpose: Deep inferior epigastric perforator (DIEP) free flap is considered the gold standard for autologous breast reconstruction. While breast related complications have been well described, less is known about donor site complications and contributing patient risk factors.

Materials and Methods: We examined a multi-institutional (three academic institutions) prospectively maintained database of all patients undergoing DIEP free flap breast reconstruction between 2015 and 2020. We evaluated patient demographics and characteristics, operative details, and abdominal donor site complications. Categorical variables were analyzed with a Chi-Square Test and Fisher's Exact Test. Continuous variables were analyzed with T-test. Univariate and multivariate analyses were performed to assess the relationship between risk factors and abdominal donor site complications.

Results: Over a 5-year period, a total of 661 patients were identified, including 1037 DIEP free flaps. Body mass was an independent risk factor for seroma, wound dehiscence, surgical site infection, and umbilical complications. Specifically, for every 1 kg/m2 increase in body mass index over 24 kg/m2 there was a 1.068 (confidence interval (CI 1.005-1.134, P=0.033)) increased risk for seroma, 1.102 (CI 1.058-1.147, P=0.001) increased risk for wound dehiscence, 1.095 (CI 1.045-1.147, P=0.001) increased risk for surgical site infection and 1.11 (CI 1.043-1.181, P=0.001) increased risk for umbilical complications. Additionally, bilateral reconstruction was found to be a risk factor for umbilical complications ((Odds Ratio) OR 2.854 (CI 1.28-6.36) P=0.010). Immediate reconstruction decreased the risk of bulge formation (OR 0.216 (CI 0.108-0.429), P=0.001).

Conclusions: Higher body mass index is associated with increased complication rates following DIEP free flap breast reconstruction. Efforts to lower preoperative body mass index, if feasible, can help decrease the rate of donor site complications.

Biosynthetic Onlay Mesh Exposure: Management and Outcomes

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Background: Among the classes of mesh used for hernia repair operations, a newer addition is biosynthetic mesh, such as Phasix™ (poly-4-hydroxybutyrate, or P4HB). Placement of synthetic mesh in an onlay position is associated with increased rates of skin breakdown and mesh exposure. However, onlay biosynthetic mesh has better outcomes with lower recurrence rates and greater applicability. Despite the lower risk, exposure of biosynthetic mesh does occur, with numerous options for management. We describe institutional experience and treatment options in cases of exposed biosynthetic mesh.

Methods: Adult patients who underwent hernia repair with onlay, P4HB mesh performed by two plastic surgeons between January 2015-July 2021 were identified. Patients with a documented postoperative mesh exposure were included. Clinical and demographic data were extracted and analyzed.

Results: Fifteen patients met inclusion criteria with a mean age of 57.2 and BMI of 32.1; 73.3% were female. Seven of the 15 patients had prior history of wound infection. Overall, 33.3% of patients had a reoperation after initial management but no patients received a new piece of mesh. Three of the fifteen patients had a spontaneous mesh exposure first documented in an outpatient setting. These spontaneous exposures were caused by chronic wounds (n=2) and a gastric tube leak (n=1). Two of the cases were managed with operative debridement, one required four total operative debridements.

Twelve patients had mesh exposed during an exploratory operation, reasons included seroma (n=1), chronic wound (n=3), necrosis (n=3), infection (n=2), wound breakdown (n=1) and hematoma (n=2). Management for these patients included debridement with skin re-closure (n=6), partial closure (n=1) or skin left open (n=5). Four of these patients required subsequent unplanned reoperations.

Four of the twelve patients with mesh exposed in an operative setting had exposure after chronic surgical site occurrences (SSOs), >200 days after initial mesh placement, average 316 days. These were caused by chronically draining wounds (n=3) and seroma (n=1). In each case, small pieces of unincorporated mesh were and excised. One patient underwent one further debridement and the other three did not need further management.

Conclusions: Original P4HB mesh was ultimately retained in all patients. Operative debridement, minor mesh excision and re-closure resulted in uncomplicated healing in the majority of patients.

Botulinum Toxin Utilization for Abdominal Wall Reconstruction

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Introduction:
Reconstruction of large incisional hernias (IH) presents a challenging surgical problem with high recurrence rates. Botulinum toxin (BTX) injection preoperatively has been proposed to facilitate closure of an open abdomen1 and more recently to assist in fascial closure during repair of incisional hernia.2–5 There is limited data on outcomes of patients who received botulinum toxin injections when compared to similar patients who did not. We aim to examine the outcomes of patients with incisional hernias who receive BTX injections prior to abdominal wall reconstruction.

Methods: A retrospective cohort study of adult patients from May 2019 to July 2021 who underwent IH repair after BTX abdominal wall injections was conducted. All patients underwent a standardized BTX treatment course followed by interval abdominal wall reconstruction. A matched cohort who underwent IH repair without BTX treatment from the same time period were identified. This control group was selected with comparable defect size and BMI to the BTX group. Clinical and demographic data were extracted from charts. Chi-square and t-tests were used for data analysis.

Results: Twenty patients underwent IH repair with BTX injections compared to 30 patients who did not. There was no difference in average age (58.6 and 61.4 years, p=0.514) nor BMI (32.9kg/m2 and 32.4kg/m2, p=0.813). Average abdominal wall defect size was 663.9cm2 in the BTX group and 608.43cm2 in the non-BTX group (p=0.513).
Primary outcome of fascial closure was achieved in every patient in the BTX group (20/20) vs 86.7% (26/30) in the non-BTX group (p=0.089). There rate of component separation was lower in the BTX group (65.0% of the BTX group vs. 93.3%, p=0.01). The BTX group had higher

rates of seroma (p=0.03) and longer surgery time, 4:07 vs 3:58 (p<0.01). Only one dehiscence occurred in the post-operative period (non BTX group). There was no difference in incidence of surgical site infection, abscess, delayed healing, respiratory failure requiring prolonged intubation and re-intubation, pulmonary embolism, acute kidney injury or length of stay.

Conclusions:
When compared to similar patients in regards to defect size and BMI, patients receiving botulinum toxin injections into their abdominal wall musculature achieved greater rates of closure with without significant negative outcomes in the peri-operative period. We conclude that botox injection for large incisional hernias is safe and effective method for relaxation of abdominal wall muscle and assistance in the closure of large abdominal wall defects.

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Sociodemographic Predictors of Morbidity and Mortality Among Pediatric Burn Patients in the United States

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Purpose: Health and health outcomes particularly morbidity and mortality have been linked to sociodemographic factors such as race, income, and insurance status. There is a relative paucity

of information linking these factors to outcomes in pediatric burns in the U.S. Herein, we examined sociodemographic factors as predictors for morbidity and mortality among pediatric burn patients using the 2016 Kids' Inpatient Database (KID).

Methods: The 2016 KIDs was used to select patients with primary and secondary ICD-10 diagnosis of burns (T30.0 and T31.0). Demographics of this cohort regarding racial, financial, and insurance status composition were identified. Multinominal logistic regression analysis was performed to assess race, income quartile, and insurance status as significant predictors for morbidity level and mortality risk using All Patient Refined-Diagnostic Related Group (APRDRG). Statistical analyses were conducted in STATA using an $\alpha<0.05$ for determining statistical significance of predictors.

Results: 6906 patients were identified that met inclusion criteria. Risk of morbidity among patients with primary or secondary burn diagnoses among different races was assessed, showing that compared to white patients, Hispanic patients had 1.29 times the risk of having "major loss of function". When analyzing income, we found that those in the lowest income quartile ($1-42999) had 1.64 times the risk of having "extreme loss of function" compared to those in the highest income quartile ($71000+). Analyses of risk among different insurance statuses revealed that compared to those using private insurance methods, those who were uninsured, or self-pay had 2.09 times the risk of having "extreme loss of function". Figure 1
Among different racial groups there were no differences in mortality risk among pediatric burn patients. When examining income quartiles, we found that those in the lowest two quartiles ($1-42999) ($43000-53999) had 2.29 and 2.53 times "major likelihood of dying" risk respectively compared to the highest income quartile ($71000+). Examining mortality risk among insurance groups revealed that those who were uninsured or self-pay had 2.10 times "major likelihood of dying" risk compared to those using private insurance. Figure 2

Conclusions: Certain sociodemographic factors significantly increase the risk of morbidity and mortality among pediatric burn patients. Hispanic individuals were found to at significantly higher risk of having increased morbidity compared to white patients, those in the lower-income quartiles had significantly more risk of morbidity and mortality compared to those in the highest income quartile, and those who were uninsured had significantly more risk of morbidity and mortality compared to those using private insurance. To our knowledge this is the first study to assess sociodemographic factors in relation to morbidity and mortality among pediatric burn patients utilizing the KIDs and APRDRG classification. These findings highlight the need to inform future health care policy and health education amongst at-risk vulnerable socioeconomic groups.

Reconstruction of Plantar Foot Defects with Superficial Circumflex Iliac Artery Perforator Free Flap

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Purpose: Reconstruction of plantar foot defects presents various challenges due to its load-bearing glabrous structures.1,2 Various techniques have been described for the reconstruction of soft tissue defects of plantar foot.1-3 In this article we report our experience using superficial circumflex iliac artery perforator (SCIP) free flap in reconstruction of plantar defects.

Patients and Methods: From November 2018 to February 2021, 21 patients with soft tissue defects on plantar region underwent reconstruction with SCIP free flap. After trace of perforators was identified by using hand Doppler, meticulous dissection and elevation of flap was performed. Anastomosis was performed at posterior tibial (n=13) and dorsalis pedis (n=8) arteries through a subcutaneous tunnel. Donor sites were closed primarily.

The characteristics of patients and defects, injury mechanisms, complications, hospitalization and follow-up period were evaluated.

Before and 12-months-after-surgery, the pain, disability and activity limitations of feet, and cosmetic satisfaction were evaluated using foot function index and 5-point Likert satisfaction scales by patient and two observes, respectively.

Result: Study included 16 male and 5 female patients. Mean age of patients was 36.8±11.2 years. The defects were located on heel(n=5), in-step(n=6), first metatarsal head(n=6), other metatarsal head(n=2), first finger plantar surface(n=2) and caused by crush injury(n=11), gunshot(n=3) injuries, diabetic ulcer (n=5), pressure ulser(n=2). The size of the soft tissue defects ranged between 3×3 cm to 5×10 cm. All of flaps survived completely without any complications. Patients were discharged on average 8.3± 2.6 days after surgery.
Preoperativly severe limitations of feet (mean scores =9.3±0.5) improved normally (mean scores =0.8±0.4) after reconstruction ($p<0.00$). All patients and observers were satisfied with feet cosmetics. (Preop patients scores= 1.3±0.4, postop patients scores=4.7±0.5).
All flaps had excellent contour and provided stable soft tissue coverage without discomfort in performing daily activities and all patients were able to wear same size shoes. Donor sites healed uneventfully.

Discussion: SCIP flap can be considered as a reliable alternative for the reconstruction of plantar soft tissue defects of feet with some advantage; comfort with footwear and walking, provided thin flap for foot contour, a concealable donor scar, elevation with supine position, easy primary closure of the donor site, and well-hidden scars and high patient's satisfaction.3-5

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Cryopreserved Adipose Successfully Mitigates Complex Burn Adhesion and Contracture in a Multi-Staged Reconstructive Approach

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Introduction: Complex and extensive burns remain a recalcitrant problem requiring rapid triage, surgical debridement, and prolonged reconstruction in order to prevent mortality and mitigate morbidity. However, these both the injuries and their can result in significant soft-tissue loss, disfigurement, and residual disability. With high enough total body surface area or in austere conditions providing autologous coverage is challenging. Further, when these injuries affect mobile, functional, or highly visible anatomy subsequent contracture, adhesion, and soft tissue deficits frequently result loss of quality of life, ability to work and/or return to duty, and psychosocial well-being. We have previously demonstrated the viability of an adipose-first approach to reconstruction to answer the initial need for autologous coverage and both address soft tissue deficits and coverage of critical structures as well as to mitigate adhesions during stages skin grafting. Here we looked to utilize cryopreserved adipose collected at time of initial harvest to perform staged hypodermal augmentation to further improve reconstructive outcomes.

Materials and Methods: Subcutaneous adipose was collected from herd matched female Yorkshire swine and milled to generate aliquots appropriate for injection via 16-gauge needle. Milled adipose was cryopreserved for repeat application as follows. Our porcine complex

burn/soft tissue loss model is as follows: female Yorkshire swine received 16, 4x4 cm full-thickness burns. After 48 hours, eschars and non-viable tissues were excised to fascia. Control wounds were stratified across pigs to receive A) No Reconstruction, B) Skin-Only Reconstruction, C) Immediate Fat-Only Reconstruction, D) Immediate-Skin, Delayed-Fat, E) Immediate-Fat, Delayed-Skin Reconstruction, or F) Immediate-Fat, Delayed-Skin Reconstruction with an Additional Round of Delayed-Penetrating Fat Grafts. At 6- and 8-weeks post-engraftment animals were sacrificed. Terminal photography, ultrasound, and tension measurements performed. Skin and serum collected for histology and protein analysis.

Results: As previously described, we noted that immediate use of adipose mitigated development of deep adhesions. This early adipose eventually incorporated into the granulation tissue resulting in significantly increased soft tissue thickness by histology and ultrasound in both the early and delayed setting vs. immediate skin grafting or fat-free reconstructions (ANOVA; $p<0.05$). In absence of staged adipose, there was a significant increase in contracture noted with fat-first vs. skin-first reconstructions ($p<0.05$). When staged/delayed cryopreserved adipose was utilized we noted further significant improvement in soft-tissue thickness and resistance to adhesion (ANOVA; $p<0.05$). Once staged/delayed cryopreserved adipose was delivered there was no significant difference in graft area/degree of contracture between the fat-first and skin-first approaches.

Conclusions: Hypodermal reconstruction with delayed, penetrating fat grafts is a powerful tool to correct highly adhered, contracted, or deficient sites after complex burns. However, this is a prolonged process, requiring multiple operative visits for repeat cycles of graft and harvest. Here we utilize a translatable pre-clinical porcine model to demonstrate how balancing a single-harvest fat first approach at time of initial excision with use of cryopreservation for staged reconstruction can safely mitigate contracture, adhesion, and soft-tissue deficits and enhance reconstructive options for complex burn wounds.

The Malnourished Consult

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Background: Malnutrition, as defined by a serum albumin <3.5 mg/mL, has a well-established association with major perioperative complications. Oftentimes, the soft-tissue breakdown following procedures is so severe that it necessitates plastic surgery involvement. However, little attention has been given to the plastic surgeon's role in treating these patients and what role nutritional status might play tissue breakdown. The purpose of this study was to describe all arthroplasty and elective spinal fusion complications requiring a plastic surgery consultation and elucidate patient risk factors, both modifiable and non-modifiable, that predispose this population to needing reconstruction.

Methods: A retrospective chart review was performed on a series of knee arthroplasty, hip arthroplasty, and spinal fusion patients between January 1, 2001 and October 22, 2021. Patients were included if they underwent primary knee arthroplasty, hip arthroplasty, or spinal fusion and required consultation by a plastic surgeon. Patients were excluded if plastic surgery was not involved, their injuries were related to trauma, or if they had complications unrelated to their primary procedure. Patient demographics, time to consultation, nutrition laboratory studies, comorbidities, and complications were all considered. Statistics were done using t-tests, chi-square analysis, and multivariable logistic regression models built for each of the composite endpoints separately to predict the effects of malnutrition while controlling for potential confounding variables.

Results: A total of 90 patients met inclusion criteria including 23 males and 67 females with an average age of 58.2 (+/- 18.1). There were 37 knee arthroplasties, 15 hip arthroplasties, and 38 spinal fusions. In this cohort, 53 patients (58.8%) qualified as having malnutrition according to either an albumin of <3.5 g/dL or documentation of nutrition consultation. No significant differences were found between the malnourished cohort and the non-malnourished cohort with respect to demographics including age, race, Body Mass Index (BMI), Charlson Comorbidity Index (CCI), type of procedure, time to consultation, or days of follow-up. Only 63 patients (70%) had nutritional labs ordered as part of their initial management and only 36 patients (40%) received a nutritional evaluation with an average time to consult of 64 days (+/- 125.7 days). Complications within the group were extremely prevalent with only 6 patients (6.7%) experiencing 0 and the average patient experiencing at least 3 (+/- 1.59) complications. Wound infections and breakdown were especially common: 18 patients (20.0%) developed wound infections, 30 patients (33.3%) developed wound breakdown, 26 patients (28.9%) developed a combination of wound infection and breakdown, and only 16 patients (17.8%) had no wound-related complications. Our data demonstrates that the presence of a plastic and reconstructive surgery team is frequently requested for the sickest, and most complex, patients.

Conclusion: Optimizing patient risk factors and coordinating care between interdisciplinary specialties is an extremely crucial component prior to high-risk surgeries such as knee arthroplasties, hip arthroplasties, and spinal fusions. Oftentimes these patients are medically complex and necessitate early plastic surgery and nutrition consultation in order to prevent morbidity and improve surgical outcomes.

Current Understanding of Clitoral Anatomy and its Application to Nerve Dissection for TGNB Individuals Undergoing Phalloplasty

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Introduction: Current surgical research aimed at describing specifics of clitoral anatomy consists of small cadaveric studies with mostly Caucasian women older than 50.1-4 Furthermore, these studies are focused on detailing clitoral anatomy in the context of surgery for clitoral reconstruction or clitoral hood reduction/clitoropexy. This project summarizes the available data on clitoral anatomy and describes clitoral nerve dissection specific to the creation of the neophallus in phalloplasty.

Methods and Materials: A search in EMBASE was conducted for (clitoris) AND ('nerve'/exp OR nerve) AND ('surgical anatomy'/exp OR 'surgical anatomy') with no limitations on publication date or type of publication. The results were reviewed and summarized by the authors.

Results: The EMBASE search resulted in 20 publications. Two studies were excluded for their focus on the pudendal thigh fasciocutaneous flap and surgical treatment of female stress urinary incontinence, respectively. Of the remaining 18 studies, 11 used either adult cadavers or fetuses to detail clitoral anatomy. Only two studies characterized the course of the dorsal clitoral nerves from their point of emergence behind the crura to the ascending clitoral body, through the deep suspensory ligament to their point of arborization at the base of the glans.1-4 Our dorsal clitoral nerve dissection begins with an incision around the clitoral hood that connects laterally to form a W-incision. Hydrodissection and sharp scissor dissection are used to dissect superficial to the clitoral fascia to the pubic symphysis. The clitoral fascia is incised with curved microscissors dorsally and laterally to expose the clitoral nerves. The nerves are clipped distally and prepared for neurorrhaphy. The de-epithelialized clitoris is suspended to the pubic bone and the clitoral nerves undergo coaptation to the target sensory nerve of the flap in an end-to-end fashion.

Conclusions: Literature regarding anatomy of the clitoris, especially surgical anatomy related to its dissection, remains limited. Detailed dissection of the clitoris for the creation of a neophallus during gender affirming phalloplasty remains yet to be fully described.

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Comprehensive Measurement of Functional Status and Quality of Life of Targeted Muscle Reinnervation Patients using Patient Reported Outcomes

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Background: Targeted muscle reinnervation (TMR), both primary (at time of amputation) and secondary (after amputation), can prevent or improve pain from neuroma, phantom and residual limb pain. Prior studies have largely focused on pain scores and outcomes.1–3 The aim of this study was to obtain more holistic and quantitative measurements of the functional status and quality of life of TMR patients, utilizing Patient-Reported Outcomes Measurement Information System (PROMIS) measures.

Methods: This is a single-institution study, with a retrospective and prospective arm. A survey with PROMIS measures of physical, mental, and social health was designed. For the retrospective arm, patients (with at least 6 months follow up) who had undergone TMR by an attending plastic surgeon between 2017-2020 were invited to take the survey. For the prospective arm, patients were invited to take the survey pre-operatively on day of TMR surgery, and post-operatively at 6 months follow up. PROMIS TScores were calculated (TScore 50 = mean of general United States population).

Results: Six patients were enrolled in the retrospective cohort, and six patients were enrolled in the prospective cohort (n=12). Four patients in the retrospective cohort underwent primary TMR at time of amputation (3 above-knee amputation (AKA), 1 below-knee amputation (BKA)). At latest follow up (median 1.6 years), compared to the general population, patients had better mental health (mean TScore (mTS) 55.1, standard deviation (SD) 6.7), emotional support (mTS 58.9, SD 4.3), self-efficacy (mTS 56.0, SD 3.3) and less social isolation (mTS 43.8, SD 3.4) and pain intensity (mTS 43.6, SD 14.6).

Also in the retrospective cohort, two patients underwent secondary TMR, one at 7 years and one at 10 months after BKA. At latest follow up (2.6 years and 9 months, respectively), both had

more pain intensity (mTS 59.6, SD 0.99) and lower ability to participate in social roles (mTS 46.3, SD 2.9), but better emotional support (mTS 62.0, SD 0) than the general population.

In the prospective cohort, 6 patients (2 AKA, 4 BKA) underwent secondary TMR (median time of amputation to TMR interval 6.2 years). Pre-operatively, compared to the general population, patients had more pain (mTS 68.8, SD 6.9), sleep disturbance (mTS 58.2, SD 7.9), social isolation (mTS 60.7, SD 8.0), lower ability to participate in social roles (mTS 37.2, SD 5.4), and worse mental health (mTS 39.6, SD 9.3).

Four patients had followed up at 6 months. All patients had decreased pain intensity (pre-operative mTS 71.1 vs post-operative mTS 52.9, $p = 0.02$). Three patients had improved ability to participate in social roles (pre-operative mTS 36.3 vs post-operative mTS 42.1, $p = 0.04$) and decreased social isolation (pre-operative mTS 63.5 vs post-operative mTS 56.1, $p = 0.01$).

Conclusion: Overall, patients who have undergone primary TMR have better functional status and quality of life than the general population. Preoperatively, patients undergoing secondary TMR report poorer functional status and quality of life outcomes, with improvement in pain intensity and social health outcomes at 6 months post-operatively. Patients undergoing TMR continue to be enrolled prospectively and will be followed over two years to identify and characterize further post-operative changes.

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To Ablate or Not to Ablate: The Question if Umbilectomy Decreases Donor Site Complications in DIEP Flap Breast Reconstruction?

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Purpose: The gold standard in autologous flap breast reconstruction is the deep inferior epigastric perforator (DIEP) flap. There is a large body of literature focused on DIEP flap breast reconstruction with the primary goal of decreasing complications and improving patient outcomes. The aim of this study is to provide umbilectomy as another consideration for decreasing abdominal donor site wounds and further discussion on how to improve DIEP flap breast reconstruction.

Methods: This is a retrospective study that evaluated post-operative outcomes of patients who underwent DIEP autologous flap breast reconstruction at an academic center between January 2015 and December 2021 performed by one of two reconstructive surgeons. Primary outcome variables included abdominal donor site complications and number of complication types. Secondary outcome variables included treatment outcomes for complications. Covariates included demographic information, comorbidities, cancer treatment, and smoking.

Results: 408 patients underwent DIEP flap breast reconstruction with 194 (47.5%) undergoing umbilectomy. Umbilectomy resulted in a decreased number of any reported wounds per patient (0.31 ± 0.696, $p = 0.013$) compared to no umbilectomy (0.52 ± 0.992) as well as decreased associated risk of any reported wounds (OR = 0.530, $p = 0.009$). Umbilectomy also was associated with seroma ($\chi2(1) = 5.032$, $p = 0.038$), specifically abdominal seroma ($\chi2(1) = 6.348$, $p = 0.016$). This study also reproduced what many others have shown; BMI, hypertension, and smoking status are all associated with increased risk of complications (1). These comorbidities also led to increased risk of requiring treatment, either as an outpatient or in the operating room. A history of DVT/PE was also linked to increased risk of complications such as fat necrosis, seroma, and major wound separation.

Conclusion: The topic of umbilectomy should be discussed with the patient and considered as a part of DIEP flap breast reconstruction given the reduction in the risk of abdominal donor site wounds. Though umbilectomy decreases the rate of wounds it can increase risk of seroma and thus other interventions such as progressive tension sutures may be explored to aid in reducing seroma and improving wound healing.

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Utilizing a Cleft Organization to Facilitate Delivery of Essential Burn Reconstructive Surgery in Resource-Limited Settings

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Introduction: Cleft non-governmental organizations (NGOs) possess valuable expertise on delivering safe and effective reconstructive surgery in resource-constrained settings. However, other significantly disabling conditions, such as burns, that require reconstructive interventions lack the same level of local and international support. Cleft NGOs are optimally positioned to assist with delivering essential reconstructive care through sustainable service delivery models similar to those developed for cleft care.

Aims: To perform a study assessing the efficacy of a cleft NGO at delivering burn reconstructive surgery.

Methods: A cleft NGO with forty years of experience delivering global cleft care was utilized to establish a collaborative effort in Jordan between local and international burn experts to provide burn care. A Jordanian burn surgeon performed preoperative screening to identify patients. Virtual case conferences were held weekly to optimize operative planning. Subsequently, a five-day surgical program with a mixed team of Jordanian and international volunteers was held. Patient demographics, interventions, and outcomes are summated.

Results: Fifty-two burn patients were screened with twenty receiving surgeries. Average age was 15 years with 50% females and 25% refugees. Most had scald (65%) or flame (30%) burns from household accidents. Local cutaneous flaps were used in all cases. Only one patient required supplementary skin grafting. Seven patients had multiple operative sites that were addressed with a two-team approach. No early perioperative complications occurred. All patients were followed-up by the local team between 7 and 42 days. Five patients presented with minor complications - 5 flaps with partial necrosis and 2 partial dehiscence. None required surgical intervention.

Conclusions: The successful delivery of safe and effective reconstructive burn surgery by a cleft NGO is possible through combined local and international efforts. Cleft NGOs have the resources and experience that allows them to implement impactful surgical programs for other conditions that are critically lacking access to essential reconstructive care.

Medical and Surgical Complications of Intraoperative Crystalloid Fluid Use in Free Flap Reconstruction

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Background: Intraoperative hypotension occurs in approximately 40-60% of patients undergoing general anesthesia. [1] In free flap reconstruction, systemic hypotension can lead to hypoperfusion of the flap, causing surgical complications. Many anesthesiologists and microsurgeons avoid the use of vasopressors in these instances due to the theoretical risk that vasoconstriction could lead to vascular thrombosis, pedicle vasospasm, reduced flap perfusion and/or failure. [2], [3] Therefore, patients receive high volumes of intraoperative fluids. Despite surgical complications reported from fluid overload, little is known about the medical complications. Herein, we present a study designed to assess intraoperative crystalloid administration and postoperative medical complications in patients who underwent head, neck, and breast free tissue transfer at our institution.

Methods: An IRB-approved chart review was performed on patients 18 years old and older who underwent breast or head and neck free flap reconstruction at the Cleveland Clinic between January 2000 and December 2020 with a minimum follow-up of one year.
Results: 1706 patients underwent 1727 flaps. Flaps with post-operative venous congestion received increased intraoperative crystalloid ($p = 0.009$). On regression analysis, there was an increased risk for venous thrombosis (VT) ($p=0.045$), renal complications ($p = 0.064$), pulmonary edema ($p =0.02$) and acute blood loss anemia ($p < 0.001$) for patients that received greater than five liters of intraoperative crystalloid.

Conclusion: This study is the first to specifically analyze intraoperative crystalloid volumes and their association with medical complications in free flap reconstruction. Increased intraoperative crystalloids were associated with potentially life-threatening medical complications. This analysis, in combination with studies demonstrating the safety and potentially even protective nature of vasopressors, should cause a reassessment of how we as microsurgeons balance the use of vasopressors versus crystalloids in free flap reconstruction.

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Surgical Management of Adult Acquired Buried Penis Syndrome: A Review of the Wisconsin Classification System and Postoperative Outcomes

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Background: Adult acquired buried penis syndrome (AABP) is a debilitating condition that can significantly impair a patient's quality of life. Our institution previously proposed the Wisconsin Classification System (Reference 1) which uses preoperative examination findings to categorize patients with AABP in order to guide the operative decision-making process. The purpose of this study is to evaluate the success of the Wisconsin Classification System in AABP. Additionally, we aim to examine patient and surgical factors that influence postoperative outcomes.

Methods: A retrospective chart review was performed on all patients who underwent surgical repair of AABP from 2015-2021 by the senior author (SOP) at the University of Wisconsin Hospitals and Clinics. Variables of interest included patient demographics, classification data, intraoperative data, and postoperative outcomes. Linear regression analyses were performed to determine which factors influenced postoperative outcomes.

Results: Fifty-two patients with an average age of 56.5+14.8 years and an average BMI of 46.2+11.9 kg/m2 underwent AABP repair. Average follow-up was 178.3+228.6 days. Using the Wisconsin Classification System intraoperatively, 6 patients (11.5%) were classified as type 1 AABP, 13 patients (25.0%) had type 2 AABP, 30 patients (57.7%) had type 3 AABP, and 3 patients (5.8%) had type 4 AABP. Of these patients, 36 (67.0%) were classified in the preoperative visit. Preoperative classification was consistent with intraoperative findings in majority of these patients (86.1%) and successfully guided the surgical approach.
Overall, 21 patients (40.4%) developed postoperative complications. The most common complications were wound healing (n=10, 19.2%), infection (n=7, 13.5%), and penile reburying (n=7, 13.5%). Four of these patients (7.7%) required reoperation due to complications, and the rest were re-admitted (n=6, 11.5%) or managed in clinic (n=11, 21.2%). Increased preoperative BMI (OR 1.09, 95%CI 1.03-1.16, p=0.01), severe obesity (OR 4.40 95%CI 1.56–26.23, p=0.01), and diabetes (OR 4.55, 95%CI 1.37-15.08, p=0.01) significantly increased the risk for developing postoperative complications. Conversely, prior circumcision reduced the risk for complications (OR 0.17, 95%CI 0.04 – 0.77, p=0.02). Fourteen patients (26.9%) reported persistent symptoms, the most common being ongoing urinary difficulties (n=10, 19%). The development of postoperative complications significantly predicted persistent symptoms following AABP repair (OR 3.90, 95%CI 1.07–14.16, p=0.03).

Conclusion: The Wisconsin Classification System allows for an individualized approach to categorizing patients with AABP and helps to guide the surgical decision-making process. High

BMI and patient comorbidities may result in higher rates of postoperative complications. Further, these postoperative complications may lead to persistent symptoms following AABP repair.

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A Prospective Multicenter Randomized Controlled Clinical Study Protocol to Investigate the Safety and Effectiveness of the RECELL® System Combined with Meshed Autograft for Reduction of Donor Area in Soft Tissue Reconstruction

Abstract Presenting Author:
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Introduction: Significant challenges are often associated with closure during surgical reconstruction of soft-tissue injuries. The use of an autograft plays an important role in the treatment of patients, however, donor skin harvesting increases morbidity, creating secondary wounds for patients in already compromised condition, adding risks of donor site pain, itching, delayed healing, infection, and unsatisfactory appearance.

The RECELL® Autologous Cell Harvesting Device is a donor-sparing technology that allows for the preparation and spray application of a non-cultured autologous skin cell suspension (ASCS) to augment meshed split-thickness skin grafts (STSG) in full-thickness acute thermal burn wounds. Use of ASCS promotes epidermal regeneration while minimizing the amount of skin harvested (up to 80:1 expansion). In full-thickness acute thermal injuries, a multi-centered pivotal randomized controlled clinical trial demonstrated reduction of donor skin compared to standard of care without compromise to healing or safety, with a 32% reduction in donor site requirements.1 Additionally, ASCS treatment has been associated with less donor site pain, superior donor site healing, and improved appearance of donor sites compared to traditional STSG donor sites.2

Purpose: The objective of this study is to present a prospective randomized within-subject, blinded evaluator, multicenter controlled study protocol focused on the use of ASCS for patients undergoing reconstruction of skin defects not associated with burn injuries (NCT04091672).

Methods: This study was designed to compare clinical performance of autografting with and without ASCS on acute nonburn skin defects. Patients 5 years or older with a soft tissue defect requiring autografting of at least 160 cm2 and up to 50% total body surface area were considered for participation. Among the defect areas, two comparable areas were identified and randomly assigned to autografting consistent with the Investigator's standard of care or to receive ASCS treatment in combination with an autograft more widely meshed than the standard of care arm.

Results: Enrollment of sixty-five subjects at 18 sites was completed in January 2022. Study follow-up visits are on-going, scheduled over 26 weeks to evaluate the safety and effectiveness of ASCS, with durability confirmed at Week 26. The two study treatment areas will be compared with respect to healing characteristics, the amount of donor skin harvesting required for treatment, and safety-related adverse events. Co-primary effectiveness endpoints are healing at (or prior to) 8 weeks post-treatment and comparison of donor site areas required for treatment. Treatment-related and serious adverse events will be reported through Week 26. Participants will be seen for longer-term follow up at Weeks 36 and 52 to collect additional longer-term outcome data.

Conclusion: Products that allow for reduction in donor site harvesting are of substantial clinical interest for closure for soft-tissue reconstruction procedures. This study provides information regarding an FDA approved product for use in acute thermal burn injuries and study protocol aimed at establishing safety and effectiveness for use in combination with meshed autografting for treatment of acute full-thickness skin defects such as degloving, crush, laceration, and surgical wounds.

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The Extent of Flap Elevation During Forehead Flap Division And Inset: Review of 100 Consecutive Cases

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Introduction and Purpose: Reconstruction of nasal defects following resection of malignancies can be particularly challenging given the prominent subunits involved in the facial cosmesis. Definitive reconstruction of the nasal subunits is achieved by the forehead flap with excellent cosmesis and soft tissue coverage.1 The forehead flap is utilized in patients of all age groups presenting with defects from various causations including trauma, cancer resections, congenital anomalies, and rhinoplasty revisions.2 The forehead flap is a multi-staged procedure including elevation and attachment of the forehead flap to the nasal defect, division and inset stage, and in a few cases, revision of the inset.3,4,5 Although the literature thoroughly describes the second stage (division and the inset stage) of the forehead flap procedure, there is no evidence of a safe ratio of the flap elevation to the nasal defect circumference to achieve the best favorable

cosmetic outcomes. The purpose of this study is to retrospectively analyze the extent of nasal flap elevation during the division and inset stage and the correlation of complication rate to the extent of flap elevation prior to the inset on the nasal defects in consecutive cases. Ultimately, the study will provide a safe flap elevation to the defect base ratio that any surgeon can utilize to avoid major complications during a forehead flap surgery.

Methods: A retrospective chart review was conducted to collect demographics, preoperative defect location and size, pedicle design, time of division, number of stages, use of cartilage grafts, lining reconstruction, and photo analysis of the flap elevation during the division and inset stage. Additionally, post-operative data were recorded to include complications related to the reconstruction, complications related to the donor site, complications leading to re-operation, cosmetic/aesthetic results, type and number of revisionary procedure outcomes and all adverse complications. A photo editing software was utilized to calculate the flap elevation to the defect base ratio from the intraoperative picture captured during the division and inset stage.

Results: The study included 100 consecutive patients who underwent division and inset of their forehead flap reconstruction. Average flap elevation to base of the defect ratio was 75%. The average time to division and inset was 30 days with 73 patients receiving 2 staged procedure and 27 receiving 3 stages. Most of the defects were found to be of the nasal ala. There were 4 complications, ranging from partial flap loss to postoperative myocardial infarction (n=1) which occurred 30 days after the procedure. All flap elevations were cranial to caudal with the caudal end attached during the division, inset, and thinning stage.

Conclusions: Establishing the flap elevation to the defect base circumference ratio gives the reconstructive surgeon confidence in safely elevating the flap to achieve the best cosmesis for nasal reconstruction. The forehead flap is the most used pedicle flap of the face, and it is essential to learn that elevating the flap up to 80% from its base results in similar complication rates with this surgery as previously described in other forehead flap studies.

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The WISHED System for Revision Surgery Following Alloplastic and Autologous Breast Reconstruction: A Systematic Six-Step Approach from a Single-Institution Experience with Two Hundred Patients

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Introduction: Breast reconstruction is often a multistage process that necessitates further revision operations to enhance the breast's aesthetic nature. We propose a methodical approach for analyzing the reconstructed breast which we have titled the "WISHED System." This six-step stepwise system can be utilized to characterize cosmetic and functional issues of the breast prior to revision surgery. The primary purpose of this study is to present the WISHED System and evaluate its utilization in characterizing indications for revision operations. The secondary aim is to compare revision operations and maneuvers performed on patients following alloplastic and autologous breast reconstruction.

Methods: The WISHED System can characterize concerns of the reconstructed breast based on: Width (W), Inframammary fold (I), Size-shape-and-symmetry (S), Height (H), External skin envelope (E), and Dynamic breast changes (D). We retrospectively examined two hundred patients who underwent post-mastectomy alloplastic or autologous breast reconstruction from 2010-2020 by a single surgeon at our institution. Variables included WISHED System parameters addressed during revisions, number of revision operations, and type of revision maneuvers performed. Continuous variables were compared using independent samples t-tests, while categorical variables were compared using chi-square tests.

Results: Of the two hundred patients, 64.5% underwent revision surgery following the index reconstruction. The most common indication for revision following alloplastic reconstruction was to address breast height (H). Alloplastic patients had significantly more revisions than autologous patients to address the position of the inframammary fold (I) ($p<0.05$). Following autologous reconstruction, the most common indication was to address the breast size-shape-and-symmetry (S). Autologous patients had significantly more revisions to address the exterior breast envelope (E) compared to alloplastic patients ($p<0.05$). Overall, autologous patients were more likely than alloplastic patients to undergo at least one revision surgery ($p=0.025$). The average number of revision operations was the same between reconstructive modalities (1.6+0.8), however, alloplastic patients received significantly more revision maneuvers than autologous patients (7.0+4.8 versus 5.4+3.9, $p=0.04$). Selective pectoralis muscle denervation and capsular

maneuvers were performed more frequently in alloplastic patients ($p<0.05$) while scar revision, fat necrosis removal, breast reduction, and nipple reconstruction were performed more in autologous patients ($p<0.05$).

Conclusions: Despite meticulous preoperative planning, revision surgery is often necessary following breast reconstruction. The "WISHED System" can be used to systematically characterize post-reconstructive breast concerns of the patient and surgeon and to develop a comprehensive revision surgery plan. Using the "WISHED System," we have highlighted differences in reconstructive maneuvers between alloplastic and autologous breast reconstruction. These data can be used to counsel patients during the reconstructive process.

Enhanced Recovery After Surgery Protocol Implementation Results in Decreased Length of Stay and Post-operative Narcotic Use Following Microvascular Breast Reconstruction

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Purpose: Enhanced recovery after surgery protocols have previously demonstrated safety and efficacy following microvascular breast reconstruction.1,2 The purpose of this study was to evaluate the effects of implementation of a new enhanced recovery after surgery (ERAS) protocol for patients undergoing microvascular breast reconstruction at a high volume breast reconstruction center.

Methods: Prior to ERAS protocol implementation, all patients were managed on a traditional pathway following microvascular breast reconstruction at our institution. In April 2019 a new ERAS protocol was developed and implemented for all prospectively enrolled patients including increased use of pre-operative counseling, improved multimodal analgesia including use of NSAIDS, early return to diet, and early mobilization. Data including length of stay, inpatient narcotic use, narcotic prescriptions, and complications was prospectively collected for all patients undergoing microvascular breast reconstruction between April 2019 and July 2021. Traditional pathway patients who underwent reconstruction immediately prior to ERAS implementation were retrospectively reviewed as matched controls.

Results: A total of 101 patients were included in each of the traditional and ERAS cohorts respectively. The traditional and ERAS cohorts were well matched with regards to average age (53.6 vs 51.1 years) and rates of bilateral reconstruction (59.4% vs 60.1%). Average length of

stay decreased from 4.13 to 3.03 days with implementation of the ERAS protocol ($p<0.005$). Inpatient milligram morphine equivalents (MME) were decreased by approximately 50% when comparing traditional (172.73 MME) to ERAS (98.99 MME) Patients ($p<0.005$). ERAS patients were prescribed significantly less narcotics upon discharge (298.87 MME vs 178.86 MME, $p<0.005$) and did not require any additional prescription refills. There were no statistically significant differences with regards to complications between the two groups including hematomas, ED readmissions, seroma, or wound healing complications. There were trends towards decreased rates of microvascular takebacks in the ERAS cohort (Traditional 5.9% vs ERAS 0%) and ileus (3.9% vs 0%) however these did not reach statistical significance.

Conclusion: Implementation of an ERAS protocol at a high-volume microvascular breast reconstruction center resulted in a significant decrease in length of stay and post-operative narcotic usage with no increase in perioperative or postoperative complications. Enhanced recovery after surgery protocols can be implemented safely and effectively resulting in improved recovery for patients undergoing microvascular breast reconstruction.

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Free Functional Muscle Transfer Innervated Solely by the Masseteric Nerve – a Longitudinal Analysis of Dynamic Changes in Facial Symmetry in Patients Followed for up to 10 Years

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Objectives: The purpose of this study is to assess the changes over time in facial symmetry in patients reanimated with a free functional muscle transfer (FFMT) innervated solely by a nerve to masseter (NTM) that have been consistently followed for up to 10 years.

Materials and Methods: Facial palsy patients receiving an FFMT innervated solely by the masseteric nerve by the senior author from 2013-2020 were reviewed. Inclusion criteria required a minimum of 2 postoperative photographic and videographic documentation, as well as a minimum of one year of follow up. We obtained objective facial measurements including commissure excursion (CE), commissure height deviation (CHD), smile angle (SA), and upper lip height deviation (ULH) using Emotrics and measured dental show using ImageJ from photos organized into time-based cohorts with an average of 3 months, one year, 3 years, 5 years, and 10 years of follow up as available. Longitudinal results were analyzed using paired sample t-tests.

Results: With closed-mouth smile, masseteric FFMT demonstrated significant differences longitudinally at the one- (average 1.1 years, 26 patients) and three-year (average 2.64 years, 25 patients) timepoints for all smile measurements, as well as significant differences in CHD by 5.6 mm ($p=0.01$) and ULH by 4.3 mm ($p=0.003$) at the five-year timepoint (average 5.38 years, 10 patients). There were significant differences in SA by 11.5 degrees ($p=0.008$) and ULH by 4.1 mm ($p=0.04$) in the ten-year timepoints (average 9.33 years, 6 patients). During open-mouth smile, all smile measurements were significantly different than pre-op at the one-year timepoint. The three-year timepoint revealed significant differences in CE by 7.88 mm ($p<0.001$), CHD by 5.99 mm ($p<0.001$), SA by 8.99 degrees ($p<0.001$), and ULH by 5.54 mm ($p<0.001$). Five-year timepoints revealed significant differences in CE by 7.55 mm ($p=0.003$), CHD by 7.89 mm ($p<0.001$), SA by 10.12 degrees ($p=0.009$), and ULH by 5.98 mm ($p=0.003$). The ten-year cohort did not reveal significant differences from preoperative measures for open smile. There was no significant difference in total or symmetric dental show at any timepoint.

Conclusions: In this cohort, significant differences were consistently observed one year postoperatively and demonstrated escalating symmetry at three years and five years. At ten years, the trend of increasing symmetry was no longer consistent. The lack of effect of this procedure on dental show warrants further consideration for additional nerve contributions to the gracilis muscle to improve smile in the long term.

How is Pre-Operative Hemoglobin A1c Effecting Implant Based Breast Reconstruction

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Background: Many studies have shown a correlation between peri-operative glucose control and wound healing. Given the rising prevalence of diabetes, it is important to identify the association between hemoglobin A1c (A1C) and outcomes in patients undergoing implant-based breast reconstruction.

Methods: After IRB approval, a retrospective review of 203 diabetic patients that underwent implant-based breast reconstruction between March 2013 and October 2020 was performed. An abnormal A1C within three months of the operation was defined as >5.7%, in concordance with the ADA and CDC. Complications were evaluated, with relation to A1C during both the tissue expander placement and exchange operations. Data was then analyzed for statistical significance and weighted specifically for A1C.

Results: Statistically significant differences in overall complication, dehiscence requiring local wound care, and tissue expander loss were noted after tissue expander placement. However, after weighted analysis for A1C, dehiscence requiring local wound care was the only complication that approached statistical significance in this operation (p=0.054). Comparatively, in the exchange operation, the incidence of dehiscence requiring local wound care was not increased with elevated A1C (p=0.025). A weighted bivariate logistic regression model showed preoperative A1C did not affect complications with statistical significance (OR=0.76, 95% CI=0.37-1.54; p=0.440).

Conclusion: The unweighted data demonstrated that elevated pre-operative A1C increases the risk for complication. However, further weighted analysis showed no statistically significant difference with regard to elevated A1C and overall complication in implant-based breast reconstruction.

Split-Thickness Skin Graft Under Topical Anesthesia In Diabetic Patients With Foot And Leg Wounds Improves The Surgical Outcome With Better Glucose Control

Abstract Presenting Author:
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Purpose: Diabetic foot wounds are the leading cause of hospitalization and limb amputations, and timely healing and closure is critical. Split-thickness skin grafting (STSG) remain the gold standard treatment for lower extremity wounds in the diabetic patients, however these patients usually had multiple comorbidities and high risk for general anesthesia (GA) or spinal anesthesia (SA). In this study, we demonstrated our experience in treating diabetic leg and foot wounds with STSG by topical anesthesia (TA) with eutectic mixture of lidocaine and prilocaine (EMLA). The goal of the procedure was to lower the anesthetic risks and achieve better outcomes.

Methods and Materials: This was a prospective, non-randomized, single-center study in Far Eastern memorial hospital. From January 2018 to December 2020, the diabetic patients with leg

or foot wounds undergoing STSG surgery were included. Their wounds were all well-granulating and suitable for immediate skin graft. The patients were separated into two groups: topical anesthesia (TA) and general anesthesia or spinal anesthesia (GA/SA). Data on patient demographics and characteristics, wound etiology, location, and sizes were recorded. The outcomes including wound healing status, postoperative complications, length of hospital stay, medical expenditure and perioperative blood glucose were also evaluated.

Results: During the study period, 28 patients underwent STSG under TA while 46 patients were under GA/SA. All the patients in TA group tolerated the procedural pain well without the conversion to GA or SA, and the mean pain score was 0.98 ± 1.37. The complete wound healing rate was 82.1% at postoperative 4 weeks. There was no significant difference in age, gender, comorbidity index, HbA1c and defect size between TA and GA/SA groups. The wound healing status was similar in both groups, however, TA group had less postoperative infections (TA VS GA/SA =3.6% VS 21.7%, p=0.044), shorter post-grafting hospital stay (TA VS GA/SA = 8.3 ± 6.2 VS 11.1 ± 7.2 days, p = 0.048) and lower mean blood glucose and glucose variability.

Conclusions: Conducting STSG under TA can effectively treat the lower leg and foot wounds in diabetic patients. Comparing with GA and SA, it could achieve better perioperative glucose control and had less postoperative infections. STSG under TA can be considered in patients with high anesthetic risk.

Use of Facial Artery Perforator Propeller Flaps in Reconstruction of Central Facial Defects

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Introduction: Defects in central face are most commonly results of malignancies or trauma due to its unprotected localization and subsequent actinic exposure. Various techniques have been described for reconstruction1. We would like to present our result of perforator propeller flap of facial artery (PPFF) in reconstruction of central facial defects.

Method: From November 2018 to February 2021, forty-three patients with defects in central face that were reconstructed with PPFF were included. The facial ar¬tery and its perforators were determined with hand-held Doppler and dissected at inferior margin of defects with nasolabial fold incision. Perforator flap was elevated and rotated 180-degrees to the defect area. The donor scar was concealed to the nasolabial fold.

Before surgery, patients' medical records were reviewed for age, sex, malignancies type, previous treatment, size, and localization. Surgical scar and facial cosmetic about final shape and symmetry were respectively evaluated using patient's and observer's scar assessment scale (POSAS) and 5-point Likert satisfaction scales by patient and two observers at 12-months postoperatively.

Results: Study included 28 male and 15 female patients. Mean age of patients was 57.8±11.4 years. Patients had medial canthal(n=8), infraorbital(n=12), malar(n=6), nasal sidewall(n=8), nasolabial(n=9) region defects. The defects were caused by premalignant lesions(n=15), non-melanocytic skin cancers(n=23) and trauma(n=5). Defect size ranged from 4.4 to 12 cm2. Early venous congestion was seen in five flaps, which resolved spontaneously. All patients and observers were satisfied with midface cosmetics (Likert patients' score=4.8±0.3, observers' score=4.6±0.5) and scar (POSAS patients' score= 1.7±0.3, observers' score=2.4±0.5).

Donor site scars were well-hidden on the nasolabial fold. All flaps had excellent contour, color and texture match. The mean follow-up period was 16.5 months.

Conclusions: Propeller flaps are valuable tools in the arsenal of plastic surgeons. Their use has been described in perioral and perinasal defects and territories of the facial artery perforators have been thoroughly analyzed.2-5.

Local flaps are indispensable in reconstruction of midfacial defects due to their superior match for color and texture. Among local flaps of central face, PPFF have advantages of having a wide rotation arc, minimal donor site morbidity and placement of the scar along the nasolabial fold, especially among the elderly with excess tissue. Due to these factors, higher patient satisfaction, as observed in our series, is easier to achieve.

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Component Separation Technique (CST) Following Failed CST in Re-operative Massive Recurrent Ventral Hernias

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Background: Open anterior CST with external oblique release (EOR) and posterior CST with transversus abdominis release (TAR) are well established techniques for abdominal wall reconstruction. However, pooled hernia recurrence rates range from 3-15%. There is also a paucity of data concerning management of these CST hernia recurrences. The aim of the study was to describe a tertiary center's reoperative CST outcomes following previously failed CST (FCST).

Methods: A prospectively maintained single-institution hernia database was used to identify the cohort of patients who underwent AWR with a re-operative CST after a FCST from February 2014- January 2019. A 1:1 propensity score match (PSM) was then performed between FCST patients and primary CST (PCST) patients. The outcomes assessed included 30-day readmission, hernia recurrence and wound and mesh complications. Standard statistical methods were used.

Results: Reoperative CST was conducted in 26 FCST patients. Mean age was 60± 11.5 years, mean BMI was 29.9±4.8 kg/m2, 46.2% were diabetic, and 15.4% were previous smokers. The mean number of previous hernia surgeries was 3.4±2.3, with mean defect size was extremely large (306.25±193.49.0 cm2). The FCSTs that were performed were predominantly anterior component separations (92.3 % EOR vs 7.7% TAR). CDC Class 1 wounds were most common (65.4%), followed by Class 3 (23.1%) and Class 2 (11.5%) wounds. Pre-operative Botox was used in 34.6% of patients. Reoperative CST consisted of 42.3% EOR, 46.2% TAR, and 11.5% hybrid (EOR on one side and TAR on another). Biologic mesh was used in 30.7% of cases and synthetic mesh in 69.3% of cases. Mean mesh size was 1074±655.804 cm2 and 46.2 % of patients had concomitant panniculectomy. Operative time was 207.0±63.2 min. Mean length of stay (LOS) was 7.7±4.0 days. The wound complication rate was 19.3%, but there were no wound infections, 30-day readmissions, or hernia recurrences with a mean follow up of 16.9±17.4 months.

Following PSM, there were 23 FCST patients and 23 PCST patients. FSCT were similar to PCST patients in terms of BMI (30.5±4.6 vs 28.7±4.6 kg/m2; p=0.25), diabetes (52.2% vs 43.5%; p=0.76), and smoking (13.0% vs 8.7%; p=1.00). Mean defect size (319.4±187.1 vs 271.3±169.2 cm2; p=0.32) was comparable. The FCST had fewer patients with CDC 3 or 4 wound (26.1% vs 56.5%; p=0.02). The number of ACS/EOR (65.2% vs 60.9%) and TARs (34.8% vs 39.1%) were similar (p=1.00), as was operative time (208.3±67.0 vs 211.5±51.9 min;

p=0.84). Fascial closure was achieved in all cases. LOS (7.5±3.1 vs 7.2±2.0 days; p=0.40) and 30-day readmission (8.7% vs 0.0%; p=0.49) were similar. There was no difference in wound complication rate (21.7% vs 30.4%; p=0.37) or wound infections (0.0% vs 13.0%; p=0.11). Hernia recurrence was 0.0% vs 4.3% (p=1.00), albeit with shorter follow up for the FCST patient group (16.6±18.0 vs 27.2±20.1 months).

Conclusions: These data suggest FCST patients undergoing a second component separation have comparable outcomes to those undergoing primary CST. Careful preop assessment and perioperative planning is important to reconstruct the abdominal wall and avoid further complications and need for reoperation.

Clinical and Patient-Reported Outcomes of the Standard Gluteal Thigh Flap to the Modified Wide Propeller Gluteal Thigh Flap for Perineal Reconstruction

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Purpose: With increasing popularity of laparoscopic and robotic approaches to abdominoperineal resection (APR), thigh-based flaps are becoming a feasible option for perineal reconstruction. The standard gluteal thigh flap (SGTF) has historically been associated with a high complication rate, principally caused by critical distal vascularization. This study compares the outcomes of SGTF with the wide propeller gluteal thigh flap (WPGTF) designed to include perforators of the profunda femoris to improve flap vascularity.

Methods: An IRB-approved retrospective chart review was conducted for patients who received a GTF post-APR from a single center. Patient demographics, comorbidities, APR details characteristics, flap details, and outcomes. Thirty variables related to patients' base-line information, chemoradiation, APR, and GTF; and twenty-seven outcome variables were collected.

Flap-related complications were divided into major and minor, early, and late, recipient site-related or donor site-related. Recipient site complications included seroma, infection, herniation, wound dehiscence, and discharge, and fistula formation. Donor site complications included infection and wound dehiscence.

Two validated patient reported outcomes (PROM) questionnaires were administered via mail. The EORTC QLQ-CR29 quality of life questionnaire for colorectal cancer (0-100; higher scores represent better functioning) and the Lower Extremity Functional Scale (LEFS) (0-80, with a lower score representing greater disability). Univariate analysis with parametric and non-parametric methods were conducted to assess differences between SGTF and WPGTF.

Results: Thirty-three patients were identified (22 SGTF, 12 WPGTF). Bilateral SGTF were required in 4 patients in SGTF group versus none in WPGTF group (p=0.403). One WPTF was excluded from outcome results for short follow up period. Recipient site complications developed in 70% SGTF and 27.3% WPGTF (p=0.054). Partial graft necrosis occurred in 18.2% SGTF vs 0% in WPGTF (p =0.403). Wound dehiscence occurred in 40% of SGTF versus none in WPGTF (p =0.072). There were a comparable number of donor site complications following STGF (15% SGTF versus 9.1% WPGTF, p=0.792), readmissions and reoperations (45.0% SGTF versus 18.2% WPGTF, p=0.227).

For the PROM analysis, out of 22 living patients, there were 10 (45.5%) respondents (5 SGTF and 5 WPGTF). The follow up period for the SGTF group was significantly longer (9.8±1.4 vs. 6.5±1.1 years, p<0.001). The SGTG group reported a lower severity of symptoms in the urinary frequency domain of the EORTC QLQ-CR29 compared to those who had a WPGTF (3±2 vs. 5±0, p=0.025). There was no difference in any other domain of the EORTC QLQ-CR29, including urinary incontinence, body image, stomach problems, dysuria, abdominal pain, anxiety, fecal incontinence, impotence, dyspareunia, or others. There was a significantly higher mean LEFS score in the STGF group compared to that of the WPGTF group (53±28 vs. 45±18, p<0.001).

Conclusions: This study demonstrates similar clinical outcomes when performing the modified WPGTF as an alternative to the SGTF to cover post-APR perineal defects. While not significant, a higher rate of postoperative complications was observed after SGTF. Although patient-reported outcomes had a limited sample size (5 vs. 5), quality of life was reportedly slightly higher after SGTF compared to WPGTF, while the remainder of symptoms and function assessed were equivocal.

Evaluation of Drain Use for Complex Locoregional Reconstruction following Spinal Instrumentation

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Introduction: In recent years, plastic and reconstructive surgeons have become increasingly involved with locoregional closure of spinal wounds following instrumentation, which has proven to minimize post-operative wound complications, especially among high-risk patient populations. Flap-based complex closure of spinal wounds is not without limitation, as adverse sequelae are possible despite soft tissue reconstruction. Therefore, optimization and standardization of surgical technique, including drain placement, for complex spine closure remains paramount to actively minimize post-operative complications, namely seroma formation and surgical site infection (SSI). This study aims to investigate drain usage following plastic surgery closure for spine wounds to identify risk factors for post-operative complication that may provide insight to further guide intra-operative decision making.

Methods: IRB approved retrospective chart review was conducted to identify 179 consecutive patients who underwent spinal instrumentation with plastic surgery-assisted locoregional flap closure performed at a tertiary academic medical center between January 2016 and July 2021. Patients were stratified by drain characteristics (single drain versus multiple drains). Univariate and binomial logistic regression analyses were conducted to compare patient characteristics and clinical endpoints between sub-groups.

Results: Patients who underwent locoregional complex closure of spinal wounds with a single drain (n = 92) demonstrated lower incidence of SSI (4.4% versus 16.0%, p = 0.01) and re-operation for any complication (6.6% versus 16.0%, p = 0.04) when compared to the multi-drain cohort (n = 87) via univariate analysis. Depth of infection (superficial versus deep) did not differ between groups. Seroma rates were comparable (14.0% versus 16.0%, p = 0.74). Patient characteristics were well-matched among groups, except for history of radiation, neoplastic indication, time interval to drain removal, and number of levels instrumented, which were greater in the multi-drain cohort. When controlling for these confounding variables in binomial logistic regression analysis, the use of multiple drains continued to demonstrate increased odds of SSI (OR 4.83, 95% CI 1.21-24.75, p = 0.04). Odds of seroma or re-operation were not found to be statistically significant. Of note, time interval to drain removal was found to be an independent predictor of infection. Sub-group analysis was performed among patients within the single drain cohort based on depth of drain placement, with no difference in post-operative complication rates between those who received a superficial drain only (n = 18) versus those who received a deep drain only (n = 70).

Conclusion: The results of this study suggest that the use of multiple drains following complex locoregional closure of spinal wounds may confer an increased risk of surgical site infection, without the theorized protection from seroma formation. Although patients in the multi-drain group underwent more extensive dissection and demonstrated greater peri-operative morbidity, similar trends were observed when controlling for confounding variables in logistic regression analysis. As such, this work serves as a foundation upon which future studies can be conducted

to better standardize operative technique and drain use for locoregional closure of spinal wounds, as plastic surgeons become increasingly involved in the management of these complex patient populations.

Geographic Travel Trends in Gender Affirming Surgery

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Background: Access to gender affirming (GA) surgery is based on a variety of factors including insurance status, access to a GA surgeon, and geographic location. State level health insurance policies vary based on their mandates for coverage of transition related care. The effect that such policies have on location of GA surgeries and effect on patient travel for GA surgery is poorly understood. We hypothesize that states with favorable state insurance policies perform a higher frequency of GA surgeries compared to states with exclusionary policies.

Methods: Using the Marketscan Database (Ann Arbor, MI) inpatient file we identified patients with a diagnosis for gender dysphoria or transsexualism from 2012 to 2018. We then identified patients who underwent at least one GA surgery: facial, chest, or genital surgery. We then tabulated the number of surgeries per quarter. State health insurance policies were identified through publicly available records and coded as favorable, neutral, or exclusionary. Ratios of GA surgeries performed on in-state versus out-of-state residents were calculated and mapped for the five states that performed the greatest number of GA surgeries.

Results: Overall, there were 693 facial, chest, and genital GA surgeries performed from 2012-2018. Mean age was 37.2. There were 21 facial surgeries, 68 chest surgeries, and 604 genital surgeries. California performed the greatest number of GA surgeries (269 total surgeries; 144 out-of-state patients) followed by Pennsylvania (103 total surgeries; 82 out-of-state patients), and New York (67 total surgeries; 16 out-of-state patients). California, Pennsylvania, and New York had favorable state-level insurance policies. Arizona performed 49 total surgeries (34 out-of-state patients); Arizona had exclusionary state insurance policies. Texas performed the fifth highest number of GA surgeries (44 total surgeries; 26 out-of-state patients). These findings are represented geographically in Figure 1.

Conclusion: This study demonstrates the three states with the highest number of GA surgeries (California, Pennsylvania, and New York) had favorable state level insurance policies and were able to attract the greatest proportion of out-of-state patients. These findings suggest that sexual and gender minority patients predominantly travel to states with policies favorable toward GA surgery.

The Staged Anterolateral Thigh Phalloplasty with Post-Lamination Urethral Lengthening: A Reliable Technique for Gender Affirming Phalloplasty

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Background: The anterolateral thigh (ALT) phalloplasty is an option for gender-affirming penile reconstruction. Urethral lengthening (UL) can be combined with the ALT phalloplasty to facilitate the creation of a directable urinary stream while standing during micturition. A variety of techniques for performing ALT phalloplasty with UL have been described, including single versus staged procedures as well as various lining options for the urethroplasty including skin grafts, mucosal grafts and flaps, and microvascular free tissue transfer. The purpose of this study is to describe the senior authors' novel three-stage approach to the ALT phalloplasty with post-lamination UL, and to review outcomes and complications.

Methods: Following IRB approval, retrospective chart review was performed to identify all patients undergoing primary three stage ALT phalloplasty with UL by the senior authors. Stage I involves single tube, pedicled ALT transfer. Stage II involves vaginectomy, pars fixa urethroplasty, scrotoplasty, and ALT unfurling and post-lamination with a split thickness skin graft (STSG). Stage III involves pars pendulans urethroplasty and anastomosis to the pars fixa as well as re-tubularization of the ALT and glansplasty. Data collected included patient demographics, intraoperative details, postoperative courses, and complications.

Results: Twenty-four patients were identified. Twenty-one patients (87.5%) underwent ALT phalloplasty prior to vaginectomy. Three patients (12.5%) underwent vaginectomy and scrotoplasty prior to ALT phalloplasty. Twenty-three ALT flaps (95.8%) were rolled into a single tube during Stage I, while one flap (4.2%) was amenable to a tube-in-tube design. Three flaps (12.5%) required takeback to the OR for pedicle compromise, all of which were successfully salvaged. There were no cases of full or partial flap loss. All patients with single tube phalloplasties underwent post-lamination STSG for the penile urethra reconstruction (Stage II). Following Stage II, four out of the 23 patients undergoing STSG (17.4%) developed a urologic complication requiring operative revision. Of these four patients, three (75%) underwent operative revision during the planned Stage III while one patient (25%) required revision outside of the planned stages. Following Stage III, 10 patients (41.7%) experienced

urologic complication requiring operative revision, most commonly urethrocutaneous fistula (9 patients, 37.5%) and urethral stricture (3 patients, 12.5%). Twenty-two patients (91.7%) achieved standing micturition at the time of data collection.

Conclusions: The staged ALT phalloplasty with post-lamination split thickness skin grafting for urethral lengthening is an effective method of achieving standing micturition with an acceptable complication rate in gender affirming penile reconstruction. Benefits include temporal separation of periods of highest risk for soft tissue versus urologic complications and the ability to perform revisions during planned operative stages.

Complete Reduction of Arm Lymphedema in 190 Patients with Liposuction without Recurrence - 25 Years' Follow-up

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Purpose: Patients with chronic non-pitting lymphedema do not respond to conservative treatment because of early deposition of excess adipose tissue due to chronic inflammation. (1-3) Microsurgical reconstructions, in contrast to liposuction, cannot provide complete reduction. To remove the excess adipose seems thus to be a logical treatment strategy. This prospective study describes the long-term outcome of liposuction of arm lymphedema.

Methods And Material: 190 women with arm lymphedema underwent liposuction. All patients were preoperatively treated with bandaging followed by compression with flat-knitted, made-to measure garments to get optimal decongestion, i.e., resulting in a non-pitting lymphedema. No postoperative bandaging or manual lymphatic drainage was used. Aspirate and arm volumes were recorded. Volumes were measured with water plethysmography two weeks before surgery and at the same time compression garments were ordered based on measurements of the healthy arm.

Results:
Mean±SEM age at liposuction was 62±0.8 years. Postoperatively compression with garments continued 24/7. Mean age at breast cancer operation, mean interval between breast cancer operation and lymphedema starts, and duration of lymphedema were 51±0.8 years, 2.8±0.4 years, and 8.6±0.5 years respectively. Aspirate mean±SEM volume was 1671±45mL with an adipose tissue concentration of 96±0.7 % in the tourniquet fraction. Preoperative mean excess volume was 1411±52 mL. Postoperative mean reduction was 104±2.0% at 3 months and

116±2.1% at 1 year, and more than 100% during 25 years' follow-up, i.e., the lymphedematous arm became somewhat smaller than the healthy arm. No surgical complications occurred.

Conclusion:
Liposuction is an effective method for treatment of chronic, non-pitting arm lymphedema with long-lasting results. Removing the hypertrophied adipose tissue is a prerequisite to achieve complete reduction.

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Masseteric to Facial Nerve Transfer Combined with Cross-Facial Nerve Graft – A Longitudinal Analysis of Dynamic Changes in patients followed up to 5 years Postoperatively

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Objectives: The purpose of this study is to assess changes in smile symmetry over time in patients reanimated with Nerve to Masseter (NTM) combined with cross-facial nerve graft (CFNG) given the availability of extensive and periodic follow up.

Materials and Methods: Facial palsy patients receiving an NTM with CFNG by the senior author from 2013-2020 were reviewed. Inclusion criteria required a minimum of 2 postoperative photographic and videographic documentation, as well as a minimum of one year of follow up. We obtained objective facial measurements including commissure excursion (CE), commissure height deviation (CHD), smile angle (SA), and upper lip height deviation (ULH) using Emotrics and measured dental show using ImageJ from photos organized into time-based cohorts with an average of 3 months, one year, 3 years, and 5 years of follow up as available. Longitudinal results were analyzed using paired sample t-tests.

Results: During closed mouth smile, the one-year timepoint (average 1.11 years, 16 patients) revealed significant improvement in CE by 9.48 mm ($p<0.001$), CHD by 7.45 mm ($p<0.001$), SA by 10.51 degrees ($p<0.001$), and ULH by 6.23 mm ($p<0.001$). The three-year timepoint (average 2.62 years, 13 patients) revealed significant improvement in CE by 9.6 mm ($p=0.001$), CHD by 6.4 mm ($p=0.002$), SA by 8.3 degrees ($p=0.011$), and ULH by 5.7 mm ($p=0.002$). There were no significant differences at the five-year timepoint (average 4.35 years, 4 patients). During open-mouth smile, the one-year timepoint revealed significant improvement in CE by 9.66 mm ($p<0.001$), CHD by 6.01 mm ($p=0.001$), SA by 5.82 degrees ($p=0.001$), and ULH by 7.44 mm ($p<0.001$). The three-year timepoint revealed significant improvement in CE by 10.63 mm ($p<0.001$), CHD by 6.63 mm ($p=0.001$), SA by 5.02 degrees ($p=0.005$), and ULH by 6.93 mm ($p=0.001$). Of note, a significant increase in total dental show by 34.5 mm^2 ($p=0.014$) was only noted at the three-year timepoint.

Conclusions: Our cohorts demonstrated increased differences from preoperative measurements three years postoperatively in the NTM with CFNG group, with a significant difference in dental show noted only at three-year timepoint. Our findings support that NTM with CFNG demonstrates escalating symmetry in open and closed smile over three-years.

A 10-Year Retrospective Review on the Use of Prophylactic and Salvage Paraspinous Flaps in Spinal Surgery

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Introduction: Complex spinal surgery can harbor devastating postoperative wound complications, such as hardware exposure, reoperation, and potential hardware loss. Paraspinous muscular flaps have been suggested to aid in the wound closure and healing in these patients. Literature has previously shown that complication rates have ranged from 19-40 percent, with a reoperation rate of up to 12 percent. The authors investigated whether prophylactic closure of the spinal wounds with muscle flap improves outcomes, as compared to salvage operations.

Methods: An institutional review board (IRB)-approved retrospective review of patients who underwent a multi-level spinal surgery with concurrent muscle flap coverage at a single

institution (August 2011 to November 2021) was done. Patient demographics, clinical profile, procedures, and outcomes at a minimum 90-days post-operatively have been described.

Results: 73 prophylactic flaps in 60 patients were compared with 47 salvage flaps in 38 patients. Between the two cohorts, there was no significant difference between the mean age (59.9), BMI (28.10) or length of post op stay (8.6). Salvage flaps however were more likely to have a larger initial wound defect size 103.5cm2 bs 93cm2, p=0.045) and a longer length of operation (285 minutes vs 133 mins, p<0.001). Though there was no notable difference in complication rates, prophylactic flaps were less likely to lead to a re-operation (7% vs 11%, p = 0.034).

Conclusion: Paraspinous flaps have been described as a useful adjunct to complex spinal surgery to aid in would healing. This article supports their safe and routine utility for closures in this cohort of patients, as either a prophylactic or salvage-based means.

Access To Reconstructive Surgery for Female Genital Mutilation In The United States And Western Europe

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Introduction: Female genital mutilation/cutting (FGM/C) is the intentional alteration, removal, or injury of female genitalia for non-medical reasons.1 FGM/C affects nearly 200 million women worldwide, many of whom live in developed countries.2 Genital reconstructive procedures have promising functional and patient-reported outcomes, but it is unclear how many victims have access to surgical and associated psychosocial care.1 The purpose of this study was to determine how many victims of FGM/C have access to comprehensive care, including reconstructive surgery, in the United States (U.S.) and Western Europe. Additionally, we characterized current plastic surgery resident training and interest in FGM/C reconstruction for the future.

Methods: FGM/C care centers were identified using End FGM European Network. Access to comprehensive care (surgical, psychological, sexological, and gynecologic) and to publicly insured FGM/C care within the region (U.S.) or country (Western Europe) was documented. Population data were extracted from the U.S. Centers for Disease Control and Prevention, U.S. Census Bureau, End FGM European Network, and World Bank. A 10-item survey capturing interest in and exposure to FGM/C reconstruction was administered to residents at our institution.

Results: Approximately 1.3 million women in Western Europe and the U.S. are affected by FGM/C. Reconstructive surgery in these areas is offered by plastic surgeons (36.8%), gynecologists (57.9%), and urologists (5.3%). Overall, 32% (n=411,624) of women do not have access to reconstructive surgical care (U.S.: 33.8%, Western Europe: 30.8%). 57.7% (n=742,784) of affected women do not have access to comprehensive care (U.S.: 80.3%, Western Europe: 42.8%). 69.4% (n=892,621) do not have access to publicly insured care (U.S.: 100%, Western Europe: 49.1%). 12 residents at our institution completed the survey. 83% of residents had some clinical or operative exposure to FGM reconstruction patients. Further, 75% cited a desire for increased exposure in residency. The most preferred method of exposure for most residents (92%) was greater operative experience.

Conclusion: Female genital mutilation/cutting affects millions of females in the developed world. One-in-three of these women do not have access to reconstructive surgical options. Most affected women cannot obtain publicly insured comprehensive care. Plastic surgeons should consider incorporating reconstructive surgery into their armamentarium. Residents are likewise interested in incorporating FGM/C reconstruction into their training. There must be a greater effort from plastic surgeons to care and advocate for this vulnerable population.

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A Comparison of Direct Care At Military Medical Treatment Facilities With Purchased Care In Plastic Surgery Operative Volume

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Background: Plastic surgeons have played an integral role in the care and recovery of casualties wounded in combat through complex wound management, craniofacial reconstruction, and regenerative medicine. Declining case volume and the subsequent lack of readiness for Department of Defense surgeons being immediately deployable has been an increasing concern

over the last five years.1,2 Little is known about DoD plastic surgery case volume. The purpose of this study was to quantify the volume of plastic surgery cases performed at military treatment facilities (MTFs) and in direct and purchased care settings during fiscal years (FY) 2016-2019.

Methods: A list of plastic surgery Common Procedure Terminology (CPT) codes was compiled to encompass common elective therapeutic ("tracer") and reconstructive ("readiness") surgery procedures. The Military Health System (MHS) Data Repository was queried from FY 2016-2019. A geospatial map was created to illustrate where each of these procedures were being performed and at what volume in relation to MTF and purchased care. Using these data, plastic surgery case volume was determined by Defense Health Agency (DHA) market.

Results: From FY 2016-2019 a total of 85,191 cases meeting criteria were identified during this time period. Readiness cases comprised 31.6% (n=26,950) while tracer cases were 68% (n=58,241) of the cases performed. Overall, 83.2% (n=70,854) were purchased care. A total of 1,397 (1.6%) readiness cases were performed at the MTF's, and 25,553 via purchased care (30%), while 12,940 tracer procedures (15.2%) were performed at the MTF's, and 45,301 via purchased care (53.2%). San Antonio (n=223), San Diego (n=216), and the National Capital Region (n=122) had the highest volume of readiness cases over the four-year period.

Conclusions: As an overall trend, plastic surgery volume within MTFs has declined over the past several years. DHA MTF's with high numbers of purchased care should be considered for the consolidation of plastic surgery resources and manning, and other strategies developed to recapture purchased care in the MHS. Like other surgical specialties, civilian partnerships would likely benefit plastic surgeons in preparation for combat deployments.3

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Reconstruction of Large Sacral Defects with Freestyle Perforator Propeller Flaps

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Introduction: The large and full-thickness soft tissue defects in the sacral area present a reconstructive challenge to surgeons.1 The advanced reconstruction options including musculocutaneous and multiple flaps are on the agenda for larger defects but causes loss of muscle function and multiple donor morbidity.2,3
In this study, reconstruction results of large sacral midline defects with freestyle perforator propeller flaps (FPPFs) are presented.

Patients and method: From December 2018 to January 2021, eighteen patients who were operated for the reconstruction of large sacral midline defects were retrospectively investigated. The strongest perforators adjacent to the defects and allow to primary closure of donor gluteal areas were used for reconstruction. The characteristics of patients, etiology, comorbidities, dimensions of defects, location of perforator and flaps, postoperative complications, hospitalization, and follow-up period were recorded. Satisfaction of the patients was scored with 5-point Likert's scale.

Results: 14 patients were male, and 4 patients were female. The mean age of the patients was 49.3±6.7. The patients were smokers (n=9) and had paraplegia(n=9), hypertension(n=4), diabetes(n=4), and heart disease(n=2), chronic pulmonary disease(n=1). The defects caused by pressure ulcer(n=10), sarcoma excision(n=3), and hidradenitis suppurativa(n=5). Dimensions of defects were ranged from 100 to 352 cm2. Flap dehiscence was observed in a patient and treated with debridement and primary closure. Venous insufficiency was observed two patients and resolved spontaneously. All the lesions were closed successfully without complications. All the patients were satisfied with the results.

Discussion: The reconstruction of sacral defects requires pressure-resistant healthy tissue transfer in immobile patients to avoid recurrence and wound dehiscence at the margin of the defect area. In mobile patients, reconstruction techniques don't disrupt functional muscles. FPPFs are alternative options for large sacral defects with some advantages including freestyle design on many perforators, a large arc of rotation, stable coverage, preserving functional muscle, reuse for recurrent defects, acceptable contour, minimal donor-site morbidity and prevent late complications.1,2,4,5.

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Complete Reduction of Leg Lymphedema in 126 Patients with Liposuction Without Recurrence - 20 Years' Follow-up

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Purpose: Patients with chronic non-pitting lymphedema do not respond to conservative treatment because of early deposition of excess adipose tissue caused by chronic inflammation. (1-3) Microsurgical reconstructions, in contrast to liposuction, cannot provide complete reduction. Removing the excess adipose is therefore a logical treatment strategy. This prospective study describes the long-term outcome of liposuction of leg lymphedema.

Methods: 126 patients with leg lymphedema underwent liposuction. There were 64 primary (PL), and 62 secondary lymphedemas (SL) following cancer treatment. All patients were preoperatively treated with bandaging followed by compression with flat-knitted, made-to measure garments to get optimal decongestion, i.e., resulting in a non-pitting lymphedema. No postoperative bandaging or manual lymphatic drainage was used. Postoperatively compression with garments continued 24/7. Volumes were measured with water plethysmography two weeks before surgery and at the same time compression garments were ordered based on measurements of the healthy leg.

Results: Mean SEM age at liposuction was 49 1,4 years, and duration of leg lymphedema was 13 0,9 years. Age at cancer treatment, and interval between cancer treatment and lymphedema start were 42 1,8 years and 2,8 0.7 years respectively. Age at onset of PL was 28 1,9 years. Aspirate volume was 3452 135 mL with an adipose tissue concentration of 94 0,9% in the tourniquet fraction. Preoperative excess volume was 3489 155 mL Postoperative mean reduction was 82 2,4% at 3 months and 101 2,2% at 1 year, and more than 100% during 20 years' follow-up, i.e., a slight overcorrection. There was no difference in reduction between primary and secondary lymphedemas. No surgical complications occurred.

Conclusion: Liposuction is an effective method for treatment of chronic, non-pitting leg lymphedema with long-lasting results. Removing the hypertrophied adipose tissue is a prerequisite to achieve complete reduction.

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A Case for Preventative Plastic Surgery? Association Of Clinical Risk Factors and Sternal Bone Anatomy with Deep Sternal Dehiscence Following Sternotomy

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Purpose: Deep sternal wound complications continue to be a significant morbidity following median sternotomy for cardiac surgery. Prior studies have suggested the use of prophylactic procedures such as plating or muscle flaps in individuals at high risk of deep sternal dehiscence (DSD). While several clinical risk factors for DSD have been identified, the association of sternal bone anatomy on dehiscence risk is poorly understood. In this study we assess the adjusted and unadjusted effect of radiologic sternal measurements on the risk of DSD in an effort to identify patients who may benefit from prophylactic interventions.

Methods: A case-control study was performed of 133 unique patients who developed DSD and 401 unmatched controls at a single institution (October 2007 - March 2019). DSD was defined as a requirement for operative sternal bone debridement following median sternotomy for open cardiac surgery (CPT=21627). Demographics, comorbidities, and outcomes were obtained from the Society for Thoracic Surgeons (STS) Adult Cardiac Surgery Database. Anatomic sternal bone measurements were taken from preoperative and postoperative lateral CXR scans (thickness at manubrium, 3rd, and 5th intercostal spaces) and preoperative sagittal and axial CT

scans (thickness and width at manubrium, 3rd, and 5th intercostal spaces). Three serial measurements were taken at each sternal level and averaged for mean thickness and width. Univariate, adjusted multivariate, and subgroup analysis was performed.

Results: On univariate analysis, patients who had a DSD were significantly more likely to be female (55.9% vs 30.3%, $p<0.001$), diabetic (59.3% vs 34.2%, $p<0.001$), have PVD (20.3% vs 12.6%, $p=0.04$), have higher BMI (median 32.6 vs 27.7, $p<0.001$), have higher HbA1c (median 6.9 vs 5.9, $p<0.001$), have a longer LOS (median 6.5 vs 5 days, $p=0.001$), and have a narrower lower sternal width (median 22.6 vs 26.7, $p=0.025$). Patients with DSD were more likely to have decreased median manubrial, mid sternal, and lower sternal thicknesses relative to BMI ($p<0.001$) and body weight alone ($p<0.001$). On adjusted multivariate analysis, decreased manubrial sternal thickness indexed by BMI was associated with DSD (estimate 0.13, $p<0.001$), however female gender (estimate 0.33, $p=0.02$) and diabetes (estimate 0.42, $p<0.001$) were also significantly associated with development of DSD.

Conclusions: Although patients who had a DSD did not have a thinner or narrower sternum as compared to matched controls, patients with a DSD had a significantly thinner and narrower sternum when indexed by BMI and body weight alone. While sternal bone measurements may be associated with the development of DSD, especially when indexed to BMI and body weight, pre-operative, and operative clinical risk factors such as female gender, diabetes, obesity, and PVD were more strongly associated with this complication. When determining the need for preventative surgical interventions, it may be important to assess primarily for known clinical risk factors such as diabetes, PVD and obesity, and secondarily for mechanical factors such as relative sternal thickness.

Fabricated Chimeric Free Flap Reconstruction of The Lower Limb

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Summary: Reconstruction of complex and extensive lower limb defects are difficult surgical problems. Occasionally, these deserve the use of more than one free flap to achieve the optimal functional and aesthetic outcome. A fabricated chimeric free flap with the second flap anastomosed to the pedicle of the first flap requires only one recipient site and allows greater freedom of flap inset.

Methods: 14 patients underwent reconstruction of complex lower limb defects with fabricated chimeric flaps undertaken by the senior author. Of which, seven had sustained high-energy transfer injuries involving bone loss or exposed fracture and metalwork; two had chronic

osteomyelitis; two had developed non-union; one required extensive resurfacing of a transfemoral amputation; one had an extensive verrucous congenital pigmented naevus on the sole of their foot; and one required staged reconstruction of an infected knee arthroplasty.

Results: All defects were entirely resurfaced with skin flaps. 12 with an anterolateral thigh (ALT) flap with the second flap buried (gracilis muscle flaps in 11 and a medial femoral condyle corticoperiosteal flap in one), one with bilateral parascapular flaps and one with a parascapular flap combined with medial plantar artery flap.

There were no flap losses or anastomotic revisions. Primary wound healing was achieved for all patients. All fractures and fusions united, although two fractures required secondary procedures to achieve this. All limbs were salvaged.

The use of fabricated chimeric free flaps is well described for breast and head and neck reconstruction, but not for the lower limb. Occasionally, lower limb defects deserve the use of more than one flap, not achievable with an indigenous chimeric flap, while allowing recipient sites to be spared. The anatomy of the ALT flap is particularly suited as the basis of this technique.

The Swollen Limb: Predictors of Lymphedema Diagnosis and Surgical Eligibility Of Patients Referred To A Lymphedema Treatment Center

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Background: Lymphedema is a debilitating condition that impairs emotional, social, and physical well-being. Recent advancements in lymphatic imaging and surgical treatments have contributed to the earlier detection of lymphedema. Despite the advent of effective surgical techniques and diagnostic tools to treat lymphedema, patients continue to be misdiagnosed and may receive sub-optimal treatment prior to consultation with a lymphedema specialist. We evaluated the accuracy of referral for lymphedema in patients with limb swelling, predictors of patients who would benefit from lymphedema surgery, and follow-up interventions.

Methods: The study was conducted as a retrospective review of all outpatient referrals for the evaluation of "lymphedema" to a single surgeon at a tertiary care center between September 2020 and June 2021. Lymphoscintigraphy and ICG fluorescent lymphography were used to establish the diagnosis of lymphedema. Data on patients' characteristics, referral source,

diagnostics, secondary referrals from the lymphedema surgeon, and interventions planned by secondary referrals were tabulated.

Results: 94 patients were referred for the evaluation of possible lymphedema. The percentage of patients without lymphedema was 27%. Upper extremity symptoms were more common in patients diagnosed with lymphedema compared to those who did not have lymphedema (61% vs. 20%; $p<0.01$). In contrast, lower extremity symptoms were more common in patients who were misdiagnosed with lymphedema compared to those who had lymphedema (80% vs. 45%; $p<0.01$). Patients with a diagnosis of lymphedema were further divided into surgical candidates and non-surgical candidates by the senior author. Surgical candidates (n=51) were determined by lymphoscintigraphic evidence of lymphedema and lacked evidence of venous insufficiency, obesity, and lipedema. More surgical candidates were referred by providers familiar with lymphedema (plastic surgery, surgical oncology, or medical oncology) compared to non-surgical candidates (59% vs. 17%; $p<0.01$). Surgical candidates had a lower BMI compared to non-surgical candidates (27 kg/m2 vs. 34 kg/m2; $p<0.01$). Non-surgical candidates were more likely to be referred to a certified lymphedema therapist (CLT) after lymphedema evaluation compared to surgical candidates (44% vs. 12%; $p<0.01$). Predictors of surgical candidacy included radiation therapy, lymph node dissection, and upper extremity symptoms. By contrast, chronic venous insufficiency and lower extremity symptoms were predictors of non-surgical candidacy.

Conclusion: Our study reveals predictors of patients who are eligible for lymphedema surgery and highlight the need for improved education to expedite the diagnosis and appropriate treatment of patients with limb swelling. In patients without surgically treatable lymphedema, plastic surgeons may refine the diagnosis and connect patients with appropriate surgical or non-surgical care. By assisting providers in expediting correct diagnosis and management of limb swelling, we hope to improve the quality of life for patients with this challenging and multifaceted problem.

Targeted Muscle Reinnervation for the Treatment of Complex Regional Pain Syndrome in Lower Extremity Amputees: A Case Series

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Background: Complex regional pain syndrome (CRPS) is characterized by severe pain accompanied by vascular, motor, or trophic changes. Targeted muscle reinnervation (TMR) has

been shown to improve phantom limb pain in lower extremity (LE) amputation. The objective of this case series was to characterize TMR as a treatment for CRPS patients with LE amputation.

Methods: A retrospective review was done of CRPS patients receiving LE amputation and TMR with a single surgeon from 2018-2021. Demographics, operative details, and pain outcomes were collected. Variables were analyzed using appropriate statistical tests.

Results: There were 6 patients identified, all Caucasian women, with an average age of 32.5±15.4 years and body mass index (BMI) 24.9±5.0 kg/m2 . CRPS was the indication for all amputations, done either before or during TMR. All patients were following with Pain Management at the time of TMR.

Patients 1 and 2 both carried a CRPS diagnosis due to LE trauma less than 1 year before TMR, for 4 and 11 months respectively. Patient 1 had a simultaneous amputation with TMR, while patient 2 had an amputation 11 months prior. Both patients were otherwise healthy and previously tried ketamine infusions to control their CRPS. They were followed for an average of 11±4.2 months after TMR procedure and reported no change in their pain based on NRS pain assessments. Patient 1 did not have any previous nerve operations, while Patient 2 had a tibial nerve coaptation and saphenous neurectomy during amputation. At most recent follow up, Patient 1 reported complete resolution of pain and a decreased dose of their neuroleptic medication. Patient 2 continued to endorse generalized pain but denied any resting leg pain (RLP) or phantom limb pain (PLP). Both Patients 1 and 2 were newly independently ambulatory 90 and 122 days after TMR, respectively, reporting the improvement in pain quality allowed them to tolerate a prosthetic.

The remaining four patients all carried a CRPS diagnosis due to trauma or a post-surgical etiology ranging from 3-8 years before TMR. They were all otherwise healthy, with exception of a Sjogren's (patient 3) and an Ehlers Danlos diagnosis (patient 4). Both of these patients had simultaneous amputation and TMR. Patients 5 and 6 had amputations beforehand, waiting 16 and 93 months, respectively. All had tried either ketamine infusions, spinal cord stimulation, DRG stimulation, or lumbar nerve blocks before TMR. When comparing pre- and post- TMR NRS values, all reported a 2-point increase with exception of patient 5, who maintained a score of 7 both before and after TMR. At most recent follow up, all patients endorsed generalized pain. All but patient 6 continued to endorse PLP after TMR. Of note, patient 6 had multiple neuroma excisions before TMR and reported a decrease in their narcotic dosage by most recent follow up. There were no changes between pre- and post- TMR ambulation status for these patients.

Conclusion: CRPS is a debilitating condition with a variety of treatment options. Operative results may be improved for patients who have TMR done earlier after CRPS diagnosis.

Complications In Gender Affirmation Surgery: Frailty Measures Outperform Historic Risk Proxies as Predictors

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Background: Gender affirmation surgery (GAS) has few articles investigating complication profiles and risk factors. New surgical literature supports frailty measures, such as the Modified 5-item Frailty Index (mFI-5) or the Modified Charlson Comorbidity Index (mCCI), as stronger risk predictors for plastic surgery than age, BMI, and smoking (1,2). We sought to assess risk proxies versus frailty measures, in predicting postoperative complications after GAS.

Methods: We retrospectively reviewed the National Surgical Quality Improvement Project (NSQIP) database from 2013-2019. Patients were included who underwent surgery for gender dysphoria. Patients were excluded who had other concurrent procedures. Demographics, comorbidities, and outcomes/complications data were used to calculate mFI-5, mCCI, and aggregate Clavien-Dindo severity (ACDS) scores. Risk factors were assessed with univariate and multivariate linear regression.

Results: Of 5,330 patients identified, the mean age was 3.15±11.3 years and mean BMI was 28.1±6.6. More patients were listed as female (62.8%, n=3347) than male (37.2%, n=1983) or nonbinary (1.4%, n=72). Patients were predominantly white (64.0%, n=3410) and nonsmokers (84.7%, n=4585).

The most common procedures were mastectomy (n=964), breast implant (n=578), and laparoscopic hysterectomy/oophorectomy (n=472). The most common GAS-specific procedures were CPT 55970 ("intersex surgery; male to female", n=288), feminizing genital surgery (n=405), and masculinizing genital surgery (n=50).

In aggregate, the most common complications were reoperation (2.6%, n=138), readmission (2.0%, n=104), surgical site infections (SSI) (1.9%, n=98), and wound dehiscence (1.1%, n=56). The strongest predictors for all-cause complications, surgical site complications, and systemic complications were mCCI (OR>3.11, p<0.018) and mFI-5 (OR>2.74, p<0.006). ASA class, diabetes, and age were weakly predictive of complications. BMI was not predictive of any outcome measure except complication severity. Smoking was not predictive of any outcome measure.

For feminizing chest surgery, frailty measures predicted length of stay ($p<0.047$), but no other metric. For masculinizing chest surgery, increasing mFI-5 and mCCI were strong predictors of every negative outcome ($OR>2.96$, $p<0.047$). For feminizing genital surgery, mFI-5 score was predictive of all negative outcomes except mild systemic complications ($OR>1.42$, $p<0.044$). For masculinizing genital surgery, frailty measures predicted complication severity, readmission, and reoperation ($p<0.05$). In hysterectomy/oophorectomy, frailty only predicted length of stay ($p<0.034$), and in facial GAS, frailty measures predicted mild systemic complications and aggregate complication severity ($p<0.018$).

Conclusions: Frailty measures are the strongest predictors of most outcome measures in GAS, both in aggregate and by subtype. BMI and smoking status have minimal impact on complication rates. Further work is needed to differentiate risk factors for specific procedure types.

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Predictors of Primary Targeted Muscle Reinnervation Failure Following Below-Knee Amputation

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Background: Patients with major lower extremity amputation are at high risk for chronic pain. Targeted muscle reinnervation (TMR) is a nerve procedure used to treat phantom limb pain (PLP) and neuroma. Prophylactic TMR at the time of below-knee amputation (BKA) has previously been shown to improve pain outcomes compared to standard nerve operations, though pain still occurs postoperatively in some patients. The aim of our study was to assess the severity

of postoperative pain at different time points following primary TMR and evaluate whether patient factors predict these findings.

Methods: All patients receiving prophylactic TMR from 2018 to 2021 by a single surgeon were retrospectively reviewed. Patient demographics, comorbidities, operative information, and pain outcomes reported at three-, six-, and twelve-month postoperative visits (POV) were collected. Factors associated with pain severity, assessed using the Numerical Rating Scale (NRS, scale of 0-10), were analyzed using linear regression. Significant variables on univariate analysis were then analyzed using multivariable linear regression with significance defined as $p<0.05$.

Results: A total of 247 patients met inclusion criteria. Mean age and BMI were 58.8+13.3 years and 29.3+7.2 kg/m2, respectively, with mean Charlson Comorbidity Index (CCI) score 5.2+2.4. Mean NRS-rated pain was 1.3+2.8 for POV-3, 1.5+2.8 for POV-6, and 1.4+2.7 for POV-12, reporting low pain severity throughout recovery. The most common chronic pain complication was PLP, with 95 (38.2%) patients developing PLP within one year.

Univariate linear regression of patients seen at POV-3 revealed older age and higher hemoglobin A1c levels (HbA1c) were associated with lower pain severity ($\beta= -0.035$, $p=0.024$ and $\beta= -0.614$, $p=0.013$, respectively). Mean pain severity in patients with a previous diagnosis of end-stage renal disease (ESRD) was 2.0, compared to 1.0 in patients without ESRD ($\beta= 1.04$, $p=0.019$). Current smokers reported higher pain severity ($\beta= 1.067$), though this finding was not significant ($p=0.061$). Selection and number of nerves undergoing TMR did not correlate with significant differences in pain. Multivariable linear regression including age, HbA1c, and ESRD found that ESRD independently correlated with increased pain ($\beta= 1.839$, $p=0.048$), while age and HbA1c were no longer significantly correlated ($p=0.630$, $p=0.096$). No patient or operative factors were correlated with NRS pain severity during POV-6 or POV-12.

Maximum reported pain within 1-year follow-up was analyzed for all patients. ESRD was significantly associated with higher pain severity ($\beta= 0.931$, $p=0.032$). Both current and prior smoking history were significantly correlated with increased pain ($\beta= 1.418$, $p=0.014$ and $\beta= 0.845$, $p=0.036$, respectively). HbA1c was correlated with reduced pain ($\beta= -0.553$, $p=0.035$). Multivariable linear regression of these variables did not yield significant results. No other variables were associated with pain severity.

Conclusion: Prophylactic TMR during BKA has previously shown improved rates of chronic pain. Our results suggest ESRD and tobacco use are correlated with more severe pain compared to other patients undergoing primary TMR. ESRD was the only independent predictive factor of pain severity three months after surgery. Future studies are warranted to evaluate the impact of concurrent pain management programs alongside primary TMR to improve quality-of-life in patients with chronic pain.

Meeting in the Middle: Pediatric Abdominal Wall Reconstruction for Omphalocele

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Background/Purpose: Omphalocele is one of the most common congenital abdominal wall defects with an annual incidence of one in every 4,200 births in the United States. This pathology is attributed to a failure of physiologically herniated bowel to return to the abdominal cavity by gestational week 12. The presence of omphalocele carries a heightened risk of over 50% for aneuploidy and genetic abnormalities, which may require urgent attention in the neonatal period. Delayed repair, in the first few years of life, has proven effective, especially in giant omphaloceles, as the bowel is protected by membranous coverings that epithelialize with time; this also allows patients to maintain lung compliance and gives providers time to address other life-threatening comorbidities. Alternatives to delayed closure include silo reduction, amnion inversion, skin flap usage, and reduction within the membrane. Surgical technique and mesh usage have changed considerably over the last two decades. As such, we sought to establish an improved surgical and ventilation protocol for patients with omphalocele requiring abdominal wall reconstruction.

Methods: An IRB-approved retrospective review was performed on all patients with diagnosed omphalocele from January 2006-July 2021 requiring abdominal wall reconstruction by Plastic Surgery and/or Pediatric Surgery at a pediatric tertiary-care referral center. Patient birth history, comorbidities, demographics, perioperative metrics, surgical details, ventilation data, complications, and recurrence were abstracted from chart review. Patients with other abdominal wall defects, namely gastroschisis, umbilical hernia, prune belly syndrome, and vitelline duct fistula, were excluded, as were patients who received subtotal reconstruction.

Results: Of 135 patients screened, six patients (4.4%) with omphaloceles required Plastic Surgery involvement. In this cohort, average age was 5.2 years old; four patients (66.7%) had comorbidities including one patient with dextrocardia and hypothyroidism, one with Wolff-Parkinson-White and malrotation, and one with pulmonary hypoplasia and obstructive sleep apnea; mean defect size was 110.6 cm2 (range: 24-178.5); four patients (57.1%) required component separation; zero patients received mesh; and zero complications or recurrences were recorded. Two patients (33.3%) required postoperative ventilation for an average of 2.5 days; this was based on increased peak inspiratory pressures (PIP) at surgery stop versus start time.

Conclusion: Abdominal wall defects are addressed based on size and chronicity; small defects can be treated with primary closure while larger defects may require complex reconstruction, component separation, and mesh. Our tertiary referral center treated 135 patients with omphaloceles during a 15-year period; however, only 4.4% of these patients required Plastic

Surgery involvement, possibly correlated with defect size. Interestingly, 0% received mesh; therefore, we advocate for primary fascial closure without mesh in cases where good fascial approximation can be achieved with component separation, thereby reducing pediatric exposure to foreign bodies. In addition, we recommend postoperative ventilation for patients with increased PIP at operative stop time. Future research should follow patients who have matured out of pediatric clinics to evaluate the incidence of hernias in adults with Plastic Surgery-repaired omphaloceles.

Provider Understanding of Novel Nicotine Delivery Systems

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Introduction: In December 2016, the US Surgeon General took the drastic step of issuing a full report on the use of e-cigarettes and identified this activity as a major public health concern.1 As the use of novel nicotine delivery systems continues to rise it then follows that healthcare providers must understand the use of these products. Unfortunately, healthcare provider understanding lags behind the change in our patients' consumption patterns. Healthcare teams are taught to quantify tobacco-based products in terms of "pack per day" and equivalent language to conceptualize nicotine exposures.2 Vape, or e-cigarette use questioning is often limited or absent altogether. We highlight the gap in provider understanding of e-cigarettes used by our patients.

Methods: An online survey was distributed to physicians, medical students and advanced practitioners using REDCap (Nashville, TN). The survey investigated individual perceptions of the participants' understanding of e-cigarette technologies and routine use of counseling. Other questions included specific objective information regarding e-cigarette use as a means of internal control. Statistical analyses were performed using R Studios (Boston, MA).

Results: 101 respondents participated in the survey, which consisted of MDs (63, 62.4%), DOs (3, 3.0%), NPs (6, 5.9%), PAs (4, 4.0%), and Medical Students (25, 24.8%). Respondents' experiences varied from up to 5 years (37%), 6 to 10 years (13%), or greater than 10 years (18%). Most participants were unfamiliar with nicotine content for both traditional tobacco products (84%) and e-cigarettes (85%). 29.7% of respondents reported never questioning e-cigarette usage in their practice. Responses indicated significantly less frequent ($p<0.05$) discussions of nicotine dosage and consumption with patients who use e-cigarettes (17.9%) in comparison to patients who use traditional cigarettes (88.1%). Respondents familiar with e-cigarettes were significantly more likely ($p<0.05$) to assess nicotine doses in e-cigarettes in

comparison to those unfamiliar (40.0% vs. 14.0%) Patients who use e-cigarettes were also less likely to undergo urine cotinine testing (16.8% vs. 24.8%). 14% of respondents incorrectly responded YES to if e-cigarettes are FDA approved devices for smoking cessation.

Conclusion: The results of this survey demonstrate a lack of common knowledge among practitioners regarding e-cigarette use. This is seen across practitioners of all levels of experience. Many participants do not ask about e-cigarette use. This can affect patient care and lead to potential adverse outcomes. Furthermore, most participants do not assess nicotine consumption in e-cigarette users, which creates a significant portion of our population missed in risk stratification.3 The increased dosage screening among respondents familiar with e-cigarettes in comparison to those unfamiliar strongly represents the positive implication of education and awareness on e-cigarette screening. The relatively high percentage of respondents that believed e-cigarettes are FDA approved devices for smoking cessation reinforces the premise that a lack of knowledge regarding e-cigarettes among providers exists.4 Accurate screening may be difficult for providers with relative unfamiliarity of the questions necessary for a patient interview.

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Pelvic Floor Function and Quality of Life Outcomes in Transgender Women Following Vaginoplasty

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Purpose: Vaginoplasty is a common procedure for transfeminine patients seeking genital surgery. Widely reported surgical outcomes following vaginoplasty include delayed wound healing, bleeding, and stricture/stenosis.[1] There is, however, a paucity of patient reported outcomes from validated trans-specific assessments after gender affirming surgery. The objective of this study was to assess patient-reported pelvic function and quality of life measures following vaginoplasty in transgender women using a validated study.

Methods: This study utilized a validated patient-reported functional and quality of life outcomes survey to assess outcomes of vaginoplasty in transgender women following vaginoplasty. Participants were given surveys to complete at 3 months, 6 months and 12 months following their vaginoplasty, and 98, 66, and 47 participants completed the survey, respectively. Patient demographics along with postoperative satisfaction with pelvic floor function, postoperative quality of life, and emotional well-being were collected in the survey. Survey responses were collected on a Likert scale. Z-tests of proportions, Fisher's exact, and paired t-testing were used for statistical analysis.

Results: At 3 months post-vaginoplasty, 83%, 83%, 76%, 49%, and 76% of patients reported experiencing zero to minimal issues with pelvic floor function regarding pain, bowel function, bladder function, quality of life, and emotional well-being, respectively. At 6 months, 89%, 79%, 71%, 73%, and 76% of patients reported experiencing zero to minimal issues with pelvic floor function regarding pain, bowel function, bladder function, quality of life, and emotional well-being, respectively. At 12 months, 89%, 89%, 77%, 93%, and 87% of patients reported experiencing zero to minimal issues with pelvic floor function regarding pain, bowel function, bladder function, quality of life, and emotional well-being, respectively. There was no significant difference between patient reported complications regarding pain, bowel function, urinary system function, nor emotional well-being between any time points at which patients were assessed. Patients at 6 months reported significantly better quality of life outcomes when compared to patients at 3 months post-vaginoplasty ($p = 0.036$).

Conclusions: This group of transgender women overwhelming reported satisfactory functional and quality of life outcomes following peritoneal vaginoplasty. Although a minority, the patients reporting pelvic floor issues represent an important opportunity to develop new post-operative care approaches. These outcomes are consistent with previously reported outcomes in the literature.[2] With increased time following vaginoplasty, there was no significant difference in patient reported outcomes of pelvic floor function regarding pain, bowel function, bladder function, and emotional well-being. This study puts forward a unique questionnaire that is validated within a population of transgender women that does not use the anatomic or physiologic cisgender woman as the standard. Furthermore, this study calls into question the utility and effectiveness of surveying this population at these extensive timepoints.

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Getting a Leg Up: Predictors of Postoperative Complications in Patients with Lower Limb Osseointegrated Prostheses

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Purpose: Osseointegrated prostheses are a novel solution for patients with lower limb amputations in the United States. These bone-anchored implants serve as an alternative to traditional socket-suspended prostheses, which are associated with poor fit, soft tissue damage, and pain. Osseointegration eliminates the socket-skin interface and allows for weight-bearing directly on the skeletal system. However, osseointegrated prostheses can also be complicated by post-operative issues that plastic surgeons must manage. Not much is known about the incidence of or risk factors for these complications, as few centers in the US are currently equipped to perform the procedure.

Methods: An IRB-approved chart review was performed on all patients who received unilateral lower limb osseointegrated implants with concurrent plastic surgery closure at our institution between the years 2017 and 2020. Patient demographics, medical history, operative data, and post-operative complications were recorded. Specific complications include superficial infection, osteomyelitis, neuroma growth, and hardware failure. Fisher's exact test and the Mann-Whitney U test were performed on qualitative and quantitative independent variables, respectively.

Results: There were a total of 25 patients who underwent osseointegrated implantation by a joint orthopedic and plastic surgery team during the study period. This cohort was comprised of 13 males and 12 females with a total of 14 transfemoral and 11 transtibial amputations. The cohort had an average age of 50 years, BMI of 30.5 kg/m2, and follow-up period of 18 months. A total of 26 post-operative complications were observed; 10 superficial infections treated with topical or oral antibiotics, 4 cases of osteomyelitis treated with IV antibiotics or operative washout, 6 neuromas treated surgically, and 6 cases of hardware failure that necessitated reoperation or removal of the implant. The Fisher's exact test revealed statistically significant associations

between transtibial implants and post-operative osteomyelitis, prior history of amputation revision surgery and decreased rates of neuromas, and diabetes mellitus with number of complications ($p<0.05$). The Mann-Whitney U test showed statistically significant correlations between increased age at implantation and neuroma development, and increased length of stay and hardware failure ($p<0.05$).

Conclusions: As more institutions in the US begin to offer osseointegrated prostheses for lower limb amputees, plastic surgeons will become increasingly responsible for managing these patients intra- and post-operatively. Given the historically high rate of comorbidities in the amputee population, added care should be given to minimize complications, which negatively impact patient health and wellbeing. Increasing awareness of the factors that correlate with such complications will allow plastic surgeons to preempt and appropriately manage them. However, more follow up must be done to understand the long-term complications associated with osseointegrated implants, and how to best diagnose and treat them.

Public Interest in Gender-Affirming Surgery in the Era of Zoom: A Google Trends Analysis

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Purpose: The changing landscape of social interaction and social media usage throughout the COVID-19 pandemic has led to the increased utilization of videoconferencing platforms. Multiple studies have demonstrated that the use of videoconferencing platforms have the potential to increase an individuals' appearance dissatisfaction because of exposure to an image of themselves on camera for extended periods of time, increased self-focused attention, and engagement in video-manipulation behaviors. Few studies have shown that public interest in plastic surgery increased following the onset of the COVID-19 pandemic, specifically facial cosmetic plastic surgery.[1]

This phenomenon is particularly pertinent to the transgender and gender diverse population because the increased use of videoconferencing tools during the COVID-19 pandemic has the potential to accentuate incongruence between patients' appearance and gender identity. The purpose of this study was to examine the impact of the COVID-19 pandemic on public interest in gender-affirming surgery using Google Trends as a proxy for public interest.

Methods: Utilizing Google Trends in the US, analysis was completed using popular search terms related to different aspects of gender-affirming surgery and procedures from January 2015 to March 2021. The structural break was assessed using a Chow test, with the break considered one month prior to COVID-19 stay at home orders being put into place (February 2020). Individual analysis was performed on singular search terms followed by an analysis that grouped these search terms based on the overall surgery or topic to which they relate. Search terms within the following overall categories were included in the analysis: MTF bottom surgery, FTM bottom surgery, transfeminine top surgery, transmasculine top surgery, facial feminization, facial masculinization, gender-affirming surgery, and gender dysphoria.

Results: The individual search terms gender dysphoria ($p = 0.02$), top surgery, gender affirming surgery, facial feminization, FFS, gender dysphoria, and MTF breast augmentation had statistically significant ($p < 0.001$) increases in search volumes following February 2020. The search terms that were grouped together in the categorical search terms MTF top surgery and facial feminization had a statistically significant ($p < 0.001$) increase in search volumes following February 2020.

Conclusions: There was an increased public interest in gender-affirming surgical procedures following the announcement of COVID-19 as a pandemic which led to the induction of stay-at-home orders and the increased usage of videoconferencing platforms. As Google Trends analysis is not able to isolate the gender identity of those who used these search terms, it is necessary to continue to examine the way in which COVID-19 specifically impacted the way the interest of specifically TGD individuals in plastic surgery. This is particularly important because some gender-affirming surgeries were postponed at the height of the pandemic along with other non-emergency surgeries.[2]

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Where You Go to Medical School Does Not Make You a Better Plastic Surgeon

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Background: To date, no study evaluated the association between where a plastic surgeon completed medical school and subsequent surgical skills or patient outcomes. The purpose of this study is to examine the association of US News & World Report medical school ranking with microsurgical skills and long-term surgical outcomes of microsurgical fellows who completed a plastic surgery residency.

Methods: The authors conducted a prospective evaluation of microsurgical skills using the validated Structured Assessment of Microsurgical Skills at the start and end of the fellowship, in an animal laboratory model and clinical microsurgical cases. A retrospective review of the outcomes of abdominal wall reconstructions (AWR) performed independently by the fellows at MD Anderson Cancer Center from March 2005 to June 2019 was also performed. Medical school ranking was assessed using the US News & World Report medical school ranking for primary care. Cox proportional hazards and multivariable logistic regression models were constructed to identify predictive/protective factors for study outcomes.

Results: A total of 39 fellows and 98 consecutive patients (52% female) were included in this study. Twenty-three percent of fellows were from top 20 schools, 26% were from top 11-40 schools, and 51% were from schools ranked >40. At the beginning of the fellowship program, fellows from top 20 medical schools demonstrated similar clinical scores (42.3±1.3 versus 43.1±2.9 versus 41.4±4.7, P=.49) and laboratory scores (35.3±1.3 versus 33.9±4.3 versus 31.7±7.5, P=.28) to fellows from the top 11 – 40 programs and fellows from schools ranked >40, respectively. Evaluation at the end of fellowship indicated no difference in clinical scores (49.5±5.6 versus 51.1±1.6 versus 51.8±1.9, P=.52); however, fellows from the top 20 schools had higher laboratory scores (45.5±5.5 versus 41.9±7.7 versus 37.3±5.5, P=.003). In multivariable regression, AWRs performed by fellows from the top 20 medical schools were not associated with hernia recurrence (HR, 0.69; 95%CI, 0.09 to 3.6), SSOs (OR, 1.40; 95%CI, 0.45 to 4.24), or SSIs (OR, 0.16; 95%CI, 0.01 to 1.06).

Conclusion: While fellows from the top 20 medical school demonstrated better laboratory microsurgical skills at the end of fellowship, we found no difference in clinical microsurgical skills or patient outcomes. These findings indicate that attending a top medical school is not necessarily predictive of surgical outcomes.

Plastic Surgery Residency Program Ranking is Not Associated with Surgical Skills or Patient Outcomes

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Background: The ranking of residency programs has been shown to influence the application decisions of medical students and fellowship program directors. To date, no study has been conducted to examine the relationship between residency program ranking and surgical skills or patient outcomes. The purpose of this study is to examine the association of plastic surgery residency program Doximity ranking with surgical skills and patient outcomes of microsurgical fellows who completed a plastic surgery residency.

Methods: The authors conducted a prospective evaluation of microsurgical skills using the validated Structured Assessment of Microsurgical Skills at the start and end of the fellowship, in an animal laboratory model and clinical microsurgical cases. A comprehensive review of the outcomes of abdominal wall reconstructions (AWR) performed independently by microsurgical fellows at MD Anderson Cancer Center from March 2005 to June 2019 was also performed. Outcome measures included hernia recurrence (HR), surgical site occurrence (SSO) and surgical site infection (SSI). Program Doximity reputation rankings were abstracted and correlated to outcomes using Cox proportional hazards and multivariable logistic regression models.

Results: We identified 41 fellows and 101 consecutive patients who met the inclusion criteria. Thirty-four percent (n=14) of fellows were from the top 10 programs, 39% were from the top 11 – 40 programs, and 27% were from programs ranked >40. At the beginning of the fellowship program, fellows from top 10 programs demonstrated higher clinical scores (43.3±3.0 versus 39.1±3.7 versus 40.15±1.1, P=.005) but lower laboratory scores (32.4±4.5 versus 36.4±3.6 versus 36.8±5.7, P=.05) than fellows from the top 11 – 40 programs and fellows from programs ranked >40, respectively. However, evaluation at the end of fellowship indicated no difference in clinical scores (49.5±5.6 versus 51.1±1.6 versus 51.8±1.9, P=.52) or laboratory scores (42.2±7.9 versus 42.0±4.1 versus 40.8±6.1, P=.92) between the fellows. In multivariable regression, AWRs performed by fellows from top 10 programs were not associated with hernia recurrence (HR, 0.69; 95%CI, 0.11 to 5.7), SSOs (OR, 1.75; 95%CI, 0.56 to 5.77), or SSIs (OR, 0.18; 95%CI, 0.01 to 1.20).

Conclusion: Despite its widespread use during the residency and fellowship application process, the Doximity residency ranking was not associated with microsurgical skills or patient outcomes. These findings highlight the necessity for a non-subjective ranking system that emphasizes objective characterization and measurable training outcomes to effectively guide applicant selection.

Financial Toxicity of Hidradenitis Suppurativa in Patients at a Single-center Wound-care Clinic

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Background: Hidradenitis suppurativa (HS) is a chronic, recurring, inflammatory disease of the skin and soft tissue. Symptom control and lesion resolution are often inadequate, and longstanding disease leads to high rates of emergency department (ED) visits and inpatient admissions. It has been reported that patients with HS utilize healthcare in high-cost settings more so than other patients with chronic inflammatory skin disorders. The aim of this study was to assess factors associated with high HS disease burden at a single center wound care center.

Methods: A retrospective chart review was performed on patients with HS from 2010 to 2021. Patient demographics, surgical details, comorbidities, and ED visits for HS-related complications were captured. Procedural interventions were defined as inpatient or outpatient surgical operations (e.g., debridement, excisions, flap reconstruction), and non-surgical procedures done under general anesthesia. Data was analyzed using unpaired student's t-tests with significance defined as $p < 0.05$. The 11-item COST survey with a 12-item investigator-generated survey was distributed via email and phone to assess financial toxicity related to HS diagnosis, disease course, and treatment. In the COST survey, lower values indicate a higher financial impact.

Results: Of the 223 patients with HS, 133 underwent one or more procedural interventions and were analyzed. Patients underwent a mean of 3.49 ± 3.94 procedures for their HS and visited the ED an average of 1.76 times. The mean age at time of initial visit was 38.6 ± 14.4 years, with a mean follow-up of 32.1 months. Mean BMI was 31.8 ± 7.3 kg/m2, and over 73% of patients were African American. Patients with Hurley Stage 3 disease had a higher proportion of procedures performed than those with lower stages of disease (4.31 vs. 2.48, $p = 0.028$). African Americans underwent more procedural interventions (3.77 vs. 2.67, $p = 0.17$) and ED visits (2.08 vs. 0.85, $p = 0.068$) compared to other races. Survey response rate was 41%, and patients reported an average out of pocket cost of $2878 in the past 12 months for their HS. Based on the

COST survey, older age at time of diagnosis (β=-0.326, p=0.026) and axillary disease (13.1 vs. 25.2, p=0.022) were associated with higher financial burden. Survey results also demonstrated that 71.4% of patients changed their daily habits (e.g., spending, attending social/family events, etc.) due to the burden of their disease.

Conclusion: Almost two-thirds of patients with HS in our study required procedural treatment beyond antibiotics and basic wound care, and almost half presented to the emergency room from complications of their disease in a 2.7-year span. There appears to be a higher utilization of the ED and requirement for procedural interventions in the African American population. While our survey results represent a fraction of our entire patient population, it is clear that HS has a significant impact on the day-to-day finances of an individual. Further investigation is warranted to elucidate the financial and emotional impact of HS and its interplay with healthcare expenditure, with the goal of highlighting how multidisciplinary care may alleviate the burden of disease.

A Propensity Score-Matched Analysis of Abdominal Wall Reconstruction Outcomes with Bovine Versus Porcine Acellular Dermal Matrix

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Background: Abdominal wall reconstruction (AWR) using acellular dermal matrix (ADM) is one of the most commonly performed procedures, yet large comparative studies comparing outcomes of AWR using bovine acellular dermal matrix (BADM) and porcine acellular dermal matrix (PADM) are lacking.

Methods: In this retrospective cohort study of patients who underwent AWR from March 2005 to June 2019, the primary comparative outcome measure was hernia recurrence with BADM versus PADM. The secondary outcome was the incidence of surgical site occurrence (SSO) and surgical site infection (SSI). Propensity score matching approach was applied to compare the clinical outcomes between the two study groups.

Results: We identified 725 patients who underwent AWR using BADM (50.5%) or PADM (49.5%). Their mean (± SD) age was 59.8 ± 11.5 years, mean body mass index was 31.4 ± 6.7

kg/m2, and mean follow-up time was 42 ± 29 months. With propensity score matching, 219 matched pairs were identified. Hernia recurrence rates in BADM (11.4%) and PADM (13.7%) groups did not differ significantly (P = .793). SSOs (26.5% versus 29.2%; P = .518) and SSIs (13.2% versus 11%; P = .456) rates did not differ significantly in the PADM and BADM groups, respectively. Conditional logistic regression model and marginal Cox proportional hazards regression model determined that type of ADM was not significantly associated with SSOs (adjusted OR=1.11, 95%CI=0.74-1.70, p=0.589) or hernia recurrence (adjusted HR=0.85, 95% CI=0.50-1.42, p=0.52).

Conclusion: Both BADMs and PADMs provide durable, long-term outcomes. The hernia recurrence and postoperative surgical complication rates were not significantly different between BADM and PADM.

The Role of Indocyanine Green (ICG) Lymphography as a Screening Tool for Early-stage Lymphedema: Sensitivity and Specificity Analysis

Abstract Presenting Author:
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Purpose: Lymphedema is a morbid disease for which there is no cure. Indocyanine green (ICG) lymphography has emerged as a promising tool for surgical planning and staging of lymphedema. However, current approaches are qualitative in nature and limit our ability to longitudinally measure changes following surgical intervention. In addition, although ICG lymphography abnormalities are present in lymphedematous limbs, the specificity of ICG abnormalities for disease diagnosis is not known. Since substantial lymphedema symptoms may be present prior to any clear evidence of clinical metrics, we sought to develop a sensitive and quantitative screening tool that can be used to diagnose lymphedema in patients treated for breast cancer with axillary lymph node dissection (ALND), analyze responsiveness to treatments, and provide a novel, practical classification method for lymphatic function using a simple set of quantitative metrics.

Methods: ICG lymphography videos and images were recorded 5 mins and 30 mins after dye injection, respectively, for both the lymphedema and the unaffected arm. Pumping frequency was quantified using Image J. Regions of interest (ROI) were drawn on each vessel, the mean intensity of the pixels in each ROI was be plotted, and the graph was used to determine the mean pumping frequency for each arm. Dermal Backflow rate was accurately quantified using Image

J. Both 2D and fluorescence images were thresholded and used to create a binary mask of each aspect of the arm. The ratio between the area occupied by dye and the total area of the patient's arm was calculated to provide the dermal backflow rate for each aspect of the arm. The mean value between the dorsal and volar aspects was calculated, with the unaffected arm acting as a control. Lymphatic Clearance Capacity was evaluated 10 days after dye injection, quantifying the percentage of dye left in each arm using the same methods utilized for dermal backflow analysis. Sensitivity and specificity of pumping frequency, dermal backflow rate, and clearance capacity rate was compared to that of current diagnostic modalities including manual volume measurements, bioimpedance scores (L-Dex) and Quality of Life scores.

Results: 32 patients who underwent ALND were included in this study. Pumping frequency, dermal backflow rate, and lymphatic clearance capacity rate recorded using ICG lymphography were highly sensitive and had a higher positive predictive value for diagnosing lymphedema compared to manual volume measurements, L-Dex scores and Quality of Life scores. Manual volume measurements had the lowest sensitivity and specificity compared to Bioimpedance (L-Dex) scores, pumping frequency, dermal backflow rate, and clearance capacity rate recorded on ICG.

Conclusions: This paper studied the role of ICG lymphography as a screening tool for early-stage lymphedema, analyzing the sensitivity and specificity of this tool compared to current diagnostic methods. ICG-based functional parameters demonstrated the highest sensitivity for the diagnosis of early-stage lymphedema. Screening for lymphedema and accurate quantitative assessment of lymphatic functional impairment represents a major shift in current clinical practice paradigms, putting an emphasis on prevention of disease progression rather than palliative treatments and symptomatic relief. Therefore, the suggested ICG-based quantification system is a significant advancement in the field of plastic surgery that would have an immense impact on disease progression and patient quality of life.

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The Impact of One- versus Two-Stage Dual-Innervated Gracilis Free Functional Muscle Transfer on Excursion in Facial Palsy Patients

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Background: In the treatment of facial palsy, gracilis free functional muscle transfers (FFMT) receiving dual innervation from combined masseteric nerve transfer and cross facial nerve graft may have amalgamated increases in excursion, synchroneity, and potentially spontaneity compared to single innervation.1-3 The ideal staging of FFMT dual innervation has not been thoroughly investigated. We aim to compare postoperative dental show parameters and symmetry following one- and two-stage dual-innervated gracilis FFMT.

Methods: Included were patients with long-standing facial paralysis who underwent either a one- or two-stage dual innervated gracilis FFMT. Excluded were patients who lacked preoperative or postoperative open-smile standardized photographs and those who solely underwent single-innervated gracilis FFMT. Objective measurements of dental show and

symmetry were obtained from standardized photographs of patients in open-mouth smile taken at the following timepoints: preoperative and postoperative at earliest follow-up, 1-year, 3-years, and 5-years. Symmetry was measured by the absolute difference in area between the right and left halves of dental show; a lower value indicates greater symmetry. Measurements were made with ImageJ, a program designed for image analysis by the National Institutes of Health. Shapiro-Wilk, Mann-Whitney U, and Independent Samples T-test were conducted for statistical analysis.

Results: Included were 15 patients: 5 patients received a one-stage dual-innervated gracilis FFMT and 10 patients underwent two-stage surgery, with an average follow-up time of 3.0 and 3.3 years respectively. Preoperatively, there were no significant differences between the two groups with dental show and symmetry (both $p>0.05$). However, at the earliest postoperative follow-up (mean of 0.4 years), one-staged procedures had significantly less dental area (respectively, means were 93.260 ± 34.898 and 173.014 ± 80.988 mm^2 ; $p=0.020$) but with statistically similar symmetry ($p=0.191$) compared to two-staged procedures. Yet, at 1, 3, and 5 years postoperatively these differences in dental show became insignificant over time while symmetry remained similar (all $p>0.05$).
Conclusions: Compared to one-staged dual-innervated gracilis FFMT, two-staged cases produced similar dental symmetry but significantly greater dental show in the early postoperative period though with long-term follow up this difference was no longer observed.

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All or Nothing: Barriers in access to Mastectomy with Reconstruction at Multiple Hospital Centers within a Single Network

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Introduction: Immediate post-mastectomy breast reconstruction has been shown to have many psychosocial benefits.1, 2 Despite the government policies aimed at producing equitable access to care, disparities still persist. The limited amount of literature has largely examined the barriers in access to immediate breast reconstruction through the use of single institution studies or national databases. We aimed to study the sociodemographic influences of post-mastectomy reconstruction between multiple academic institutions within a single hospital network.

Methods: We performed a retrospective study of all mastectomy patients at Weill Cornell Medical Center (WCMC) and Columbia University Irving Medical Center (CUIMC) from 1998 to 2019. Chart review identified demographic, socioeconomic, and clinical data. The primary outcome was receiving any form of immediate reconstruction. Quantitative data was subjected to chi-squared tests and multivariate logistic regression analysis.

Results: 6,361 patients were included in our cohort. 2648 (41.6%) and 3713 (58.4%) of patients underwent surgery at CUIMC and WCMC, respectively. 3,029 (47.6%) and 3,352 (52.4%) patients underwent mastectomy alone and mastectomy with immediate reconstruction. The rate of reconstruction varied by age at diagnosis, Race, Ethnicity, and Insurance status ($p < 0.05$ for all). Multivariate logistic regression found that patients with an age of diagnosis of at least 50 years or older were significantly less likely to receive reconstruction compared to those under 40 years old ($p < 0.05$). When compared to White patients, Asian American Pacific Islander patients were 45% less likely to receive reconstruction ($p <0.05$). Additionally, the odds that Black patients were 15% less likely to receive reconstruction when compared to white patients approached significance ($p = 0.059$). Patients with Medicare/Medicaid were 30% less likely to receive reconstruction when compared to patients with private insurance ($p < 0.05$). There was no difference in reconstruction rates based on known Ethnicity. Additionally, there was no difference in reconstruction rates between hospital centers.

Conclusion: This multi-institutional data indicates the presence of barriers in access to care amongst socioeconomic and demographic cohorts. We aim to further examine our cohort to better understand how the intersectionality of patient specific factors and the influence of hospital-specific treatment pathways may potentially increase the disparities in access to post-mastectomy care for the same population.

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Revisiting the Dorsal Intercostal Artery Perforator (DICAP) Flap as a Viable and Novel Reconstructive Option for Traumatic Back Wounds- A Case Series

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Summary: Reconstruction of trunk defects is challenging, and only recently have perforator flaps been utilized with increasing frequency for this purpose. In our case series, we present two cases of posterior upper lateral trunk defects (scapular wounds) which were reconstructed using Dorsal Intercostal Artery Perforator (DICAP) Flaps, a pedicled perforator flap which provides durable and flexible soft tissue coverage, allows for primary donor site closure, and minimizes functional deficits associated with traditional myocutaneous flap options. There is a paucity literature describing the utility of this perforator flap in reconstructing traumatic trunk defects, however, we demonstrate it to be a viable option to consider in the appropriate context. Given the variable anatomy encountered in both of our case examples, further anatomic studies should be performed to better clarify the anatomy of the different posterior trunk perforator flap options.

A New Reconstructive Technique for Below-Knee Amputation Coverage; Utilizing the Neurovascularized Lateral Compartment Flap, TMR, and RPNI

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Background: The Below-Knee amputation (BKA) remains a viable surgical option in contexts such as trauma, oncology, and vascular disease. However, the current procedural gold standard of simple osteotomy and traction neurectomy, with a long posterior myocutanoeus flap can lead to less-than-optimal outcomes. Traction neurectomy is often associated with disorganized nerve growth, resulting in both residual and phantom limb pain (1). The long posterior flap may result in stump widening, edema, muscle atrophy, and need for revisions (2). With recent literature advocating for the use of both targeted muscle reinnervation (TMR) and/or regenerative peripheral nerve interfaces (RPNI) at the time of amputation (3-5), we describe a new, effective, and incision protective reconstruction method for below-knee amputation coverage, via the utilization of these peripheral nerve techniques and a lateral compartment rotational muscle flap, neurotized by the superficial peroneal nerve.

Methods: Survey data from 14 (11 males and 3 females) consecutive patients who had below-knee amputation from October 2019 through October 2021, with peripheral nerve preparation,

and new flap technique closure with the neurotized lateral compartment flap were retrospectively analyzed. Clinical and demographic data were extracted from charts. Chi-square and t-tests were used for data analysis.

Results: Satisfactory results were achieved with this combination of rotational flap and peripheral nerve techniques in 14 patients. 57% of the patients were completely pain free, with 42% reporting moderate residual limb pain, and only 14.3% reporting phantom limb pain. Only one patient reported an associated stump wound that inhibited him from achieving optimal prosthetic use, which he attributed to poor initial fitment.

Conclusion: As a result, the presented reconstruction technique provides increased stump muscle bulk, relocation of the stump incision, optimized sensation via innervation of the peroneus muscles, and decreased neuropathic pain. We describe a technique that provides reliable soft tissue coverage, resulting in a lower chance of wound dehiscence, stump revision, and latency to prosthetic fitment.

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Free Flap Reconstruction of Lower Limb Extremity Defects: A Systematic Review and Meta-Analysis

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Purpose: Free flaps in lower extremity reconstruction have shown success for the management of large and complex defects, restoration of function, and favorable aesthetic outcomes [1,2].

However, patient reported outcomes have not been well explored in previous literature. Our objective was to provide a comprehensive and up-to-date summary of all patients reported outcomes among patients undergoing free flap reconstruction of the lower extremity.

Methods: We searched MEDLINE and Embase from 1946 to 2021 for all studies reporting free flap reconstruction of the lower extremity. The main outcome of interest was patient reported outcomes. The Critical Appraisal tools in JBI Systematic Reviews were used to assess the risk of bias for included case series and observational studies [4,5]. Two independent reviewers extracted relevant data and assessed the risk of bias independently in duplicate.

Results: Two reviewers screened 555 abstracts and 82 full-text studies; 52 studies were eligible for inclusion with 2 case reports (3.8%), 19 case series (36%), and 31 retrospective cohort studies (60%). Overall, 2183 patients received 1934 free flaps for lower limb reconstruction: 870 myocutaneous (45.9%), 522 fasciocutaneous (27.2%), and 189 perforator (9.80%) [30 studies]. The majority of patients were male [1309(67.7%)] with a mean age of 32.9(7–84) years, mean length of stay of 16.14(10–42) months, and mean follow-up of 10.1(1–228) months. The mean postoperative Lower Extremity Functional Scale (LEFS) was 60.3(±12) out of 80 points total [4 studies, 79 patients]. The mean postoperative American Orthopedic Foot and Ankle Society (AOFAS) was 75.1(±15) out of 100 points total [4 studies, 49 patients]. The mean postoperative 36-item short-form health survey (SF-36) scores were 88.1(±8.0) standardized out of 100 overall; mental health component 48.7(±8.9) and physical component 38.4(±8.2) [4 studies, 116 patients].

Conclusion: To our knowledge, this is the first systematic review and meta-analysis to summarize patient reported outcomes. Our findings demonstrated that patients had the ability to ambulate independently (LEFS), fair pain, function, and alignment results (AOFAS), and minimal physical and mental disability (SF-36). Limitations included the lack of quantitative measures reporting of patient reported outcomes across all eligible studies. Evidence profiles presented in our review may help guide future decision making around individualized patient care.

Objective: Participants will explore patient reported outcomes summarized across the literature for all patients who received free flap reconstruction of the lower extremity.

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The Omental Lymph Node Mapping Project

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Introduction: Omental lymph node transfer1,2 become promising in lymphedema treatment at our center. The anatomy and number of lymph nodes are still unclear from previous studies.3,4 For deeper understanding, our study aims to define anatomic location and number of lymph nodes along right gastroepiploic artery.

Materials And Methods: Thirty omentums were harvested from 30 fresh cadavers. Each specimen composes of entire greater curve of stomach and greater omentum including gastroepiploic vessel. Number, size and location of lymph nodes were recorded in two steps. First, lymph nodes founded by direct vision, described as "macroscopic lymph nodes". Then, omentum was dissected under microscope to further identify "microscopic lymph nodes". Random samples of lymph nodes were confirmed histologically. Location mapping was done along X- and Y- axes, landmarked by gastric pylorus.

Results: Lymph nodes were found in 26 out of 30 omentums (87%). Despite microscopic dissection, lymph nodes could not be identified in other 4 omentums. Macroscopic lymph nodes were directly identified in 19/26 omentums (73%). The mean size of macroscopic lymph nodes was significantly larger than microscopic lymph nodes ($p<0.05$). However, there was significantly a greater number of microscopic lymph nodes founded ($p<0.05$). Lymph nodes could be found scatteredly along right gastroepiploic vessel and 87.37% of lymph nodes were found within 100 mm from pyrolus and 88.2% within 20mm caudally from right gastroepiploic vessel.

Conclusion: Consider from quantity and location of lymph nodes, we suggested omental flap, based on right gastroepiploic vessel, as a reliable donor to treat lymphedema.

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Surgical Management of Adult Acquired Buried Penis Syndrome: A Systematic Review of Postoperative Outcomes

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Introduction: Adult acquired buried penis syndrome (AABP) is a chronic and disabling condition that often necessitates surgical intervention. Postoperative outcomes following surgical repair of AABP have been highly variable within the literature. The primary aim of this study was to perform a systematic review of outcomes following AABP repair, including postoperative symptoms, complications, and patient satisfaction.

Methods: We utilized standard PRISMA guidelines to perform this systematic review. Medline, Embase, Web of Science and Cochrane Library were queried for "buried penis" from 1954 to 2021. Studies discussing the surgical management of AABP and postoperative outcomes in the English language were included. Non-full text articles, case reports, editorials, commentaries, and articles examining only patients with congenital buried penis etiologies were excluded. Outcomes of interest included patient demographics, intraoperative data, symptoms attributed to AABP, postoperative complications, and patient satisfaction.

Results: Following the database search, 999 records were identified, and 19 unique articles met inclusion criteria. A total of 440 patients underwent surgical repair of AABP. Average duration of follow-up in the studies ranged from 6 to 39.4 months, while age ranged from 22.4 to 61.5 years and BMI ranged from 26.0 to 55.0kg/m2. The most common reported etiology of AABP was obesity (n=110). Nine studies (n=237) examined patient reported symptoms. The most frequently cited presenting symptoms associated with AABP were sexual dysfunction (n=151, 63.7%) and urinary difficulties (n=130, 54.8%). Other preoperative symptoms included unsatisfactory aesthetic appearance (n=3, 1.3%), recurrent infections (n=15, 6.3%), hygiene concerns (n=47, 19.8%), and pain (n=21, 8.9%). Following surgical management, 88 patients (37%) reported ongoing sexual dysfunction in the studies while 5 patients (2.1%) had ongoing urinary difficulties. No other postoperative symptoms were reported in any of the studies. Rates of complications among the studies varied from 0% to 75%. Out of the 440 patients, 98 of the patients (24.9%) developed postoperative complications. Of these patients, 17 (4.3%) required operative intervention. Thirteen patients (3.0%) were reported to have reburying of their penis. The majority of studies assessing patient satisfaction (6/8 studies) reported satisfaction rates

above 75%. Nine articles reported improvement in patient-reported outcomes following the surgery, but the questionnaires utilized were highly variable among the studies.

Conclusion: Operative management of AABP is complex, but the rates of reoperation and reburying of the penis remain relatively low. Though sexual dysfunction may persist following surgical repair, many pre-existing symptoms associated with AABP improve following the operation. Nevertheless, postoperative complication rates following AABP surgery are highly variable in the literature. Furthermore, there is currently no validated patient-reported outcome measure for assessing patient satisfaction following the operation. These findings highlight the need for a standardized classification system to guide management of AABP through a multidisciplinary approach.

The Impact of Travel Distance and Income on Breast Reconstruction After Mastectomy in a Rural Population: A Single-Institution Experience

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Summary: Factors that influence breast reconstruction after mastectomy have been examined in national databases, but not at a regional level.1,2 The purpose of this study was to determine the impact of patient travel distance and median household income on rates of breast reconstruction after mastectomy in our region. We hypothesized that patients with further distance traveled, and lower median household income would be less likely to undergo breast reconstruction after mastectomy.

Method: A retrospective review of patients that underwent mastectomy from 2017-2021 was performed, utilizing our institution's prospectively enrolled tumor registry database. Patients with incomplete records were excluded. Statistical analysis utilized frequencies and percentages, descriptive statistics, chi-square analysis, and independent sample t-tests.

Results: 475 patients were included. Average BMI was 29.1, 96% of patients identified as White, and average age at diagnosis was 59.3 years. Reconstruction was performed in 51.2% of patients following mastectomy and average length of follow-up was 23.9 months. No significant

difference was found in the distance traveled by patients that underwent reconstruction compared to those that did not (22.42 vs. 22.58 miles; p=0.93). Further analysis demonstrated that rates of reconstruction in patients that traveled 0-10 miles, 11-30 miles and over 30 miles, did not differ significantly (p=0.94). There was a significant difference in the average median household income (MHI) in reconstructed and non-reconstructed patients ($58,474.79 vs. $54,901.98; p=0.036). Subgroup analysis showed that rates of reconstruction were significantly higher in patients with MHI greater than $65,000, compared to the patient groups with MHI less than $45,000 and $45,001-65,000 (p=0.033). Among patients that received breast reconstruction, travel distance and MHI had no significant association with timing and type of reconstruction, use of acellular dermal matrix, complication rates, implant removal and need for revisional surgery.

Conclusion: Travel distance was not significantly associated with rate and type of breast reconstruction after mastectomy at our institution. However, there was a significant association with higher income, especially in patients with MHI greater than $65,000. This is the first study to examine these factors at a single academic institution serving a rural population. Our results do not fully support the findings of previous studies based on national databases.1 This may be related to focused efforts on patient education, resource allocation and multidisciplinary approach to breast cancer care at our institution. At the same time, our findings highlight that smaller-scale studies, at an institutional or regional level, remain valuable, especially when examining specific patient populations that may not be accurately represented in larger-scale database studies.

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ALT versus SCIP Free Flap for Reconstruction of Upper and Lower Limb Defects: Comparison of Donor Side Morbidity and Recipient Side Outcomes

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Background: The anterolateral thigh (ALT) and superficial circumflex iliac artery perforator (SCIP) free flaps have been widely used for various kinds of reconstructions. (1-5) The aim of this study is to compare functional and aesthetic outcomes, and donor-site morbidity of ALT and SCIP free fasciocutaneous flaps in extremities reconstruction.

Methods: 144 patients who underwent reconstruction of upper and lower limb defects by using SCIP (totally=61, upper limb= 26, lower limb=35) and ALT (totally=83, upper limb= 22, lower limb=61) free flaps were included in this study. Flaps with at least 1 year follow-up results were included in the study. The characteristics of patients and flaps, closure pattern and morbidities of donor defects including hematoma, seroma, dehiscence, skin necrosis, graft failure, hypertrophic scaring, pain, functional impairment in hip and knee, hypoesthesia, cold intolerance, hyperpigmentation, scar contraction were retrospectively analyzed. The functional improvement of upper and lower extremities was evaluated with quick disabilities of the arm, shoulder and hand score (QDASH) and foot functional index (FFI), respectively. The aesthetic satisfaction was evaluated with 5-point Likert satisfaction scales. Donor-site scars were evaluated by Patient and Observer Scar Assessment Scale (POSAS).

Results: 98 patients were male, others female. Mean age of patients was similar in SCIP group (35.3±14.2 years) and ALT group (37± 12.5). Mean dimensions of flaps were higher in ALT group (98.1±45.4) than SCIP group (67.6±36.8). The mean functional improvement of upper and lower extremities score was significantly better in SCIP group ($pQDASH<0.05$; $pFFI<0.05$). Donor defects of SCIP flaps were closed primarily, but 17of ALT flaps need to skin graft. The donor site morbidities were higher in ALT flap (n=13) than SCIP flap (n=4). ALT flap patients complained poor aesthetic donor result. Satisfaction scores were statistically higher in SCIP group (n=4.7±0.2) than ALT group (n=4.3±0.5). Mean POSAS score was 2.2±0.4 in SCIP group, 2.7±0.5 in ALT group.

Conclusions: Considering the donor site morbidity, ALT free flap carries slightly higher morbidity than SCIP free flap. This is due to the fact that ALT flaps are preferred in larger defects and the donor area is more visible and mobile. (4)

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Ventral Hernia Repairs in the US: Determining Rates of Recurrence Over Time

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Introduction: Recurrence of ventral hernias is the most challenging adverse event after repair as it increases complications and subsequent need for repair. Rates of recurrence range between 30% to 70% after initial ventral hernia repair. Even though the recurrence rate of ventral hernias has been reported to be associated with specific factors and differ depending on patients' characteristics, reports on rates of recurrence over time have remained scarce. Thus, this study aimed to determine the ventral hernia recurrence rate over time.

Methods: The Abdominal Core Health Quality Collaborative (ACHQC) database, which collects hernia-specific data from surgeons across the United States, was used to evaluate recurrence rate over time of patients with ventral hernias. Descriptive analyses compared demographics and surgical characteristics of patients who had a post-operative recurrence or not. Pearson's Chi-square was used to compare categorical variables and Wilcoxon rank sum test for continuous variables. Time to recurrence was estimated using the Kaplan-Meier method. R software version 4.0.3 (2020) was used for all statistical analyses.

Results: A total of 4,053 patients who underwent ventral hernia repair with completed one-year or greater follow-up were identified in the ACHQC database. In this cohort, 16.5% had a recurrence after their hernia repair. The mean±SD age of patients with recurrence was 57.96±12.04. Patients with post-operative recurrence more often had prior hernia repairs compared to those who did not (49.0% vs. 40.4%, $p<0.001$). Approximately half of patients with a recurrence did not have a prior hernia repair (51%), whereas 21.5% had 1 prior hernia repair, 12.1% had 2 prior hernia repairs, and 15.4% had 3 or more prior repairs. Patients with a post-operative recurrence had a smaller mean ± SD hernia width (9.85±7.87 vs 10.40±9.96, $p<0.001$) and mean ± SD hernia length (13.59±9.66 vs 14.94±9.03, $p<0.001$) compared with patients who did not have a recurrence. There was a higher proportion of patients who underwent laparoscopic surgery in those with post-operative recurrence compared with patients who did not have a

recurrence (8.52% vs. 6.68%, p=0.024), and a lower proportion of patients underwent open surgery in those with post-operative recurrences compared with patients with no recurrences (76.38% vs. 78.40%, p=0.024). Of patients with Sublay mesh placed, a lower proportion of patients who had a recurrence had retrorectus/retromuscular mesh compared to those who did not have recurrence (61.79% vs. 75.22%, p<0.001), whereas a higher proportion of patients who had a recurrence had intraperitoneal mesh compared with those who did not have recurrence (28.82% vs. 14.55%, p<0.001). The Kaplan-Meier showed a recurrence rate of 0.8% [95% CI (0.5%, 1%)] at 6 months; 5.2% [95% CI (4.6%, 5.9%], at 1 year; 16.7% [95% CI (15.2%, 18.2%)], at 2 years; 25.8% [95% CI (23.6%, 28.0%)], at 3 years; 34.5% [95% CI (31.5%,37.5%)] at 4 years; and 40.8% [95% CI (37.1%, 44.5%)] at 5 years.

Conclusion: The 5-year recurrence rate of a ventral hernia was 40.8% [95% CI (37.1%, 44.5%)]. Further research should be focused on determining predictive factors for recurrence at various time points following initial ventral hernia repair.

Does the Quantity of Transferred Lymph Nodes in Vascularized Lymph Node Transfer Affect Patient-Reported Outcomes for Upper Extremity Lymphedema?

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Introduction: Vascularized lymph node transfer (VLNT) is one of few existing surgical approaches for the treatment of extremity lymphedema. There is limited literature comparing the quantity of transferred lymph nodes to clinical and patient-reported outcomes, such as quality of life and hours in compression therapy. Additionally, previous studies have reported the effects of nodal quantity on postoperative outcomes exclusively in lower extremity lymphedema. In this study we compare the number of lymph nodes transferred during omental VLNT to postoperative outcome measures in patients with upper extremity lymphedema.

Methods And Materials: A retrospective review of our prospectively maintained lymphedema database from May 2017 to October 2021 was performed. All patients who underwent omental VLNT for the treatment of upper extremity lymphedema were identified and reviewed. Patients were classified into one of two groups based on the number of transferred lymph nodes (1-5 or ≥ 6 nodes), identified using ultrasound intraoperatively. Demographics and postoperative outcomes including relative volume difference in limbs, LDex, hours spent in compression therapy, incidence of cellulitis, Lymphedema Quality of Life (LYMQoL) scores, and self-reported quality

of life (10-point Likert Scale) were collected at 3, 6, and 12 months postoperatively. To assess differences between groups, univariate analysis was performed.

Results: A total of 24 patients that met inclusion criteria were identified. Of those included, 95% were female with a mean age of 58.8 (SD 11.1) years and a body mass index of 30.3 (SD 3.9) kg/m2. Eight patients (33%) had undergone a suction lipectomy procedure prior to VLNT. The median number of lymph nodes transferred during VLNT was 6 (IQR 2.1). Groups 1 and 2 demonstrated a mean improvement of 1.5 and 2.0 points, respectively, in overall quality of life scores. Similarly, both groups had improvements in mean LYMQoL scores (indicated by a decrease in score value) from baseline to 12 months, postoperatively. The incidence of cellulitis decreased from 0.09 episodes/year preoperatively to 0.05 postoperatively in Group 1 and 0.49 to 0.16 in Group 2. Additionally, the mean reduction in total hours that patients spent in compression therapy was 33.5 (SD 3.4) hours for Group 1 and 16.3 (SD 4.5) hours for Group 2; 12.5% (n=3) discontinued using compression therapy entirely by 12 months. Other objective measures including LDex and relative volume difference in limbs revealed no association between the two groups.

Conclusion: The patient-reported quality of life scores improved in both groups with no relationship to the quantity of transferred lymph nodes during VLNT. Additionally, both groups spent less time in compression therapy postoperatively. No statistically significant differences in other postoperative outcome measures were found between the two groups. These findings suggest that the number of transferred lymph nodes during omental VLNT does not impact clinical and patient-reported outcomes. However, further studies with larger sample sizes are needed to corroborate such findings.

Risk Factors Associated with 30-day Soft Tissue Complications Following Lower Extremity Sarcoma Surgery

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Introduction: Sarcomas are most commonly located in the lower extremity. Despite the functional and cosmetic advantages of limb sparing surgery, perioperative complications such as wound dehiscence and infection occur at higher rates than amputation. Post-operative soft tissue complications after lower-extremity sarcoma surgery are difficult for patients as well as surgeons. The purpose of our study is to comprehensively investigate risk factors predisposing to such complications in the lower extremity amputations.

Methods: The American College of Surgeons (ACS), National Surgical Quality Improvement Project (NSQIP) data was queried from the years 2010 to 2019. All patients with CPT consistent with lower extremity tumor resection and amputation from the hip region to the ankle were collected (n=48393). Patients were further reviewed using ICD codes. The surgical management of lower extremity sarcoma was confirmed using these codes, resulting in 946 patients. Those with incomplete data or aged >90 were excluded for a total of 918 patients. Patient demographics, pre-operative lab values, and comorbidities were recorded. Tumor type (soft tissue or bone), location, and procedure type (amputation, bone resection, soft tissue resection) were included as well as the presence of concurrent plastic surgery procedures (skin grafts, complex wound repair, flaps). 30-day soft tissue complications included surgical site infections (SSIs; superficial, organ space, deep) and wound dehiscence, 30-day adverse outcomes including unplanned reoperation and death were also recorded. Bivariate analysis was performed on categorical variables with Fischer's exact test and non-parametric continuous variables with Mann-Whitney U test on IBM SPSS.

The average age was 59, with 483 male patients and 435 female. The average BMI was 27.4. Comorbidities included smoking (13.9%, 128), hypertension (37.3%, 342), and insulin-dependent diabetes (3.7%, 34). Pre-operative lab values included albumin <3.5 (6.8%, 63), hematocrit <30% (8.2%, 75), and platelet count <150,000 (5.9%, 54). The 30-day soft tissue complication rate was 5.7% (52 of 918). Superficial SSIs accounted for 50.0% (26), deep SSIs accounted for 21.1% (11), wound dehiscence accounted for 17.3% (9), and organ space SSIs accounted for 11.5% (6). In multivariate analysis, insulin-dependent diabetes (p=0.027), tumor type (p=0.014), procedure type (p=0.027), concurrent plastic surgery procedures (p=0.007), total operative time (p=0.008), and pre-operative radiotherapy (p=0.040) were associated with soft tissue complications. However, this data was only available for 3 of the 10 years in the database, for only 113 patients, of which 17 had pre-operative radiotherapy.

Conclusions: Insulin-dependent diabetes, tumor type, procedure type, concurrent plastic surgery procedures, as well as long operation times appear to be risk factors for 30-day soft tissue complications following lower extremity sarcoma surgery. Of special note, pre-operative radiotherapy was statistically significant in association with soft tissue complications. Importantly, patients with insulin-dependent diabetes should be given special clinical consideration prior to lower extremity sarcoma surgery. Future studies investigating these risk factors would be of benefit to patients and surgeons alike.

Understanding Transition Regret and Gender-Affirming Surgery: A Systematic Review

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Background: Gender-affirming surgery is a safe and necessary component of care for patients suffering from gender dysphoria. Demand for transgender care continues to grow, especially for gender-affirming surgery.1,2 The plastic surgery community has rightly embraced the responsibility of providing high-quality gender-affirming surgery. However, the current environment has highly politicized transgender care. Therefore, it is crucial for plastic surgeons to understand how frequent transition regret is in this community and how often patients seek reversal for their gender affirming surgery.

Methods: A systematic review was conducted of all literature in PubMed and EmBase using the following search terms: "gender", "transgender", "surgery", "surgical", "regret", "reversal". According to PRISMA guidelines, the resultant articles were screened by title and abstract before full text. Literature written in English that described either trans male and trans female care was included. Only literature containing patients who underwent surgery and quantified extent of patient regret was included. Information extracted included demographics, surgical care, experience of regret, reasons for regret, and surgical reversal.

Results: A total of 845 pieces of literature were reviewed. 17 were included. A total of 48,656 transgender patients were treated and assessed. Only 5907 (12.1%) underwent any surgical treatment. Of the total population assessed, only 840 (1.7%) experienced regret with their transition. Most patients who experienced regret were trans males (70.1%) compared to trans females (29.9%). Of those patients who experienced regret and had documented information, 32.2% underwent a reversal surgery. Reversal for bottom surgery (66.0%) was more common than reversal for top surgery (34.0%). Nine articles cited reasons for transition regret: dissatisfaction with the medical/surgical outcome or maintenance (66.7%), change in gender identity (55.6%), societal pressure (44.4%), underlying psychologic disorder (33.3%), and others (33.3%). No article described reasons specific for surgical reversal.

Conclusion: The vast majority of transgender patients do not experience regret with their transition care. Of those patients who experience regret, a minority pursue reversal for their gender-affirming surgery. Reasons why these patients experience regret range from intrinsic to extrinsic. Motivations for, and factors that increase risk of, surgical reversal need to be better ascertained for plastic surgeons and the transgender community.

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'Modified Phallourethroplasty' as a Surgical Alternative to Phalloplasty with Urethral Lengthening: Technique, How We Present this Option to Patients, and Clinical Outcomes

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Background: Most complications after masculinizing genital gender-affirming surgery (gGAS) are associated with urethral lengthening (+UL). While many transmasculine patients desire +UL for standing urination, not all patients prioritize this benefit over the significantly increased risk of complications. Currently, phalloplasty without UL (-UL) appears to be seldom offered, and previous -UL techniques create genital anatomy that is visibly different from the anatomy created by phallourethroplasty+UL (P+UL).

Aim: To describe a novel surgical technique to create a normal-appearing phallus tip, scrotum, and perineal urethral opening that avoids urethral complications associated with +UL.

Methods: We describe our surgical technique and approach to patient counseling. We report patient satisfaction outcomes from the first cohort of patients to undergo this 'modified phallourethroplasty' (-UL) approach to date.

Results: Among patients who elected phalloplasty over metoidioplasty, 13/40 (32.5%) patients elected P-UL. Prior to 1/2020, before we standardized how we presented this option to patients, 17.4% elected this option. Of the patients that elected P-UL, 8 have completed first-stage and 7 have completed second-stage surgeries.

All patients that have undergone P-UL have expressed satisfaction with body image and urinary function. Among patients asked to rank which of 14 preoperative factors were most important (1=most important, 14=least important), having a normal-appearing phallus (mean rank 4.14) and minimizing complications (mean rank 8.14) were ranked more highly than ability to urinate in a standing position (mean rank 9.14). When asked what factors most influenced their choice to have -UL (ranked from 1-9), elimination of risks was rated the most important (mean rank 2.71) and expected decrease in risk of needing revision surgery was rated the second most important (mean rank 3.57).

Clinical Implications: The significant reduction in +UL-related complications decrease morbidity, urgent revision surgeries, and cost to our healthcare system.

Strengths and Limitations: Strengths include a novel technique that provides a surgical alternative to P+UL that eliminates the majority of phalloplasty related postoperative complications. Limitations include the small number of patients who have completed first and second stage surgery, and short follow up time.

Conclusion: It is important to understand what factors drive individual patients' choices. Patients considering masculinizing gGAS should be offered both +UL and -UL options. The costs and benefits of each option should be presented objectively and in the context of each patient's unique priorities and needs.

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Robotic-Assisted Vaginoplasty with Peritoneal Graft: A Multidisciplinary Technique for Gender Affirmation

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Background: Gender affirming trans female bottom surgery is critical in treating gender dysphoria, but can result in complications such as stricture development, neo-vaginal prolapse, and rectal injury. The authors describe a multidisciplinary robot-assisted technique incorporating a free peritoneal graft to alleviate these complications and improve outcomes.

Methods: Patients who met the World Professional Association for Transgender Health (WPATH) criteria for bottom surgery and underwent robotic-assisted penile inversion vaginoplasty with senior author (J.D.K) were considered for inclusion. The free peritoneal graft is harvested robotically and used as a strip of mucosal-like tissue for a more anatomic neo-vagina and sutured to scrotal skin grafts over a vaginal conformer. The construct is sutured to the remaining penile shaft skin and then inverted and passed through the perineal body into the robotically created space. The apex of the neo-vaginal lining created by the skin graft-peritoneal graft construct is then sutured to the peritoneal reflection with barbed suture in 2 layers intra-corporally via the robot.

Results: Forty-two vaginoplasties were included. Average age at the time of initial consultation was 31 years of age. All patients were on hormone therapy and 43% of patients had previously undergone top surgery. The average length of follow-up was 223 days. The most common complication was the formation of symptomatic granulation tissue, which was treated with silver nitrate application in 15 patients. Nine patients experienced wound dehiscence with five requiring operative repair. Four patients developed labial banding/webbing that required revision. Only three patients experienced neo-vaginal stenosis requiring return to the operating room. Eighty-six percent of patients used Soul Source vaginal dilators (Sour Source Therapeutic, North Hollywood, CA) post-operatively and of those patients 58.3% could dilate with the orange dilator (the largest, 1 1/2-inch diameter), 5.6% with teal (1 3/8 inch diameter), 16.7% with blue (1 ¼ inch diameter) and 16.7% with purple (1 1/8 inch diameter). All dilators are 9 inches in length. Patients were cleared for sexual intercourse three months after surgery. A total of 85.7% of patients were able to achieve orgasm through direct neo-clitoral stimulation and another 9.5% had not yet tried to achieve orgasm at the time of follow-up.

Conclusion: With experience and an interdisciplinary team, robotic-assisted vaginoplasty with free peritoneal grafting is safe and effective with a low complication rate and high neo-vaginal patency rate. Many patients report successful penetrative intercourse and the ability to achieve orgasm post-operatively.

Perceptions of Plastic and Reconstructive Surgery Through Education, Training, and Practice

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Introduction: Plastic and Reconstructive Surgery (PRS) is rarely covered in depth in medical school or residency programs. Prior studies have investigated medical students' perceptions of PRS procedures given their limited exposure,1,2,3 however the views of attending/residents on PRS have not been studied in depth. With increasing social media presence of cosmetic plastic surgeons,4 as well as minimal exposure in medical school, our team aimed to assess the views of medical students and the residents/attendings working closely with or referring to plastic surgeons (general surgery/anesthesia/internal medicine (IM)) on PRS as well as the experiences informing these perceptions.

Methods: Perceptions of plastic surgery were investigated via a pilot survey comparing perceived frequency of various surgical procedures including breast augmentation, liposuction, facelift, soft tissue filler injections, Botox injections, laceration repair, maxillofacial surgery, hand surgery, tumor removal, and hip replacement (a non-PRS procedure included as a control). Participants indicated how frequently they thought each procedure was performed via a Likert scale. Additionally, participants were asked to name the procedure they most associated with PRS. Participant demographics were collected as well as exposure to PRS. Survey responses were compared to the 2019 ASPS Report on Plastic Surgery.5 Data was analyzed using ANOVA and t-testing.

Results: 118 participants from University of Vermont (UVM) medical school and center completed the survey. 72 medical students, 10 (40%) general surgery residents, 12 (52%) general surgery attendings, 9 (26%) internal medicine attendings, and 15 (33%) anesthesia attendings completed the survey. When comparing survey responses to the ASPS Report on Plastic Surgery (2019), medical students, general surgery attendings and residents, anesthesia attendings, and IM attendings all overestimated the frequency of cosmetic procedures in comparison to reconstructive procedures.

Conclusion: Our study indicates that despite medical school and residency education, misperceptions regarding the field of plastic surgery continue to exist. Our data demonstrates that study participants overestimate the frequency of cosmetic procedures relative to reconstructive procedures. Medical students as well as physicians in non-plastic surgery specialties would benefit from increased exposure to plastic surgery to improve knowledge about the field.

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Increasing Body Mass Index (BMI) Escalates Surgical Site Occurrences (SSO) with Panniculectomy During Abdominal Wall Reconstruction (AWR)

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Introduction: In complex AWR, the role of concomitant panniculectomy (cP) has been debated due to concern for increased wound complications. The aim of our study was to evaluate outcomes in the low-risk patient undergoing AWR with panniculectomy stratified by pre-operative BMI.

Methods: A prospective, institutional hernia-specific database was queried for patients undergoing open AWR with cP from 2016 to 2021. Patients with a history of tobacco or steroid use, diabetes, and CDC class 3 and 4 wounds were excluded. Patients, stratified into four cohorts based on BMI: 20-30, 30-35, 35-40, and 40+ kg/m2, and were compared to a cohort of AWR without cP using a 3:1 propensity match based on BMI and hernia defect size. Demographics, operative characteristics, and outcomes were evaluated.

Results: Propensity match yielded 172 matches. The results of the match demonstrate that overall, patients who underwent AWR with cP had more frequent SSO (32.0vs9.9%;$p<0.001$). Specifically, more frequent seromas (13.4vs4.2%; $p<0.001$), more SSIs (9.9vs4.3%; $p=0.03$), and more frequent readmissions (9.9vs4.7%; $p=0.01$). They did not however, have more frequent hernia recurrence (2.9vs1.2%; $p=0.15$) or return to the OR (12.8vs6.8%; $p=0.07$). When individual cohorts were analyzed, risk of SSO, SSI, and readmission gradually increased throughout the groups and was highest in those with BMI 40+ (44.1%, 20.6%, and 29.4%) respectively. On logistic regression, BMI was an independent risk factor for both SSI ($p=0.02$) and SSO ($p=0.04$). Subgroup analysis was performed examining the impact of postoperative negative pressure incisional wound vac placement. Overall SSO was significantly decreased (8.3vs36.5%; $p<0.001$), as was seroma (2.6vs14.2%: $p=0.02$), return to OR (0vs16.5%; $p=0.006$), and 30-day readmission (2.6vs11.7%: $p=0.04$). Logistic regression demonstrated that postoperative negative pressure incisional wound vac placement independently associated with reduced SSOs.

Conclusions: BMI is independently associated with increased SSO and SSI. These risks are significantly increased in patients with a BMI above 35. Although risk appears mitigated with utilization of negative pressure wound therapy, preop weight loss is an important part of surgical pre-optimization.

Biologic Versus Synthetic Mesh for Complex Open Ventral Hernia Repair: Three-Year Follow-Up of a Pilot Randomized Controlled Trial

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Introduction: Biologic mesh is often used in complex hernia repair but there has been limited clinical evidence to date to support this practice. The aim of this study was to compare clinical and patient-reported outcomes of biologic versus synthetic mesh for complex open ventral hernia repair (OVHR) at three years.

Methods: Patients from a single center, pilot randomized controlled trial comparing biologic versus synthetic mesh in complex OVHR were followed at three years. Primary outcome was major complication, a composite of mesh infection, hernia recurrence, reoperation, and death. Secondary outcomes included surgical site infection; surgical site occurrence including seroma, hematoma, wound dehiscence; and patient-reported outcomes. Outcomes were assessed using frequentist generalized linear models.

Results: A total of 87 patients (44 biologic, 43 synthetic) were randomized and 61 patients (70%; 28 biologic and 33 synthetic) completed three-year follow-up. Baseline demographics were similar in both groups. No differences were seen in major complication (50% vs 30%, p=0.123), mesh infection (14% vs 3%, p=0.144), recurrence (39% vs 24%, p=0.214), reoperation (18% vs 12%, 0.531) or mortality (4% vs zero, p=0.459) between the two arms. The single death occurred as a result of bacteremia in a patient with hepatocellular carcinoma. Similarly, no differences were seen in secondary or patient-reported outcomes. Both groups demonstrated clinically important improvements in quality of life and pain scores at three years.

Conclusion: This study fails to find benefit with biologic mesh as opposed to synthetic mesh in complex OVHR at three years when comparing both clinical and patient-reported outcomes.

The Importance of Plastic Surgery Flap Techniques to Preserve Critical Limb Length in Patients with Transmetatarsal Amputations: Long-term Outcomes

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Background: Transmetatarsal amputation (TMA) is frequently performed in comorbid patients with chronic forefoot wounds. TMA allows limb salvage and preserves functional gait, without need for prosthesis. Traditionally, when primary closure is not possible, a higher-level amputation is performed. This series aims to evaluate the surgical and functional outcomes following local and free flap coverage of TMA stumps in patients with chronic foot wounds.

Methods: A retrospective review of patients who underwent TMA with local or free flap coverage from 2015 to 2021 at our limb salvage center was conducted. Patient demographics, comorbidities, operative details, and outcomes were recorded. Primary outcomes included early postoperative complications, long-term outcomes, and patient-reported outcome measures, using the lower extremity functional scale (LEFS) scoring system.

Results: Fifty patients underwent 51 flap (26 local, 25 free flap) reconstructions following TMA. Average age and BMI were 58.5 years and 29.8 kg/m2, respectively. Comorbidities included diabetes (n=43, 86%) and peripheral vascular disease (n=37, 74%). Twenty-six local flaps (51%) and 25 free flaps (49%) were performed. Overall flap success rate (local and free flaps) was 100%. At mean follow-up of 24.8 months (range, 0.7 to 95.7 months), limb salvage rate was 86.3% (n=44). Forty-four patients (88%) were ambulatory. The LEFS survey was completed by 22 patients (51.2%). Mean LEFS score was 46.2, correlating with 57.7% of maximal function.

Conclusion: Local and free flap reconstruction following TMA are effective methods of soft tissue coverage for limb salvage. Applying plastic surgery flap techniques for TMA stump coverage allows for preservation of maximal foot length.

Dual Fluorescent Tracers for Reverse Lymphatic Mapping and Surgical Guidance: Preventing Donor Site Associated Lymphedema in Vascularized Lymph Node Transplant Surgery

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Introduction: Vascularized lymph node transfer (VLNT) involves microvascular transplantation of functional lymph nodes to restore physiological lymphatic function. Reverse lymphatic mapping decreases the risk of impaired donor-site lymphatic function and iatrogenic lymphedema following lymph node transfer in VLNT. [1, 2] Although effective, it often requires radioactive exposure and expensive special material handling. [3, 4] Thus, we propose a safe and cost-effective lymphographic technique that allows for precise visualization and differentiation of lymphatic channels using dual fluorescence reverse lymphatic mapping without the need for radioisotopes.

Methods: Prospective analysis of VLNT patients undergoing radioisotope-free, dual fluorescent tracers-assisted harvest was performed at our institution from September 2013 to August 2020. Reverse lymphatic mapping of the lower extremity was performed with indocyanine green (ICG). Blue dye was utilized in both white light and near-infrared spectra for visualization and localization of donor site lymphatic structures. Demographics, intraoperative details, and surgical outcomes were recorded.

Results: Twenty-five patients were included. Median age was 52.9 years (34 to 77 years) with a BMI of 29.1 kg/m2 and mean follow-up of 43 months (range 17 months to 90 months). Lymphedema stage ranged from Campisi 2 to 4. Inguinal VLNT was performed in 13 patients, and 12 patients received combined VLNT and free flap breast reconstruction. No patients required change in lymph node donor site intraoperatively. All ICG stained nodes were preserved in situ.

No cases of iatrogenic lower extremity lymphedema were observed during the follow-up period. Postoperative bioimpedance spectroscopy of the donor-site limb revealed no evidence of subclinical or clinical lymphedema (L-Dex ratio: mean -1.6; range -9.6 to 1.4). Circumferential and volumetric measurements did not show significant differences between the donor site compared to the contralateral lower extremity. The donor site of the lymph node flap healed appropriately in 92% of patients. One patient required surgical treatment for methylene blue-induced skin necrosis.

Conclusion: Reverse lymphatic mapping and surgical guidance with dual ICG and blue dye fluorescent tracers provides surgeons with several advantages in groin based VLNT surgery. First, this technique provides a new means of real-time surgical guidance without the need for radioisotopes. Second, it improves surgical visualization in both white light and near infrared spectra, allowing preservation of critical structures within the flap and, importantly, in situ at the donor site. Lastly, it helps to avoid iatrogenic lymphatic dysfunction in the donor site associated limb.

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Implementation Of Plastic Reconstructive Surgery and Clinical Outcomes Trial in Vulvar Carcinoma (IMPACT-V). Can We Improve Short-Term Complications and The HR Quality of Life in Vulvar Cancer Patients by Easily Accessible Consultation of Reconstructive Surgery?

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Introduction: Vulvar carcinoma (VC), mainly vulvar squamous cell carcinoma (VSCC), accounts for about 5% of gynecological malignancies [1,2]. VSCC has had a striking increase in incidence over the last decades [1,2]. In 2019 over 450 women were diagnosed with a VSCC in the Netherlands compared to 213 in 20001. The overall 5-year survival of VSCC is approximately 75% with 84% in FIGO stage I and decreasing to 35% in FIGO stage IV [3]. Surgery is the cornerstone in the treatment of VSCC and is performed in approximately 80% of patients in both curative and alleviating symptoms in the palliative setting [3].

Wound complications (wound dehiscence, wound infection) after surgery for vulvar cancer are common, both local to the vulva and to the groin. While the high incidence of complications after inguinofemoral lymphadenectomy is widely published with wound breakdown is up to 30%, the data on complications to the vulva are limited with reported complications varying between 5.6 – 58.0% [4]. The high reported prevalence of short-term wound complications up to 45% increased with the extent of surgical therapy [4]. The exact incidence of vulvar wound complications and risk factors for their development are unknown due to the lack of studies, in our own data set we report 53.7% of wound complications. These high wound healing disorders indicate the need for early risk management, systemic wound assessment, and the evaluation of the current practice where the wounds are generally closed primarily.

Aim: We hypothesized that standard incorporation of reconstructive surgery in vulvar surgery may aid to complete, curative surgical resections with appropriate margins while preserving functionality and anatomy of the lower female genital tract. Moreover, additional reconstructive surgery aids in wound healing by primary intention and may reduce morbidity and quality of life.

Results: In an observational cohort study, we compared 2018 and 2019 vs 2020 and 2021 when we incorporated reconstructive surgery for closing the defect after vulvar carcinoma surgery. Reconstructions consist of a VY advancementplasy, Lotus petal flaps, gluteal fold flaps, OAP flaps, or pedicled ALT flaps. Complications are divided into mild, moderate, and severe [5]. Mild and moderate complications didn't change significantly by 25.9% vs 30.3%. Severe wound complications decreased by 19%: from 51.9% to 33.9%. By incorporating plastic surgery, we were able to operate larger tumors. Tumor size increased (tumors > 4cm) 13 to 27 patients (19.7% to 31.8%).

Conclusions: In the first pilot, there's a decrease of complication rate for severe wound complications This pilot in 1 center shows promising results but is underpowered and is now expanded to 9 specialized centers in the Netherlands. During a 3-year period, we will evaluate the quality of life with newly designed PROMS to monitor patients' complaints, sexual functionality, and quality of life after surgical treatment of VC, and monitor complications rate and tumor-free resection margins. The IMPACT-V study purposes to make an algorithm for reconstructive options in which we can individualize treatment, follow up and evaluate the added value to the implementation of reconstructive surgery in vulvar surgical therapy.

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Patient-Reported Outcomes After Local Flap Coverage Versus Amputation for Complex Lower Extremity Trauma

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Background: Lower extremity trauma can be devastating, and limb salvage is hypothesized to result in improved quality of life. However, there is a paucity of patient-reported outcomes (PRO) data in lower extremity salvage. Limb salvage can often be achieved with the use of local muscle (e.g., gastrocnemius, soleus) flaps or fasciocutaneous (e.g., reverse sural and propeller) flaps. Limited PRO data is available after local flap reconstruction. Further, PROs comparing these flap types to patients who underwent amputation are limited. The purpose of this study was to compare PROs of patients who received lower extremity salvage using fasciocutaneous flaps or muscle flaps to lower extremity amputation.

Methods: The outcomes of 65 patients that underwent a lower extremity local flap reconstruction (n=33) or amputation (n=32) between 2014 and 2020 were recorded. PROs were recorded utilizing both the Lower Extremity Functional scale (LEFS) and the 36-Item Short-Form Health Survey (SF-36). Chart reviews were performed to collect additional perioperative data. Variables that were predictive of outcomes were determined using multivariate analyses.

Results: Surveys were completed by 65 patients (response rate 60.7%). The mean time of survey after flap reconstruction was 3.2 years. Recent trauma (within 90 days) was the most common indication for local flap coverage (n=26). Flap complications included wound dehiscence (n=8) and infection (n=4). Other flap complications included partial flap necrosis (n=12), total flap necrosis (n=2), and secondary amputation (n=4). LEFS score and SF-36 physical functioning scores were significantly lower in patients who underwent muscle flaps compared to fasciocutaneous flaps (p=0.021 and p=0.022 respectively). Muscle flap patients had similar LEFS and SF-36 scores to amputation patients, while fasciocutaneous flap patients had significantly higher LEFS (p=0.017), SF-36 physical functioning (p=0.033), and health change (p=0.050) scores than amputation patients.

Conclusions: PROs for muscle flap patients were significantly lower than those of fasciocutaneous flap patients. Patients who underwent fasciocutaneous flaps for limb salvage reported higher PRO scores than those undergoing amputation, while patients undergoing muscle flaps reported outcomes similar to those undergoing amputation. This data suggests that while fasciocutaneous and muscle flaps are both useful limb salvage procedures, fasciocutaneous flaps may confer advantages that result in improved patient perceived outcomes. Further study is needed to better characterize outcomes in limb salvage.

Left Ventricular Assist Device Infections: Escalating Surgical Intervention Does Not Accelerate Mortality

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Purpose: Left ventricular assist devices (LVADs) have decreased mortality and improved functional capacity for patients with end stage heart failure. However, device related infections (DRI) negatively affect outcomes. The spectrum of DRI treatment ranges from medical management to complex surgical interventions including debridement or device replacement with concomitant plastic surgery reconstruction. Information regarding outcomes after complex surgical management have been limited to small case series with poorly defined indications. The purpose of our work is to characterize the management of LVAD DRIs and determine factors affecting mortality in a large, single-center cohort study.

Methods: Data from a cohort of patients with durable LVADs (placed 2008-2021) were extracted from our institutional heart failure database and stratified into the following groups: 1) no LVAD DRI, 2) medically or 3) surgically managed DRI. Demographic and other characteristics were compared between groups. A competing risks model for infection, incorporating death as the competing risk, was constructed, and risk factors for infection were identified using Cox proportional hazards regression. Survival after the onset of infection was compared between medically and surgically managed patients, and risk factors for mortality after infection were explored. The subset of surgically managed patients were further analyzed with comparison made between those undergoing cardiac versus combined cardiac and plastic reconstructive surgery.

Results: We identified 557 patients who underwent durable LVAD implant during the study period; of these, 36% (n=201) developed an LVAD DRI at a median of 290 days post-implantation. At one year, the rates of infection, mortality, and infection-free survival were 22%, 17%, and 61% respectively. We found that younger age, prior cardiac surgery, LVAD as destination therapy, history of stroke, and Medicaid insurance predicted increased risk of infection. Among patients who developed an infection, 51% (n=103) were managed surgically and 18% (n=19) of these had complex plastic reconstructive surgery. Predictors of mortality after the onset of infection included estimated GFR<60 mL/min, moderate or severe COPD, and peripheral vascular disease. Interestingly, despite the surgery group having higher rates of chronic kidney disease, stroke, right heart failure, and longer ICU stays, one year mortality after infection was equivalent for surgically and medically managed patients (14% vs 17%, P=0.83). Finally, within the surgical group, patients that required plastic surgery reconstruction had similar survival compared to those managed by cardiac surgery alone (P=0.76). Risk factors for mortality in this subgroup were similar to those for all patients with infection and included COPD, diabetes, and Medicaid insurance.

Conclusions: DRIs are highly prevalent among LVAD patients and up to half of our cohort underwent operative intervention. Similar outcomes were noted for medically and surgically treated patients despite escalating levels of intervention and a higher burden of comorbidities. This suggests that surgery in a select group of surgically complex and medically fragile patients may maintain survival. Further work is required to devise a multidisciplinary approach amongst

heart failure, infectious disease, and surgical services to provide individually tailored therapy to these high-risk patients.

Non-Racial Disparities in Management of Hidradenitis Suppurativa at a Single Center

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Introduction: Hidradenitis Suppurative (H/S) is a common disease process which may affect vulnerable patient populations. Management of this condition often necessitates medical and/or surgical care. Our objective was to explore potential non-racial disparities, including socioeconomic status, body mass index (BMI), and severity of HS among those affected by this disease cared for at our institution.

Methods: Institutional Review Board exemption (IRB-300006003) was obtained and a 10-year retrospective review of 1,187 patients with H/S seen at our institution by plastic surgery and/or dermatology was conducted. Patients above the age of 65 were excluded. Demographic information, medical history, dermatology treatment history, surgical history, and insurance information was collected. Zip codes were used to obtain median income for each zip code using U.S. census data, and dollars were adjusted for 2019 inflation adjusted dollars. These values were used to estimate patient income. Chi square tests determined statistical significance.

Results: Of the 1,148 patients included, most were female (76%) and single (53%), mean age was 36.3 (SD ±12.6), nearly a tenth (13%) lived in a zip code with a median income of less than $30,000 annually, and the majority (59%) had a BMI of ≥30 kg/m². Nearly a fourth (27%) of patients had 5 or more clinic visits over this time period.

Those with an estimated income less than $30,000 were less likely to undergo surgical excision (p=0.01) and less likely to have undergone surgery before (p=0.005).

Those with a BMI greater than ≥30 kg/m² were more likely to be afflicted by diabetes (p=0.003) and hypertension (p=0.002) than those with a BMI <30kg/m². There was no difference in rates of surgical vs medical care between groups, although those with a BMI ≥ 30 kg/m² were more likely to be afflicted by H/S of bilateral breasts (p=0.031). Those with a BMI less than ≤30 kg/m² were less likely to be insured (p=0.031).

Patients with 5 or more clinic visits were more likely to have diabetes (p=0.017), hypertension (p<0.001), a history of cellulitis (p=0.003) and other dermatologic conditions (p<0.001), and depression (p=0.011) than those with less than 5 visits. Patients with 5 or more visits were more likely to have received treatment for H/S before coming to our center, have undergone previous plastic surgery (p<0.001), experience postoperative infection (p<0.001), and require revision surgery (p<0.001) than their peers. Interestingly, those with 5 or more visits were more likely to report an improvement in both symptoms (p<0.001) and pain (p<0.001) compared to those with less than 5 visits.

Conclusions: There appears to be select nuances between patient groups who receive care at our institution. Differences in patient characteristics such as socioeconomic status, patient BMI, and severity of H/S may influence management. Although those with 5 or more clinic visits appear to have a higher disease burden, the care received by these patients may alleviate their suffering. Continued examination will aid physicians in the care of patients afflicted by H/S and promote awareness of possible disparities.

Management of Melanoma and Positive Margins

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Background: Standard treatment of melanoma remains wide local excision (WLE) with negative margins thereby decreasing disease progression and local recurrence. Lesions can be excised and reconstructed immediately, or repair can be delayed until histopathologic margins are deemed negative. There are shortcomings and benefits to each treatment modality. The goal of this study was to analyze the safety, and optimum management of positive margins following primary cutaneous melanoma excision.

Methods: Retrospective review of all Yale Melanoma Registry Database patients with positive margins after excision between January 2011 and December 2021 was conducted. Patients were

included if they had cutaneous melanoma treated with excision and excluded if they did not have positive margins or presented with mucosal or uveal melanoma. Demographics, type of reconstructive technique, management of positive margins, operative time, surgical margins, and complications were all recorded.

Results: 4620 WLEs were performed with 235 cases having involved margins (0.8%). Of these, 119 patients met our inclusion criteria. Sixty-six percent of patients were male with an average age of 69 years. Fifty-Five patients were diagnosed with melanoma in-situ and 64 with invasive melanoma at the time of primary excision. All patients underwent excision with an oncoplastic surgeon with either immediate (117 patients) or delayed (2 patients) reconstruction. 84 patients had melanoma on their head or neck, 16 patients on their upper extremity, 12 patients on their lower extremity, and 7 patients on their torso. The most common location was the head and neck (70.6%). 21 patients had their operative site closed via primary closure, 10 patients received full-thickness skin grafts, 70 were closed with a local flap, 16 received a pedicle flap, and 2 received a combination of a local flap and a full-thickness skin graft. All patients with invasive melanoma at the margin underwent re-excision, but patients with only single cell changes of MIS were also offered Imiquimod as a possible treatment. Seventy-one subjects (59%) underwent re-excision. Repeat excision required only minor procedures with smaller defects and more frequent use of primary closure or readvancement of a previously placed flap, as opposed to a new reconstruction. The maximum number of excisions needed to attain negative margins was three and only 6 (5%) patients required this many procedures. Of the 41 patients managed with Imiquimod, 48% (17 patients) were successfully treated and had negative scouting biopsies after treatment thus avoiding re-excisions. Cases with unsuccessful treatment were managed with additional cycles of Imiquimod, re-excision, or close follow-up. Complications were experienced by 5% of patients including 2 superficial infections, 1 dehiscence, 1 adverse reaction to Imiquimod, 1 flap compromise, 1 postoperative bleeding, and 1 recurrence after successful Imiquimod treatment. Our data demonstrates immediate reconstruction is safe, even in the head and neck region where wider margins are often sacrificed for more favorable cosmetic outcomes.

Conclusion: Primary excision of melanoma with immediate reconstruction is safe and eliminates the time a patient would have an open wound while waiting for margin clearance. Further study of the cost savings produced by immediate reconstruction is underway.

Use of Posterior Component Separation with Transversus Abdominus Release in the Repair of Abdominally Based Breast Reconstruction Donor Site Defects: A Multi-institutional Investigation of Surgical and Patient-Reported Outcomes

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Purpose: The greatest disadvantage of abdominally based autologous breast reconstruction (ABABR) is donor site hernia or bulge. Devascularization, denervation, and harvest of rectus abdominus muscle and anterior rectus sheath creates complex abdominal wall defects. Current literature focuses on mesh plane placement with limited report of myofascial release, with most describing anterior component separation techniques.

Posterior component separation (PCS) is a well-established technique for ventral hernia repair, however its use in patients without a portion of rectus muscle or anterior sheath is poorly studied. Herein we report a multi-institutional experience with PCS for defects created by ABABR with particular attention to long term clinical and patient reported outcomes.

Methods: A retrospective review of ABABR defects repaired at Cleveland Clinic Foundation and Penn State Health Hershey Medical Center from January 2015 through December 2020 was performed. Flap reconstruction, hernia characteristics, and postoperative complications were extracted the Abdominal Core Health Quality Collaborative database. Patient reported outcomes were assessed through the HerQLes Summary Score, Ventral Hernia Recurrence Inventory, Patient-Reported Outcome Measurement Information System (PROMIS) Pain Intensity 3a Survey, and the Decision Regret Scale (DRS).

Results: Forty patients with a history of ABABR underwent hernia repair with PCS and synthetic mesh placement by six surgeons. At the time of repair, the median age was 59 years old (53 – 63.3) and BMI was 32.7 kg/m2 (29.4-34.7). Abdominal wall defects resulted from unilateral flap harvest in 19 patients (47.5%) and bilateral flap harvest in 21 (52.5%) patients. Flap type included 14 pedicled TRAMs (35%), two free TRAMs (5%), six msTRAMs (15%), and 11 DIEPs (28%). Average hernia size was 19 cm long and 13 cm wide.

Postoperative complications included superficial surgical site infections (n = 5; 13%), seroma (n = 3, 8%), and superficial wound breakdown (n = 2; 5%). Three patients (8%) required procedural interventions; however, none required reoperation. Of the 25 patients who underwent follow-up clinical assessment, five patients (20%) were found to have hernia recurrence. Over half of patients felt or saw a bulge (n = 17; 63%) and nearly half had pain (12; 44%). One year postoperatively, HerQLes scores increased significantly from baseline 32.8 to 56.3 (p-value < 0.01) and PROMIS 3a pain scores decreased from 57.1 to 50.5 (p-value 0.04). DRS results demonstrated a score of 47.5 regarding the choice to undergo breast reconstruction and 20.8 regarding the choice to undergo hernia repair.

Conclusions: Ventral hernias following ABABR present a unique challenge in abdominal wall reconstruction. Despite a higher than previously reported clinical and patient-reported recurrence rate with PCS for these defects, patients experienced significantly improved quality of life and pain following hernia repair. This technique should be considered in these challenging cases with appropriate counseling for the long-term presence of a bulge.

Cultured Skin in the Modern Era and the Impact of Infrastructure Volatility on Learning Curves: A 33-Year Institutional Review

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Introduction: Finding the perfect epidermal transplant remains the holy grail of burn surgery. The epidermis is a site of stem cells that allow for constant death and renewal of epithelial cells. The use of cultured epithelial autografts (CEA) was first reported in the treatment of major burns in 1981. The use and application of CEA require specialized skills and thus reports from different burn centers have shown mixed results. Thus, comparing our modern data to past data would show how this field has advanced while maintaining institutional controls.
Methods: We performed a retrospective analysis of all patients admitted between January 1, 1988, and December 31, 2021, for the treatment of large burns that were managed with CEA for their injuries. Patients were divided into pre-defined groups: Group 1: Early era = 1988-1999, Group 2: Pre-modern era = 2000-2010, and Group 3: Modern era = 2011-2021. We compared the groups for differences in age, sex, percent total body surface area (%TBSA), presence of inhalation injury, hospital length-of-stay (LOS), complication rates, and predicted and actual mortality.

Results: We found 52 patients that were treated with CEA during our temporal search window. In the modern era we found 11 patients, in the pre-modern era we found 10 patients, and in the early era we found 31 patients. When comparing the demographics of all three groups, any differences in age, sex, %TBSA, and presence of inhalation injury were found not to be statistically significant. We observed lower mortality rates in the early era and modern era groups (G1: 20% v. G2: 60% v. G3: 27%, $p<0.05$) even though the predicted mortality based on Revised Baux Scores was not significantly different between the group (G1: 53% v. G2: 47% v. 49%, NS). Another difference between the two is the hospital LOS. Patients in the early era group had an overall shorter hospital LOS (G1: 90 days v. G2: 127 days v. G3: 205 days, $p<0.05$). Finally, we also saw significantly surface area grafted per patient in more recent times

(G1: 2000cm2 v. G2: 4187cm2 v. G3: 4090cm2, $p<0.05$). Differences in complication rates between the three groups were not found to be statistically significant.
Conclusion: We found statistically significant differences in mortality between the three observation groups. The rise in mortality in the pre-modern group is possibly to a change in infrastructure involving multiple, frequent staff changes. Effective use of CEA requires a learning curve and once the original team disbanded, frequency-of-use declined as well as comfort-of-use. The use of CEA has not gained popular use despite proven, positive outcomes. Our observations show that the use of CEA should be considered as a treatment option for patients with large burns.

Intraoperative Identification of Perforator Vessel Spasm and Decreased Pulsation During Free Flap Harvest Using Video-capillaroscopy

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Purpose: Perforator flaps have become widely used in plastic surgery. Anatomically, perforators have a gradual reduction in the vessel caliber as they run towards the periphery. During free flap elevation, temporary or prolonged vascular spasms can be appreciated, resulting in a momentary decrease in pulsation. This phenomenon, unless resolved, can result in postoperative flap failure. Usually, intraoperative topical application of papaverine hydrochloride and/or warm water are sufficient to restore normal blood flow. Nevertheless, due to lack of reliable assessment modalities (e.g., macroscopic observation, loupe, or palpation), resolution of the spasm and recovery of pulsation at the periphery of perforators cannot be determined in a judicious and objective manner. The purpose of this study was to use the new generation video-capillaroscopy to evaluate and analyze the pulsation of perforators and observe circulation at the end of branches with a diameter even in $\leqq$ 0.01-mm in adipose tissue during flap elevation.

Methods: Between November 2021 and February 2022, seven free flaps (two rectus abdominis flaps and 5 anterolateral thigh flaps) for head and neck reconstruction were evaluated with video-capillaroscopy (Bscan-ZD, GOKO Imaging Devices Co., Ltd., Japan). The visual field of video-capillaroscopy was about 175x and 620x, 1.2 million pixels, and 1-mm depth from the surface. The type of perforator spasm after flap elevation was divided into 6 types according to the video-capillaroscopy findings. No spasm/decreased pulsation (S/DP) (type A); S/DP with recovery within 5 minutes (type B); S/DP requiring papaverine hydrochloride spraying (PHS) and hot

water treatment (HWT), resulting in recovery within 5 minutes (type C); S/DP requiring PHS and HWT resulting in recovery within 10 minutes (type D); S/DP requiring PHS and HWT resulting in recovery within 15 minutes (type E); S/DP with no recovery on pulsation following PHS and HWT (type F).

Results: Twenty-five perforators were evaluated. Using our classification for perforator vessel spasms on video-capillaroscopy, observations of five perforating branches were classified as Type-A, seven as Type-B, six as Type-C, five as Type-D, and two as Type-E. No Type-F spasms were observed. Real-time movement of red blood cells in adipose tissue and pulsation could be observed in perforator's branches with a minimum diameter of 0.007 mm. Vascular pulsation with sinus rhythm could be observed on the imaging monitor. The absence/presence of pulsation made it possible to determine the alignment of the artery and vein.

Conclusion: During microvascular reconstruction, it is imperative that blood flow from perforating vessels is stable with resolution of S/DP before the pedicle vessel is cut and anastomosis is performed. In some instances, vascular damage during flap harvest and perforator dissection can cause interruption of blood flow to the periphery via different mechanisms. With video-capillaroscopy it is possible to confirm if blood flow deterioration occurs even in areas that are difficult to observe macroscopically. Video-capillaroscopy, a non-invasive imaging modality, is a useful alternative for the intraoperative evaluation of perforator flow and safe flap elevation and transfer.

Use of Tranexamic Acid in Gender-Affirming Mastectomy

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Background: Gender-affirming mastectomy, or "top surgery," has become one of the most frequently performed procedures for transgender and nonbinary patients. The established safety and efficacy of tranexamic acid (TXA) in minimizing perioperative blood loss in cardiac, orthopedic, and other procedures has led to a recent increased interest within plastic surgery, with recent reports demonstrating promising results in face lift, rhinoplasty, and breast surgery. These studies demonstrate decreased edema and ecchymosis, as well as reduced rates of postoperative collections with administration of TXA, however its use has not been reported in

top surgery. This represents the first study to evaluate the impact of TXA on postoperative outcomes in patients undergoing gender-affirming mastectomy.

Methods: Retrospective review identified all patients undergoing top surgery by the senior author between February 2017 and October 2021. Reflecting a change in the senior author's practice, beginning in June 2021, all patients received 1000 mg of intravenous TXA prior to incision and 1000 mg at the conclusion of the procedure. Patients were stratified according to intraoperative administration of TXA, with demographics, surgical characteristics, and postoperative outcomes compared between groups (TXA vs. No TXA).

Results: A total of 667 patients underwent gender-affirming mastectomy during the study period. Of these, 615 cases were performed without the use of TXA, while 51 patients received intravenous TXA intraoperatively as above. Demographics and surgical characteristics were similar between groups. The rate of seroma was significantly lower in the TXA group (9.8% vs. 33.8%, respectively; $p<0.001$), and the frequency of postoperative hematoma was also lower in the TXA group, however this failed to reach statistical significance (0% vs. 5.5%; $p=0.085$). There was no difference in rates of surgical site infection ($p=0.99$), and use of TXA was not associated with any increase in rates of venous thromboembolism ($p=0.99$).

Conclusions: Similar to previously published findings in other plastic surgery procedures, our results suggest that intraoperative administration of TXA in patients undergoing top surgery may safely reduce the risk of postoperative collections like seroma and hematoma without any increased risk of postoperative thromboembolic events. Additional data collection and prospective studies are warranted to corroborate these findings.

Virtual Surgical Planning in Free Fibula Reconstruction of the Head and Neck Region: Comparison of Surgical Outcomes with the Conventional Technique

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Background: Pre-operative virtual surgical planning (VSP) through computer-aided design and computer-aided modeling (CAD/CAM) is an emerging technology that revolutionized the way

we approach head and neck reconstruction after extirpative surgery. It has been particularly useful in osteocutaneous free tissue transfer for complex defects as a method to improve accuracy, operative efficiency, and osseous union with less adverse outcomes. Given the relatively recent introduction, studies performing head-to-head comparison to the conventional technique are limited. We aimed to compare free fibular reconstructions of the head and neck reconstructions with VSP versus the conventional technique for early surgical outcomes to elucidate the clinical impact of VSP.

Methods: A retrospective review of the patients who underwent head and neck free flap reconstruction at a tertiary center from 2012 to 2021 was performed. All free fibular reconstructions were included regardless of the etiology. Data regarding patient demographics, past medical history, surgical details, and overall outcomes was collected. Patients that had VSP were compared with the patients who underwent reconstruction with the conventional technique. Outcomes studied included postoperative 30-day recipient site complications, total and partial flap failure, and hardware exposure rates. Statistical analysis was performed using chi-square and T-tests, and P-value ≤ 0.05 was considered statistically significant.

Results: Free fibular reconstructions were performed in 273 patients. VSP (n=173) and conventional (n=100) cohorts had similar characteristics in terms of gender (male 64% vs 68%, p=0.520), BMI (26±6 vs 26±6, p=0.898), and tobacco use (smokers 72% vs 81%, p=0.106). The VSP cohort was younger than the conventional counterpart (58±13 vs 61±11, p=0.033), had more vascular comorbidities (8% vs 1%, p=0.019) and had higher rates of previous radiotherapy history (14% vs 7%, p=0.085). The most common reason for the reconstruction was cancer surgery in both groups (78% vs 89%, p=0.247) and majority of the flaps were osteocutaneous (89% vs 93%, p=0.274). The operative duration was significantly shorter with the use of VSP (724±153 vs 784±169, p=0.003), while the ischemia times were similar (137±32 vs 131±51, p=0.365). Both groups had similar rates of total (2% vs 2%, p=0.875) and partial (4% vs 4%, p=0.985) flap loss, recipient site dehiscence (11% vs 15%, p=0.333), infection (23% vs 15%, p=0.132) and hematoma (5% vs 2%, p=0.266). The VSP group had significantly lower rates of hardware (2% vs 8%, p=0.011) and bone exposure (1% vs 5%, p=0.053) on the postoperative 30-day period.

Conclusion: This is the largest study to compare outcomes between VSP with the conventional technique for bony reconstruction of the head and neck region. Our results show that the use of VSP has reduced the operative duration. Early surgical complication rates are similar to the conventional technique, while the hardware exposure rates are significantly lower. Longer follow-up of our cohort to assess the osseous union, precision of hardware placement and the functional outcomes will provide and in-depth understanding on the benefits of VSP for head and neck reconstruction.

Long-Term Outcomes In Patients With Peripheral Arterial Disease Who Undergo Free Flap Reconstruction For Chronic Lower Extremity Wounds

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Objectives: Free tissue transfer (FTT) is critical for limb salvage of chronic lower extremity (LE) wounds. In patients with peripheral arterial disease (PAD), FTT to the LE may be challenging due to limited vessel selection for anastomosis. Herein, we evaluate our surgical and functional outcomes following FTT to LE in patients with PAD.

Methods: A retrospective review identified patients who underwent FTT between 2011-2021 at a single institution. All patients underwent preoperative arteriogram by senior author (C.M.A.) and subsequent FTT reconstruction by a single microsurgeon (K.K.E.). Patients were classified into PAD or non-PAD cohorts, based on presence of severe LE arterial stenoses and/or occlusions, as judged by the senior author. Primary endpoints included complications, flap success, need for post-flap endovascular re-intervention, limb salvage, and ambulatory status.

Results: A total of 253 patients underwent FTT to LE, of which 84 patients (33.2%) were classified into the PAD cohort. Patients with PAD had a higher prevalence of comorbidities, including diabetes (83.3% vs. 39.1%, $p< 0.001$) and ESRD (8.3% vs. 2.4%, $p=0.028$). A total of 53 patients underwent pre-FTT endovascular intervention (51 angioplasty, 3 stent). There was significantly more forefoot (27.4% vs. 16.6%, $p=0.043$), plantar (33.3% vs. 13.0%, $p< 0.001$), and trans metatarsal amputation wounds (23.8 vs. 4.7%, $p< 0.001$) in the PAD group. Similarly, osteomyelitis was more common in the PAD group (73.8 vs. 55.0%, $p=0.004$). There were no differences in FTT donor site or flap composition. End-to-side anastomosis was performed more often in PAD patients (92.9% vs. 82.8%, $p=0.030$).

A higher number of total complications occurred in the PAD cohort (38.1% vs. 20.7%, $p=0.003$), of which partial flap necrosis was significantly higher in the PAD group (6.0% vs. 0.6%, $p=0.016$). Flap success rate was similar between the two groups ($p=0.430$). More post-flap angiograms were performed in the PAD group (29.8% vs. 7.1%, $p< 0.001$), of which post-flap repeat percutaneous endovascular intervention was needed in 68.0% of the PAD group compared to 33.3% of the non-PAD group ($p< 0.001$). At a mean follow-up of 21.1 months, limb salvage rates were similar in the non-PAD and PAD cohorts (90.5% vs. 84.5%, $p=0.158$), with no significant differences in ambulatory status or mortality.

Conclusions: This is the largest study to demonstrate excellent long-term limb salvage outcomes in patients with PAD who undergo FTT to LE. Limb salvage, utilizing percutaneous endovascular intervention and FTT, should be highly considered among patients who would otherwise undergo limb amputation.

Effect of Different Surgical Techniques on Midface Facial Paralysis Outcomes: A Systematic Review

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Background: The large variety of outcomes measurement tools remains a major challenge in evaluation of facial reanimation interventions. No single grading system has yet become widely accepted to date and thus procedural outcomes are difficult to compare. Consequently, there is limited literature of higher evidence comparing midface reanimation techniques based on operative outcome. The purpose of this study is to conduct a systematic review of facial reanimation techniques to determine the efficacy of interventions performed.

Methods: PubMed, Embase, Web of Science, and Cochrane Central databases were systematically reviewed following PRISMA guidelines. Articles reporting on midface facial reanimation literature between 1993 and 2022 were identified. Following inclusion criteria were used: at least 2 years of follow-up, level 4 evidence or higher, and availability of pre and post-operative data utilizing the same grading system. Across wide variety of facial reanimation techniques, meta-analysis with random effects of mean improvement difference was performed.

Results: 2155 articles were identified during initial search and screened. 28 articles met inclusion criteria. In included articles, six grading systems utilized to report on surgical outcomes were identified. Two most common system found were House-Brackmann (H-B) (11 articles; 39%, and 184 patients) and Terzis (10; 36%; 507 patient). H-B (6-point scale) results primarily reported on nerve transfer studies using either the hypoglossal or masseter nerve. Hypoglossal nerve transfers had an average improvement of 2.72 points (2 SD = 2.56, 2.88) while the masseter nerve transfers had an average improvement of 2.49 points (1.01, 3.97). The Terzis grading system (5-point scale) results primarily reported on 1 and 2 stage reanimation techniques. 1-stage procedures in all Terzis studies reported had an average improvement of 2.25 points (1.24, 3.27) while 2-stage procedures had an average improvement of 2.50 points (2.04, 2.96).

Conclusion: Lack of standard and widely accepted grading system to evaluate facial reanimation outcomes represents a major limitation in assessment of various facial reanimation techniques. Based on our results, two-stage procedures incline to result in greater improvement compared to one-stage. Furthermore, hypoglossal nerve transfers result in greater improvement in comparison to masseteric nerve transfers. Strong emphasis should be applied on using uniform use of single grading system for future work in facial reanimation outcomes assessment.

Utility of Outpatient Propeller Flap Reconstruction Following Skin Cancer Excision

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Introduction: Reconstruction following skin cancer resection can be difficult owing to wide margins and need to preserve both functionality and aesthetics.1 Perforator propeller flaps are a versatile option which provide reliable like neighboring tissue with minimal donor site morbidity.1 We aim to describe a single surgeon's consecutive series of outpatient propeller flap reconstructions involving the trunk, upper, and lower extremities following skin cancer resections, and report surgical outcomes and complications. In doing so, we aim to demonstrate the utility of outpatient propeller flaps in skin cancer patients who may require closure at the trunk or extremities.

Methods: All patients who underwent melanoma and non-melanoma skin cancer excision followed by propeller flap reconstruction by a single surgeon between July 2019 to July 2021 were retrospectively reviewed. Patient demographics, cancer details, operative details, and postoperative outcomes were collected.

Results: Twenty-two propeller flap reconstructions following melanoma and non-melanoma skin cancer resections were identified in 22 patients (59.1% male). Mean age was 62.7±13.4 years, mean body mass index 27.1±3.2 kg/m2, and median Charlson Comorbidity Index score 5 (IQR: 4-6). Eighteen patients presented with a local malignancy (81.8%) while four presented with metastatic spread (18.2%). Skin cancers included 17 melanoma cases (77.3%) and five non-melanoma cases (22.7%). Non-melanoma skin cancers included two cases of sarcoma (9.1%) and one case each of squamous cell carcinoma, Merkel cell carcinoma, and eccrine porocarcinoma (4.5%). Skin cancers primarily occurred in the upper extremities (11, 50.0%), followed by the lower extremities (7, 31.8%) and trunk (4, 18.2%). Mean skin defect size

following resection was 41.7cm2±18.9, with a mean flap size of 37.1±20.7cm2. Flap rotation was most frequently 180 degrees in 8 cases (36.4%). All donor sites were closed primarily. Mean operative time for propeller flap reconstruction was 125.0±44.2 minutes, with median hospital length of stay 0 days (range 0-2). Flap survival was 95.5% (n=21). Three patients experienced complications (13.6%), including one case each of hematoma and dehiscence, seroma, and partial necrosis. Two patients required return to the OR: one for hematoma evacuation, flap debridement and flap advancement, and the other due to flap failure requiring excision of the necrotic flap and secondary closure. Mean follow-up was 10.1±8.1 months.

Conclusions: Goals of reconstruction following skin cancer resection include restoration of form and function with minimal aesthetic deformity and without compromising the safety or effectiveness of oncologic treatment and resection.1 Propeller flaps are a versatile option for reliable reconstruction of defects in the extremities and trunk following skin oncologic resection and can successfully be performed in the outpatient setting. They provide adequate coverage due to their rotating ability, while reducing postoperative donor site morbidity and recipient site complications. Additional benefits include safety of use in elderly and comorbid skin cancer patients, technical ease, and reduction in operative time required to complete the procedure and in resultant inpatient stay.

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Effectiveness of Transversus Abdominis Plane block in Breast Free Flap Reconstruction
Presented During:

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Background: Transversus Abdominis Plane (TAP) block is a safe and effective regional block that has shown to help with post-operative pain control, reduction in narcotic pain medication use, and recovery in various surgical procedures that require abdominal incisions including open abdominal surgery, laparoscopic surgery, and cesarean section.1-3 Liposomal bupivacaine (Exparel) has recently come to spotlight as a local anesthetic agent that provides longer and more sustained pain relief.4 This study aims to compare the effects of plain bupivacaine TAP block to liposomal bupivacaine TAP block in patients undergoing deep inferior epigastric perforator (DIEP) flap breast reconstruction.

Methods: The authors conducted a prospective single-center, single-blinded, randomized controlled clinical trial with two arms between March of 2021 and December 2021. Authors compared post-operative pain scores and narcotic pain medication requirements between two groups who underwent DIEP flap breast reconstruction with plain bupivacaine TAP block and liposomal bupivacaine TAP block. Control group received a mixture of 30cc 0.25% bupivacaine and 50cc saline while the experimental group received a mixture of 20cc liposomal bupivacaine, 30cc 0.25% bupivacaine, and 50cc saline. All blocks were delivered by the surgeon intraoperatively. All patients received the same multimodal pain management as part of the ERAS pathway post-operatively. Participants' post-operative pain scores, narcotic pain medication requirement, and number of narcotic pain medication refill were analyzed.

Results: A total of 57 participants were included with 27 in control group and 30 in experimental group. Post-op pain scores in PACU and its average at 4, 12, 24 and second 24 hours did not show any significant difference between two groups. Control group had higher average narcotic requirement compared to the experimental group at both post-op day 1 and 2 (48.2 MME vs. 42.3 MME, 31.4 MME vs. 26.4 MME). There was no significant difference in number of narcotic pain medication refill after discharge or length of stay between the control and experimental groups.

Conclusion: Liposomal bupivacaine TAP block can help reduce the amount of post-operative narcotic requirements for patients undergoing DIEP flap breast reconstruction during their hospitalization. Liposomal TAP block did not significantly affect the post-operative pain scores, number of narcotic pain medication refills, or length of stay.

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Acute Rejection Manifesting Discordant Histological Findings in a Combined Face and Bilateral Hand Transplant Recipient

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Background: The gold standard for immunologic monitoring of most vascularized composite allografts has long been histological assessment of skin biopsies, utilizing the Banff Classification to grade the degree of inflammatory infiltrate and epithelial involvement. To limit the number of biopsies taken from allografts, the use of sentinel flaps has been proposed by some at the time of transplantation. In theory, these may serve as a proxy for monitoring of allografts. However, the published literature does not show a consistent correlation between the immunologic findings seen in the primary allografts and the sentinel flaps. We report our findings in a face and bilateral hand transplant recipient that was monitored with multi-site allograft biopsies during an episode of steroid-refractory acute rejection.

Methods: Skin biopsies were taken from both the facial and hand allografts, at the neck and forearms, respectively, at multiple timepoints over a 5-month period, during which there was ongoing clinical rejection. Histological assessment of biopsies was conducted according to the Banff Classification system by a single dermatopathologist. For each timepoint, we collected a biopsy from the facial allograft and at least one of the hand allografts. The results from each timepoint were evaluated in the context of the recipient's clinical presentation and assessed for consistency of findings between the facial and hand allografts.

Results: A total of 20 biopsies were collected at 8 separate time points. At 4 of the 8 (50.0%) timepoints, histological assessments revealed a discordance in Banff grade between the facial and hand allografts. Of these 4, the overall grade seen in the hand was higher by 1 level relative to the face at 3 (75%) timepoints, and this was due to the higher inflammatory infiltrate grading. Biopsies only showed concordant descriptions for all three sites at 50% of the time points. The patient was first admitted in May 2021 on clinical suspicion of rejection as manifested by allograft erythema and edema. He showed some improvement upon administration of pulse steroids. There was a subsequent admission in June following a similar protocol, but due to incomplete resolution of rejection, the patient required a longer admission for treatment with anti-thymocyte globulin and topical tacrolimus. Thereafter, we have not observed a recurrence of rejection.

Conclusion: We found that the discordant histological findings seen during acute rejection in a face and bilateral hand transplant recipient warrant a rethinking of the utility of the Banff

Classification system for clinical decision making in vascularized composite allotransplantation. Furthermore, our findings revealed differing cross-sectional patterns of inflammatory infiltrates in the face and hand allografts at multiple timepoints, suggesting that despite the systemic nature of acute rejection different allograft sites do not appear to be affected uniformly by this process. This may warrant reconsideration of the value of sentinel flaps as a reliable scheme for immunologic monitoring of allografts.

The Impact of Prior Breast Augmentation on Breast Reconstruction After Mastectomy

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Summary: Women with history of bilateral augmentation mammaplasty (BAM) may have lower risk of developing breast cancer compared to the general population.1,2 This may explain the relative paucity of literature on breast reconstruction in this population, especially in terms of timing and type of reconstruction performed. The purpose of this study was to evaluate the impact of previous BAM on post-mastectomy breast reconstruction in a southern rural population. We hypothesized that patients with previous breast augmentation would be more likely to undergo breast reconstruction, prefer allogenic reconstruction, and choose similar implant type and plane in their reconstructed breasts as their augmentation.

Method: A retrospective review of patients that underwent mastectomy from 2017-2021 was performed, utilizing our institution's prospectively enrolled tumor registry database. Patients with incomplete records were excluded. Rates and type of reconstruction were examined and compared in patients with and without history of BAM. Statistical analysis utilizing frequencies and percentages, descriptive statistics, chi-square analysis, and Fisher's exact test was performed.

Results: 475 patients were included. Average BMI was 29.1, 96% of patients identified as White, and average age at diagnosis was 59.3 years. Average length of follow-up was 23.9 months. 20 (4.2%) patients had history of BAM. 10 patients had saline implants and 10 had silicone, while 9 underwent subglandular augmentation and 11 submuscular. Postmastectomy breast reconstruction was performed in 80% of the previously augmented patients, compared to

49.9% of non-augmented patients (p=0.01). 100% of patients with history of BAM underwent allogenic reconstruction, compared to 88.1% in the non-augmented group (p=0.15). Submuscular reconstruction was performed in 11 patients, while prepectoral in 5. 100% of reconstructed BAM patients underwent immediate reconstruction, compared to 90.7% of non-augmented patients (p=0.24). 25% of BAM patients underwent direct-to-implant reconstruction, compared to 26% of non-augmented patients (p=1.00). In terms of type of implants, 11 patients chose silicone (68.75%) in the augmented group, compared to 43.6% in the non-augmented group (p=0.36). The 4 BAM patients that did not choose to undergo reconstruction had prior subglandular mammaplasties. Of reconstructed patients with prior BAM, 75% underwent same implant plane reconstruction, and 68.75% underwent same implant type reconstruction as their previous augmentation.

Conclusion: Patients with previous BAM were more likely to undergo reconstruction after mastectomy at our institution. All patients with previous augmentation underwent allogenic reconstruction, the majority of which were performed immediately and in staged fashion. Submuscular reconstruction and selection of silicone implants was more common among the previously augmented patients. Additionally, most patients maintained the same implant type and plane of reconstruction as prior augmentation. Larger studies are required to further investigate current trends in breast reconstruction in patients with a history of breast augmentation.

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Racial Disparities in Hidradenitis Suppurativa Management at a Single Institution

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Introduction: Hidradenitis Suppurative (H/S) disproportionately affects African Americans, requiring medical and/or surgical care. Within we describe those affected by this disease at our institution in order to evaluate potential racial disparities.

Methods: IRB exemption (IRB-300006003) was obtained and a retrospective review of 1,187 patients with H/S cared for by plastic surgery and/or dermatology at our institution was performed. Patients were excluded if older than 65. Demographic information, medical history, dermatology treatment history, surgical history, and insurance information was collected. Independent sample t-tests and chi square tests determined statistical significance.

Results: African Americans were more likely than non-African Americans to be afflicted by H/S of the axilla ($p=0.006$) and groin ($p<0.001$); and were more likely to undergo medical management only ($p<0.001$). Non-African American patients were more likely to have undergone prior plastic surgery ($p<0.001$), undergo initial excision surgery for H/S ($p=0.001$) and revision surgery ($p<0.001$) and had higher rates of postoperative infection ($p<0.001$) compared to African American cohorts. There was no difference in the rate of resolution of symptoms across cohorts, however African American patients reported higher rates of symptom improvement than non-African Americans ($p<0.001$).

Time from initial presentation to surgery was shorter for African Americans (107 days) than for non-African Americans (162 days) ($p=0.045$). Non-African American patients had a shorter time to follow-up following surgery than African American patients, 4.7 to 6.2 days ($p=0.032$). Non-African American patients had more clinic visits than their African American counterparts, 11 to 6 ($p<0.001$). There was no difference in insurance coverage between the two cohorts, however African Americans were more likely to have Medicaid as their initial insurance carrier ($p=0.022$).

There were no differences in BMI between the two groups. Non-African Americans were more likely to be afflicted by diabetes mellitus ($p=0.011$), hypertension ($p<0.001$), have a history of cellulitis ($p<0.001$), and have a history of myocardial infarction ($p=0.002$) than African Americans. African Americans were more likely to have received the human papilloma virus ($p<0.001$) and flu vaccine ($p=0.002$). There was no difference in rates of depression, anxiety, or tobacco use between groups.

Conclusions: African Americans may face disparities in management of this complex and often chronic disease course. In addition, non-African American patients may face more medical comorbidities. Thus, it is important those affected by H/S are managed by a multi-disciplinary team to ensure optimal patient care.

Reducing Length of Stay following Autologous Breast Reconstruction via Combined Nerve Block-ERAS Protocol? A Systematic Review and Meta-Analysis

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Background:
Reducing length of hospital stay (LOS) and narcotic usage following autologous breast reconstruction has been shown to reduce postoperative complications, drug-dependencies, and lead to an increased rate of recovery. Previous studies support the use of Enhanced Recovery After Surgery (ERAS) protocols as well as nerve blocks to reduce LOS and lower narcotic usage. However, the additive effectiveness of both methods is not well understood. This systematic review and meta-analysis explore current pain management methods following autologous breast reconstruction to assess best methods of practice.

Methods: A comprehensive literature search was conducted in October 2021 using publications extracted from PubMed, Scopus, and Cochrane Library. Eligible studies were published on or after 2000 and had data reporting LOS, postoperative medications, narcotic usage measured in morphine milligram equivalents (MME). The criteria used were those described in the PRISMA Declaration for performing systematic reviews.

Results: The initial search yielded 301 results. After three stages of screening, 20 studies were included. Of those 20, 9 implemented ERAS protocols and 11 used nerve blocking techniques. Implementation of ERAS protocols lead to a shorter LOS (4.5:5.85, p=0.0047) than non-ERAS postoperative methods. Implementation of nerve blocks, most commonly a Transverse Abdominis Plane block (TAP block), was also shown to reduce LOS (3.36:4.475, p=0.0254) and narcotic usage than the lack thereof.

Conclusions: Existing findings suggest the use of ERAS protocols and nerve blocks to reduce LOS following autologous breast augmentation. Furthermore, a combined intervention using both ERAS protocols and TAP block may have an additive effect in reducing LOS. Further studies analyzing the effects of a combined nerve block-ERAS protocol are needed to reliable assess the potential synergistic effects of the two components.

#TransTok: An Analysis of Surgical Gender Affirmation Content on TikTok

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Purpose: Social media platforms have become increasingly important in visual- and aesthetic-based fields, including plastic surgery. TikTok is a popular video-sharing application, where patients may access health-related information and connect with surgeons. 1, 2 While previous studies have examined the quality of TikTok videos in other specialties, no study has examined the quality of videos in the field of gender-affirming surgery, where patients are more likely to seek medical information from non-traditional sources such as social media due to high medical mistrust. 3, 4 We aim to characterize the content and quality of medical information of surgical gender affirmation videos on TikTok.

Methods: Twenty gender affirmation related hashtags were queried, with the top 25 videos per hashtag included for data analysis. Videos were categorized by creator and content characteristics. Engagement metrics including likes, comments, shares, and views were collected per video. All "educational" videos were analyzed for video reliability, understandability, and actionability via previously validated tools including the modified DISCERN score and the Patient Education Materials Assessment Tool, respectively. Kruskal-Wallis H tests, Mann-Whitney U tests, and multivariable linear regression models were utilized in analysis.

Results: The included 429 videos amassed 571,434,231 views, 108,050,498 likes, 2,151,572 comments, and 1,909,744 shares. Patients were the majority of content creators (74.88%), followed by other laypersons, and PRS physicians. Patient experience videos, such as before-and-after comparisons, were the leading content type (36.07%). The most popular hashtags were #Transgender, followed by #Topsurgery, and #Bottomsurgery. Physician creators had significantly lower likes and comments when compared to non-physicians (1645 vs. 6185, $p=0.028$; 108 vs. 47, $p=0.016$ respectively). Of note, half of the 20 hashtags did not contain any videos posted by a plastic & reconstructive surgeon. Sixty "educational" videos, which amassed 9,559,845 views, 1,896,513 likes, 17,603 comments, and 11,192 shares, were included in the video reliability analysis. There were no significant differences between engagement metrics, such as views, comments, and likes, of different content creators, even after stratifying by physician status, signifying similar audience engagement. Significant differences in video reliability, as measured by mDISCERN scores, were observed with physician created videos rated as "good quality" while non-physician videos were rated as "poor quality" (3 vs. 2, $p<0.001$). Statistically significant differences in PEMAT score were noted as well (90 vs. 84, $p=0.0003$), indicating that MD/DO-posted content was the most understandable and actionable, while patient-posted content was the least. A multivariable linear regression model demonstrated a statistically significant positive association between physician-status and both mDISCERN and PEMAT score after adjusting for video characteristics via engagement rates, with physician status being associated with an 18- and 1.30-point increase in mDISCERN and PEMAT scores, respectively ($p<0.001$).

Conclusion: While transgender-related videos on TikTok are rising in popularity, there is a dearth of content being created by plastic and reconstructive surgeons. In addition, lower quality information is associated with non-physician content creators; we encourage physicians to be continuously involved in creating quality information on TikTok.

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The Risk of Pre-Operative Covid-19 Infection on Microvascular Free-Flap Viability

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Background: Microvascular free-flap tissue transfer is the gold standard for complex reconstructive surgery. However, the impact of Covid-19 infection on free flap viability has not been evaluated.1-5 In this study, we examine outcomes in free flap reconstruction in patients based on pre-operative Covid-19 status.

Methods: A retrospective review of patients who underwent microvascular free-flap reconstruction, between August 2020 and January 2022, was performed at our institution. Exclusion criteria included patients with unknown status of Covid-19 infection prior to surgery. Patient demographics, operative details, and surgical outcomes were collected for analysis.

Results: Of the 107 flaps evaluated, 84 were included. The mean age at time of surgery was 52.6 ±13.4 and mean body mass index (BMI) was 30.2 ±6.4 kg/m2. Comorbidities of patients included hypertension (35.4%), tobacco use (22.0%), and diabetes (11.0%). Free flaps included ALT (n=11), DIEP (n=41), Fibula (n=9), Jejunum (n=1), MSAP (n=1), Omentum (n=2), PAP (n=5), Rectus (n=1), RFFF (n=12), and SIEA (n=1). Of the 84 flaps included in the study, 17 were in patients identified as having a documented Covid-19 infection prior to surgery.

Of the 17 patients with a previous Covid-19 infection, 4 of the free flaps were ultimately not viable (76.5% viability). Of the 67 free flaps in patients without Covid-19 infection prior to surgery, 5 of the free flaps were not viable (92.5% viability). On Chi square analysis, flaps in previously infected Covid-19 patients were significantly more likely to experience flap failure (p=0.012).

Moreover, the group with Covid-19 infection prior to surgery had a 3.82 (95% CI 0.9-16.174) times the odds of free-flap failure than the group without a known Covid-19 infection prior to surgery.

Conclusion: Based on our data, free flaps in patients with prior Covid-19 infection are more likely to experience microvascular flap failure. Additional studies are required to further elucidate this relationship as well as etiology. An early hypothesis is that Covid-19 infection results in a hypercoagulative state that may require adjustments to anticoagulation regimens in free flap patients.

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Outcomes of Burn Patients with Pre-existing HIV, Hepatitis B, and Hepatitis C Viral Infections

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Introduction: Clinical outcomes for patients with burn injuries are directly connected to patient comorbidities. While the subject of how different comorbidities impact hospital course and burn recovery has been extensively studied, few studies investigate the impact of HIV, hepatitis B, and hepatitis C on the clinical course of burn injuries. Burn-related immunosuppression makes patients susceptible to all infections, but it is unclear if or how pre-existing viral conditions impact burn complications and mortality. Our burn center is located in a dense urban area with a high prevalence of these viruses, making our burn patient population ideal to explore the impact of viral infections on burn recovery.

Methods: A retrospective review was performed of patients with prior HIV, HBV, or HCV infection admitted to or managed by our burn center between 2017-2021. Patients with new diagnoses of these viral infections were excluded. Demographic data, burn (B) or wound (W) details, treatment course, and infection data were collected from patient charts. Outcomes were compared between the burn and wound patient cohorts, and with the general burn population. Descriptive data were reported, and comparative analyses were performed using Student's T-test and Fisher's exact test.

Results: We identified 76 patients who were admitted a total of 87 times. At baseline, demographic characteristics were significantly different between the burn and wound groups in race and relationship status and were notable for high unemployment and homelessness rates of 71 (82.6%) and 22 (25.6%). Of these admissions, 50 (57.5%) were for burns, and 37 (42.5%) were for complex wound care. Burn mechanisms per admission included flame (n=27, 56.3%), scald (n=8, 16.6%), contact (n=5, 10.4%), frostbite (n=5, 10.4%), electrical (n=2, 4.2%), chemical burns (n=1, 2.1%), road rash (n=1, 2.1%), and SJS/TEN (n=2, 4.2%). Opioid use was higher in the wound group compared to burns (W= 24, 64.9%; B=16, 32%, p=0.005). Average affected surface area was 10.3% in burns compared to 4.3% in the wounds group (p=0.01). There was no significant difference between mortality rate (W=2, 5.4%; B=4, 8.2%, p=1), length of stay (W=24.13; B=15.32; p=0.11), 30-day readmission rate (W=9, 23.1%; B= 7, 14.89%; p= 0.37) or discharge destination (p=0.733) when comparing burn and wound cohorts. Compared to the overall population admitted to the burn center, the viral infection cohort had significantly higher 30-day readmission rate (18.4% vs. 4.36%, $p<0.001$), but no significant difference in mortality rate (p=0.23).

Conclusions: Outcomes of burn and chronic wound patients with prior viral infections were similar. However, the overall viral cohort had a higher 30-day readmission rate with no difference in mortality, suggesting increased susceptibility to late complications. High rates of unemployment and homelessness in burn/complex wound patients with comorbid HIV, HBV, or HCV suggest that social determinants of health may play a mediating role in readmission rates.

Outcomes of Free vs. Local Flaps for Reconstruction of Proximal-third Leg

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Background: Reconstruction of the proximal-third of the leg often requires soft tissue transfer to facilitate limb salvage. Tissue transfers are usually local or free flaps depending on the wound dimensions and the expertise of the surgeon. Historically, the proximal-third leg is covered with pedicle flaps, but recently, we have used more free flaps in this position. Using outcomes data from a Level 1 trauma center, we sought to evaluate outcomes of surgical management of proximal-third traumatic leg injuries using flaps.

Methods: This is an IRB-approved, retrospective chart review that was undertaken at LAC+USC Medical Center from 2007 to 2019. Patient history, demographics, flap characteristics, Gustilo-Anderson fracture classification, and outcomes were collected and analyzed in an internal database. Outcomes of interest included flap failure rates, postoperative complications, and long-term ambulatory status.

Results: Out of 121 proximal-third lower extremity flaps, 91 (75.2%) were local and 30 (24.8%) were free flaps. Average age of the local flap cohort was 44.6±15.0 years, average BMI was 29.3±8.1 kg/m2, 29.1% had hypertension, 21.5% had diabetes mellitus, 26.6% smoked tobacco, and 59.5% reported at least one comorbidity. Mechanisms of injury included auto versus pedestrian accidents (AVP) (26.6%), motorcycle crashes (MCC) (17.7%), and falls (8.9%). Of the 30 patients who received free flaps, average age was 36.4±14.8 years, average BMI was 27.6±6.2 kg/m2, 21.7% had hypertension, 13.0% had diabetes mellitus, 26.1% smoked tobacco, and 43.5% reported at least one comorbidity. Mechanisms of injury included AVP (26.1%) and MCC (26.1%). Ten (11.0%) local flaps developed hardware infection (n=4) or osteomyelitis (n=6), one of which required amputation, whereas none of the free flaps suffered from osteomyelitis yet one experienced hardware infection. Sixteen (17.6%) local flaps experienced complications including three of which required revision, three developed necrosis, and two suffered flap loss, one of which was salvaged with revision. Similarly, six (20.0%) free flaps experienced complications including four of which required revision, three developed necrosis, and two suffered flap loss; one unfortunately deteriorated and required amputation. Of note, there were significantly more revisions in the free flap cohort (p=0.0411), yet flap survival was not significantly different across cohorts. Average number of days to final ambulation for local flaps was 6.7±10.8 months and 8.2±8.1 months for free flaps (p = 0.546).

Conclusion: In conclusion, our evaluation of proximal-third leg wounds demonstrated fewer infectious outcomes with free versus local flaps; there are multiple confounding variables, such as increased comorbidities in the local flap cohort; however, it is possible that these results reflect the reliability of free flaps. Ultimately, there was no significant difference in flap survival and flap selection did not affect final ambulation. Future studies should evaluate the impact of patient comorbidities and demographics on wound healing and recovery towards full ambulation.

The Impact of Youth Onset Type 2 Diabetes on Postoperative Wound Healing Complications

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Background: Youth-Onset Type Two Diabetes Mellitus (YOT2DM) is characterized by a very rapid decline in beta cells (1), as well as accelerated microvascular and macrovascular complications compared to adult-onset type 2 diabetes (1,2), highlighting the value of viewing this disease as a unique clinical entity. However, it remains unclear if, like adult-onset diabetics, YOT2DM patients experience increased surgical complications with respect to tissue repair and regeneration. The purpose of this study is to determine whether YOT2DM is a risk factor for postoperative surgical complications compared to age-matched non-diabetic patients.

Methods: The National Surgical Quality Improvement Program Database (NSQIP) for years 2012-2019 was used to identify patients aged 18-24 with non-insulin dependent diabetes. Patient demographic information and comorbidities were recorded. Outcomes of interest included wound infections, wound dehiscence, readmissions, and re-operation. Univariate analysis (Independent sample T-test and Chi-Squared) was initially performed to identify differences between YOT2DM and non-diabetic patients for relevant variables and postoperative outcomes. Followed by multivariate logistic regression to control for potential confounders.

Results: 1589 YOT2DM and 196,902 non-diabetic patients ages 18-24 were included in the final analysis. The YOT2DM cohort exhibited a higher proportion of female (83.8% vs. 55.2% p-value <0.001), Hispanic (16.2% vs. 13.6% p-value = 0.002) and non-white (22.7% vs. 19.5% p-value = 0.001) patients. YOT2DM patients exhibited higher frequency of hypertension (HTN) (20.8% vs. 1.9% p-value <.001), a higher mean Body Mass Index (BMI) (41.16 vs 27.16 p-value < 0.001), and more often had elevated American Society of Anesthesiology status (ASA)

(category 3, 4, 5) (52.9% vs. 10.1% p-value <0.001). Interestingly, YOT2DM patients were less likely to have elevated wound contamination status (WCS) (dirty/contaminated) (16.2% vs 25.2% p-value <0.001). Univariate analysis found YOT2DM patients have a statistically higher frequency of superficial surgical site infections (SSI) (2.0% vs 0.8% p-value <0.001) and 30-day readmissions (4.0% vs 3.0% p-value = 0.026). However, deep wound infections, wound dehiscence and 30-day reoperations were not significantly different between YOT2DM and non-diabetic cohorts. Multivariate logistic regression found YOT2DM remained a significant positive predictor of SSI (Odds ratio (OR): 1.584 p-value = 0.016), as was elevated ASA (OR: 2.246 p-value <0.001) and WCS (OR: 1.694 p-value <0.001); while Hispanic ethnicity (OR: 0.746 p-value <0.001) was negatively correlated with SSI. Further, after controlling for confounders, YOT2DM did not significantly predict 30d readmission. However, ASA (OR: 3.457 p-value = 0.006), WCS (OR: 1.536 p-value <0.001) and HTN (OR: 1.604 p-value <0.001) were positively correlated with 30-day readmission, while BMI (OR: 0.985 p-value <0.001) and Hispanic ethnicity (OR: 0.894 p-value = 0.006) were negatively correlated with 30-day readmission.

Conclusion: This analysis of the NSQIP surgical outcomes database demonstrated demographic and comorbidity characteristics of YOT2DM patients consistent with previous literature (2-5). It was found that when compared to non-diabetics, YOT2DM patients exhibited a higher incidence of superficial surgical site infections in the 30-day postoperative period. Higher rates of SSI were found, despite the YOT2DM cohort exhibiting lower rates of wound contamination. After controlling for confounding variables, YOT2DM remained a significant predictor of SSI.

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Research & Technology Abstracts

Intraoperative Loss of a Microsurgical Needle: Assessing Potential Injury and Risks Through a Rat Model

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Purpose: The intraoperative loss of microsurgical needles is not uncommon due to their size (< 8mm) and delicacy. Attempts to recover the needle may subject patients to additional postoperative imaging and care. Current literature regarding the effect of retained needles is ambiguous and limited. Some studies claim procedures to remove needles introduce unnecessary risks.1 In other cases, needles caused chronic pain,2 inflicted vessel injury,3 and presented possible risk during magnetic resonance imaging.4 We sought to determine the risk of neurovascular injury from a retained microsurgical needle.

Materials and Methods: Microsurgical needles were implanted adjacent to the right femoral artery (diameter: 0.45-0.65 mm) in Sprague Dawley rats. The needlepoint faced the vessel to simulate the situation with the greatest potential for harm. The left femoral artery served as a within-subjects control and was untouched. Two experimental groups were used. One group (n=8) was implanted with a 9-0 taper point needle (6 mm long), and the second (n=8) with an 8-0 taper point needle (6.5 mm long). The control group (n=8) underwent an identical surgery with no needle implanted. Postoperatively, rats were separately assessed by two individuals weekly using a standardized pain scoring system that quantified weight change, body condition score, physical appearance, and behavior (i.e. mobility, limping). Infrared (IR) thermography was used to assess limb perfusion. After 90 days, animals were sacrificed, imaged via x-ray, and needles were explanted to determine damage to neurovascular structures.

Results: Overall, there was little difference between the control and experimental groups. Analysis revealed no difference in pain scores over 90 days between the control and experimental groups (mean score: 0). There was no significant difference between groups in the amount of weight gained on postoperative Day 30 (experimental: 54.8%, control: 43.6%, p=0.53) and postoperative Day 90 (experimental: 106.2%, control: 78.1%, p=0.31). There was no significant difference in IR-thermography mean temperature in the operated or virgin leg between control, 8-0, and 9-0 groups over 90 days (Day 15: p=0.94, Day 30: p=0.86, Day 90: p=0.48). Nearly all 8-0 needles were recovered after 90 days (n=7/8, 87.5%), and all successfully recovered 8-0 needles were visualized on x-ray. In contrast, fewer 9-0 needles were recovered (n=6/8, 75%) and none were visualized on imaging (n=0/8, 0%). Gross examination after 90 days revealed capsule formation around the needle, with no damage to nearby neurovascular structures in any animal.

Conclusions: Locating a lost microsurgical needle can add additional operative time, radiation exposure, and increased hospital cost. In the present study, there was no difference in behavior

characteristics, IR-thermography, and structural integrity of neurovascular structures over 90 days in rats who had microsurgical needles purposefully implanted adjacent to the femoral artery. Imaging aided the successful recovery of 8-0 needles, while 9-0 needles were unable to be visualized. Thus, we conclude that microsurgical needles unintentionally left near neurovascular structures may be relatively innocuous and the additional time spent imaging and searching for needles smaller than 8-0 may not present a significant clinical benefit.

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Polysaccharide-Based Nerve Protector Supports Human Adipose-Derived Stem Cells' Adhesion and Proliferation

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Introduction: Fibrosis, adhesions, and scar formation are complications of nerve surgery.1,2 Covering the injured nerve with different types of biomaterials has shown to decrease these undesired results.3 Therefore, improving the nerve healing capability of a biomaterial by adding the regenerative properties of stem cells can create the ideal environment to prevent neural scar tissue formation. Chitosan is a well-known biomaterial that can mimic the natural extracellular matrix, making it a suitable candidate to promote cell proliferation.4,5 Hence, we aimed to assess the ability of a chitosan-based nerve protector housing stem cells and their proliferative capacity.

Methods: A chitosan-based nerve protector was designed. The scaffolds were seeded with 1x106 human adipose-derived stem cells. To determine cell proliferation, we froze (-80°C) three scaffolds on days 1, 3, 5, and 7 after seeding. The cell proliferation ratio was calculated using a CyQUANT® cell proliferation assay kit. Additionally, live time-lapse and confocal microscope images of the seeded scaffold were obtained.

Results: Human adipose-derived stem cells attached to the scaffold and remained viable throughout the experiment. Cell number did not change significantly during the experiment, although we have observed a positive trend in cell proliferation until day 3 after seeding (fold change = 1.4, p-value = 0.12). After that point, cell number progressively decreased reaching a fold-change of 0.92 on day 7 (p-value = 0.32). Although differences in cell proliferation did not reach statistical significance during the study. We confirmed stem cells' adhesion, and movement in the scaffold at day 5 through confocal laser microscopy and time-lapse live imaging, respectively.
Conclusion: A chitosan-based neural scaffold demonstrated its ability to carry mesenchymal stem cells and promoted cells adhesion and expansion for five days after seeding.

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Evaluation of Spin in the Abstracts of Systematic Reviews and Meta-analyses Published in High-Impact Plastic Surgery Journals: A Systematic Review

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Background: "Spin" is a form of reporting bias where there is an inappropriate presentation of study results, often overstating efficacy, or understating harms. Abstracts of systematic reviews

in other clinical domains have been demonstrated to employ spin, which may lead to clinical recommendations that are not justified by the literature. The objective of this study was to determine the prevalence of spin strategies in abstracts of plastic surgery systematic reviews.

Methods: A literature search was conducted using MEDLINE, Embase, and Central, to identify all systematic reviews published in the top five plastic surgery journals from 2015-2021. Screening, data extraction, and spin analysis were performed by two independent reviewers. Data checking of the spin analysis was performed by a plastic surgery resident with graduate-level training in clinical epidemiology.

Results: From an initial search of 826 studies, 60 systematic reviews were included in this study. Types of spin were identified in 73% of systematic review abstracts (n=44). The most prevalent type of spin was "Conclusion claims the beneficial effect of the experimental treatment despite the high risk of bias in primary studies," which was identified in 63% of studies (n=38). There were no significant associations between the presence of spin and study characteristics.

Conclusions: The present study found that 73% of abstracts in plastic surgery systematic reviews contain spin. Although systemic reviews represent the highest level of evidence, readers should be aware of types of spin when interpreting results and incorporating recommendations into patient care.

Impact of Completing Face-Q Craniofacial Module Scales on Children and Young Adults with Facial Differences: An International Study

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Background: The FACE-Q Craniofacial module measures outcomes that matter to patients with diverse craniofacial conditions. However, it is not known whether completing a patient reported outcome measure (PROM) has a negative impact on patients, particularly children. This study aims to investigate the impact of completing the FACE-Q Craniofacial module and identify factors associated with a negative impact.

Methods: Participants were aged 8-29 years, with a facial difference, who completed at least one module of the FACE-Q Craniofacial module as part of the international field-test study between December 2016-2019. Participants were asked three questions: 'Did you like or dislike answering this questionnaire?'; 'Did answering these questions change how you feel about how you look?';

and 'Did answering this questionnaire make you feel unhappy or happy?' Univariate and multivariable logistic regression analyses were used to evaluate variables associated with a negative response.

Results: The sample included 927 participants. Most patients responded neutrally to all impact questions: 42.7% neither disliked nor liked the questionnaire; 76.6% felt the same about how they looked; and 72.7% felt neither unhappy/happy after completion. Negative responses represented a small proportion of patients across all three impact questions (<13.2%). Increased craniofacial severity, more scales completed, and lower scores on all FACE-Q scales were associated with negative responses for all three impact questions ($p<0.01$).

Conclusion: This study provides evidence that the FACE-Q Craniofacial module is acceptable for most participants. Clinicians and study investigators should follow up with patients after completing this PROM to address areas of concern in scale scores.

Seeding of Allogeneic Mesenchymal Stem Cells on Collagen Nerve Conduits is Safe in a Rabbit Model

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Background: Mesenchymal stem cells (MSC) stimulate nerve and tissue regeneration and are primed for clinical translation. Application of autologous MSCs is limited by requirements for expedient harvesting procedures, proliferative expansion to increase cell numbers, and reduced regenerative potential due to aging or pathological conditions. Because MSCs are immune-privileged, allogeneic MSCs may serve as "off-the-shelf" cell-based reconstructive treatments to support nerve repair. Therefore, we examined the safety and immune response parameters of allogeneic MSCs seeded on NeuraGen® Nerve Guides (NNG) in a rabbit model.

Methods: NNGs with or without allogeneic rabbit MSCs were applied to rabbit sciatic nerves. Randomly assigned treatment included: group I (no surgery control, n = 3) or groups II and III (sciatic nerve wrapped with unseeded or allogeneic MSC-seeded NNGs; n = 5/group). Rabbits were euthanized after 2 weeks to monitor functional recovery by histological evaluation of sciatic nerves and tibialis anterior (TA) muscle. Host reactions to allogeneic MSCs were analyzed by assessment of body and tissue weight, temperature, as well as hematological parameters, including white blood cell count (WBC), spleen histology, and CD4+ and CD8+ T lymphocytes.

Results: Histological analyses of nerves and spleen were all unremarkable, consistent with the absence of overt systemic and local immune responses upon allogeneic MSC administration. No significant differences were observed in WBC or CD4+ and CD8+ T lymphocytes across unseeded and seeded treatment groups.

Conclusions: Allogenic MSCs are safe for use and may be considered in lieu of autologous MSCs in translational animal studies as the basis for future clinical nerve repair strategies.

Gender is a Spectrum: Evaluating Current and Novel Ways to Inquire About Gender Identity in the Healthcare Setting

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Background: Gender identities are moving away from the binary paradigm and evolving into more nuanced frameworks of describing and understanding gender. Several studies have investigated optimal ways of inquiring about gender, from the multiple-choice question (MCQ) to free-response (FR) format. However, few have investigated the use of visuals to evaluate gender identity. Therefore, this study aims to 1) develop a visual to illustrate gender on a spectrum, 2) assess inclusive ways of inquiring about gender, and 3) evaluate the role of pronouns in the healthcare setting.

Methods: A survey was developed to assess the most and least inclusive ways of inquiring about gender. The survey included a visual spectrum, MCQs, and free response question. In the visual spectrum, respondents were asked to select one box that best depicts their gender on the spectrum. All answer choices for MCQs were depicted in alphabetical order to eliminate bias of placing more common answer choices initially. All respondents were patients seen at consultation or follow-up appointments for gender-affirming mastectomy or breast augmentation with the senior author.

Results: There were 49 survey responses. The majority of respondents were in their 20's (61.2%) and identified as White (51%). For the gender spectrum, the most common selections were box A (28.6%), G (20.4%), and Y (12.2%). For the FR question, there were 16 unique responses with the most common answers being "man" (18.4%) and "nonbinary" (18.4%). The three most common MCQ selections were "trans man/trans male" (26.5%), "nonbinary" (12.2%), and "other" (12.2%). The majority of respondents who identified as "trans man" or "man" on the MCQ selected A or G on the spectrum (83.3%). Respondents who identified as "trans woman" on the MCQ selected Y (40%), I (20%), G (20%), and S (20%) on the spectrum.

FR was reported as the most inclusive way to inquire about gender identity (65.3%), followed by the spectrum (30.6%), and the MCQ (4.1%).
When asked how often pronouns are asked in healthcare settings, 34.3% said sometimes, 31.4% reported rarely, 28.6% reported often, and 5.7% reported never. 65.7% agreed that asking about pronouns is very or extremely important in the healthcare setting, with 11.4% stating it is slightly important.

Conclusions: The common MCQ format for self-identifying gender may be lacking in inclusivity and fails to represent the holistic nuances of gender. For example, while respondents with more masculine gender identities selected boxes near the spectrum corner of "man", there was more variability for more feminine gender identities. Respondents preferred FR as the most inclusive way to inquire about gender. These findings highlight the importance of formatting gender identity questionnaires to foster inclusivity for transgender patients.

Delphi Consensus to Establish the Core Curricula for Gender-Affirming Surgery Trainees in the United States

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Background: Gender-affirming surgery (GAS) is the newest and fastest growing field in plastic surgery with increasing demand and interest. Therefore, it is crucial that more residents and fellows are adequately trained in the field of GAS. However, to date, there is no standardized curricula for training surgical residents and fellows in GAS. Thus, we aim to identify topics for core GAS curricula that are appropriate for fellowship and plastic surgery residency.

Methods: Four GAS surgeons from different academic institutions identified initial curricular statements within six categories: (1) comprehensive GAS care, (2) gender affirming facial surgery, (3) masculinizing chest surgery, (4) feminizing breast augmentation, (5) masculinizing genital GAS, and (6) feminizing genital GAS. Then, expert panelists, consisting of plastic surgery residency program directors (PRS-PDs) and GAS surgeons, were recruited for three-round Delphi consensus process.

Panelists chose if each curriculum statement was appropriate for residency, fellowship, or neither. A statement was included in the final curriculum when Cronbach's alpha value was ≥ 0.8 and ≥ 80% of the panel agreed on inclusion. All surveys are distributed through Qualtrics (Qualtrics Inc, Seattle, Washington).

Results: There are thirty-four experts consisting of 14 PRS-PDs and 20 GAS surgeons, representing 28 institutions in the United States who participated in the Delphi process. The response rate was 100% and 94% for the first and second rounds, respectively. Out of 124 initial curricular statements, 47 were included in the final GAS curriculum for residency and 27 for fellowship.

Out of 124 initial curricular statements, 57 statements (46%) curricular statements, achieved ≥ 80% consensus from the first round. All statement for top surgery and breast augmentation reached consensus. The 67 remaining statements were primarily related to bottom surgery. These statements were revised, and six additional statements were added to the second round survey per panelist's comments.

Out of 73 statements in the second survey, 18 (24.7%) achieved ≥ 80% consensus after the second round. The third-round survey is currently underway.

Conclusion: A national consensus on core GAS curriculum for plastic surgery residency and GAS fellowship was achieved via the Delphi method. As breast surgeries are commonly performed by plastic surgeons, consensus was quickly achieved on top surgery and breast augmentation statements. However, as bottom surgery is often performed in collaboration with other specialties and in multidisciplinary fashion, consensus was not as easily reached. Therefore, this Delphi study not only establishes a foundational GAS curriculum for plastic surgery trainees, but also promotes interdisciplinary collaboration. Implementation of these curricula will ensure that trainees in plastic surgery are adequately prepared in the field of GAS.

Ex Vivo Subnormothermic Preservation of Porcine Superior Epigastric Artery Perforator Flaps

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Purpose: Reconstruction of complex head and neck, breast, and extremity defects often require autologous transfer of vascularized tissues and restoration of perfusion microsurgical repair of the vascular pedicle. Flap failure, caused by vascular thrombosis (~5.1%), leads to significant patient morbidity, longer hospitalizations, and greater health care costs. In vessel-depleted or sick patients, free flap reconstruction is challenging. The aim of this study was to develop a protocol for Ex Vivo Subnormothermic Preservation (EVSNP) of flaps. We hypothesized that EVSNP can maintain flaps in near physiologic conditions for at least 12 hours.
Methods: Twelve superior epigastric artery perforator flaps were procured from Yorkshire pigs. Flaps were preserved using ex vivo subnormothermic perfusion (EVSNP, n=6) with an oxygenated colloid solution containing HBOC-21 as oxygen carrier or at 4°C (static cold storage control) for 12h (n=6). Outcome measures, including perfusate dynamics, temperature, gases, metabolites, electrolytes, and flap weight, were monitored and evaluated using Pearson correlations and paired t-tests. Skin biopsies were taken every 6 hours for Hematoxylin and Eosin (H&E) histological evaluation (perivascular inflammation, spongiosis, vacuolization of epidermal cells and epidermal necrosis). Indocyanine Green (ICG) angiography was utilized to analyze skin perfusion before division of the flap pedicle and after 12 hours of EVNP.

Results: Mean perfusate flow was 10±0 ml/min at baseline and increased to 16±2 ml/min at TP12 ($p=0.002$). Mean arterial pressure (45±13 mmHg) remained stable during EVNP ($r=0.08$, $p=0.78$). Mean perfusate and flap temperatures were 30.9±1.4°C and 28.4±1.6°C, respectively. Mean arterial PaO_2 was 490±74 mmHg and decreased from 566±41 at baseline to 448±56 at perfusion end ($p=0.004$). $PaCO_2$ was 21±1 mmHg on average, not changing significantly from baseline (TP0 21±1 vs. TP12 21±1, $p=0.19$). $PvCO_2$ was 24±3 at baseline and decreased to 19±1 at TP12 ($p=0.04$). The average pH was 7.37±0.02 and was comparable to baseline at TP12 (TP0.5 7.36±0.02 vs. TP12 7.37±0.02, $p=0.14$).

Mean arterial glucose was 4.7±0.7mmol/L. Venous lactate was 5.1±0.8 mmol/L and remained comparable at perfusion end (TP0.5 4.8±0.5 mmol/L vs. TP12 5.4±1.3 mmol/L, $p=0.18$). Creatine kinase increased over time (TP0.5 864±468 U/L vs. TP12 6340±1764 U/L, $p=0.001$; $r=0.99$, $p=0.01$). Venous methemoglobin was 32.3±10.0%, and increased during perfusion ($r=0.96$, $p<0.0001$). Potassium remained in a physiologic range (mean 3.9±0.22 mEq/L), increasing from 3.7±0.2 mEq/L at baseline to 4.1±0.2 at TP12 ($p=0.0005$). Sodium was slightly elevated (mean 159±3 mEq/L) and increased from baseline 157±0.4 mEq/L to 162±2 mEq/L ($p=0.0004$). Flap weight did not change from beginning to end of perfusion (TP0 0.222±0.041 kg vs. TP12 0.223±0.044 kg, $p=0.48$) or in controls (TP0 0.136±0.067 kg vs. TP12 0.135±0.067 g, $p=0.48$). There was no difference between the percent change in perfused and control flap weight from baseline to 12 hours ($p=0.09$). H&E of perfused skin biopsies did not reveal histopathological damage. Perfusion TP12 ICG angiography revealed well-perfused flaps with regional differences.

Conclusion: Ex vivo sub normothermic perfusion preserved flaps in physiologic conditions for 12 hours. Physiologic parameters were maintained without development of edema and weight gain.

Recombinant Elastin Biomatrix Improves Autologous Fat Grafting for Soft Tissue Reconstruction

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Purpose: Autologous fat grafting has emerged as a cornerstone of plastic surgery. Despite increasing applications in reconstructive and aesthetic surgery, fat grafting poses accessibility issues for patients with inadequate autologous tissue in addition to post-operative complications including fat displacement and necrosis. Currently marketed synthetic polymer or decellularized tissue injectables are inadequate to meet demand for a material able to augment autologous fat grafts due to a lack of intrinsic bioactivity, high cost, or long processing times. We report on the applications of an injectable biomatrix -Fractomer- and its ability to expand the effective volume of adipose tissue, adapt to different shapes, and reduce complications of fat grafting.

Methods: We previously developed a recombinant protein matrix designed to mimic native elastin, modifying it to have temperature responsive phase behavior – turning from liquid to solid at body temperature.1 Rate of degradation and in vivo stability of the subcutaneously injected Fractomer were tracked over 12 months in BL/6 mice using IVIS ® Spectrum in vivo imaging. In vivo biocompatibility was also assessed in Yucatan minipigs for 4 months. To test the combination of Fractomer and fat, human lipoaspirate was harvested, mixed with Fractomer, and subcutaneously injected into athymic mice. Resultant graft volume retention over 6 months was monitored and measured using micro-computed tomography. At the conclusion of all experiments, the injected grafts were excised, fixed, embedded in paraffin, sectioned, and stained to assess cell infiltration, vascularization, and foreign body response.

Results: Fractomer is biocompatible with a degradation rate tunable (25-90% resorption range) with concentration. Histological analysis of Fractomer injections excised at 12 months revealed healthy integration with subcutaneous tissue, including significant vascularization, minimal fibrosis, and minimal inflammatory reaction. Similar results were obtained for Fractomer injections in minipigs, with a high level of vascularization, minimal fibrosis, and only quiescent macrophages present at 4 months. Compared to fat alone injections, Fat+Fractomer co-injections allowed 50% less fat to be used to obtain the same final graft volume at 6 months. On histological examination of the fat+Fractomer grafts, proliferation and remodeling of fat within

the scaffold was seen along with evidence of vascularization, especially with areas of high Fractomer density. Importantly across all experiments no signs of cyst formation or necrosis were seen in the fat+Fractomer groups, whereas fat alone grafts demonstrated fat necrosis in 60% of injections.

Conclusions: Our studies to date demonstrate that the Fractomer biomatrix can integrate with and increase the effective volume of adipose tissue, maximizing graft success while reducing the required amount of autologous tissue needed for reconstruction. Fractomer achieves many coveted qualities of an ideal scaffold as it is angiogenic, biodegradable, and immune-compatible. Our findings demonstrate a viable option for reducing fat grafting complications and increasing accessibility for patients who were previously ineligible.

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Activating MAP2K1 Mutation in Zebrafish Endothelial Cells Causes Arteriovenous Shunts

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Purpose: Arteriovenous malformation (AVM) is a sporadic vascular malformation defined by a nidus of irregular blood vessels connecting arteries to veins instead of a normal capillary bed. Somatic activating mutations in MAP2K1 cause extracranial AVM. The purpose of this study was to create an AVM animal model using zebrafish.

Methods: Single-cell stage casper;Tg(gata1:dsred) zebrafish embryos were injected with 1 nL of transgenesis mixture: 100 ng/µL of either (1) Control (pTol2-Fli:GFP) or (2) Mutant (pTol2-Fli:GFP-kdrl:MAP2K1K57N) plasmid DNA + 40 ng/µL Tol2 transposase mRNA. Erythrocytes in these fish express the fluorescent protein dsRed. Embryos were anesthetized with 0.4 mg/mL Tricaine, embedded in 1% low-melt agarose (Biotech) and then imaged using a Zeiss LSM 800

Confocal Microscope or a Nikon SMZ18 Fluorescence Microscope. Confocal images were obtained using Zen Blue version 2.5. Embryos were imaged 72 hours post-fertilization. Blood flow was visualized using dsRed fluorescence.

Results: Injection of MAP2K1K57N plasmid resulted in abnormal arteriovenous shunts (58/96 transgenic embryos, 60%). The phenotype consisted of either (1) a proximal shunt with blood flowing through a direct connection between proximal aortic vessels to the common cardinal vein and immediately back into the heart (39/58 embryos, 67%) or (2) a mid-trunk shunt between the dorsal artery and posterior cardinal vein (19/58 embryos, 33%). Shunts were not present in control zebrafish (n=65). Endothelial cells at the site of the shunt expressed high levels of the marker transgene confirming shunts contained mutant endothelial cells.

Conclusions: Zebrafish endothelial cells expressing mutant MAP2K1 form abnormal arteriovenous shunts. The phenotype recapitulates extracranial human AVM. Mutant MAP2K1 zebrafish are a promising animal model for testing pharmacotherapy to treat AVM.

Women in Academic Plastic Surgery: Have We Patched the Leaky Pipeline?

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Purpose: Previous research has demonstrated a 'leaky pipeline' for women in academic plastic surgery, meaning that female representation decreases with increasing leadership status. Despite the establishment of plastic surgery societies in the 1920s, only fourteen women have been president. More than half of these presidents were elected in just the last five years. Additionally, increasing numbers of women are applying to and training at integrated plastic surgery residency programs, which may purport improved opportunities for women to advance. We investigate trends in female representation in academic plastic surgery over the last five years to more accurately assess the impact of recent efforts to promote diversity.

Methods: For gender distributions of applicants to plastic surgery residency programs from 2017-2022, data were obtained from the Electronic Residency Application Service. For gender distributions of plastic surgery trainees and faculty from 2017-2022, data were obtained from the Association of American Medical Colleges. Program director and chief names were obtained from the American Council of Academic Plastic Surgeons (ACAPS) for the 2021-2022 year. For national society and journal editorial board members and leaders, names were obtained from their respective websites for the 2021-2022 year. Gender was determined from pronoun usage on

online faculty profiles, photographs, and names when self-identification was not explicitly provided.

Results: From 2017-2022, the percentage of female applicants to the integrated pathway increased by 15%, while that of female residents increased by 1.7%. The independent pathway from 2017-2022 experienced a 0.5% increase in female residents, but a decrease in the total number of female applicants. Overall, a 2.5% increase was seen among women holding faculty positions in plastic surgery.

Eight national societies, including the American Society of Plastic Surgeons, American Board of Plastic Surgeons, American Association of Plastic Surgeons, Plastic Surgery Foundation, American Association of Hand Surgeons, American Society of Peripheral Nerve, American Society of Reconstructive Microsurgery, and ACAPS were evaluated to determine the number of physician-only female committee members and leaders. The % of female committee members ranged from 17% to 45%, and % of female leaders ranged from 0% to 45%.

Eleven prominent plastic surgery journals were evaluated for editorial board positions, including Plastic and Reconstructive Surgery, Aesthetic Surgery Journal, Journal of Reconstructive Microsurgery, Microsurgery, Journal of Hand Surgery, Journal of Plastic, Reconstructive, and Aesthetic Surgery, Annals of Plastic Surgery, Aesthetic Plastic Surgery, Clinics in Plastic Surgery, Hand, and Journal of Craniofacial Surgery. Female members ranged from 0% to 22.6%, with no women currently holding the position of editor-in-chief.

Conclusion: While the proportions of women among applicants and in prominent roles of leadership have increased, there is great fluctuation in the percentage of female participation at the level of national committees, leadership in those committees, editorial boards, and editorial chief positions. The recent trends have shown that the plastic surgery community has made great progress in promoting female leadership and training. However, further research is needed to understand the factors causing a significant difference in the level of participation for professional societies and peer-reviewed journals.

A Novel Model to Study Wound Healing Over Exposed Critical Structures in Rodents with a 3D-printed Wound Frame

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Background: Soft tissue defects with exposed critical structures usually require reconstruction with well-vascularized tissues. Skin grafts and biological wound matrices are initially completely dependent on nutrients absorbed from the wound bed and often inadequate to provide durable coverage because of the lack of blood supply from the wound bed in complex wounds. There is a paucity of direct, comparative data in the clinical setting to compare wound matrices with conventional tissue transfer. Current animal models to evaluate these materials in a clinically relevant avascular wound bed are inadequate or not easily reproducible. We aimed to develop an affordable rodent model to demonstrate the efficacy of non-vascularized materials over a poorly vascularized wound bed.

Methods: We created 20x20 mm full thickness wounds on the dorsal skin of Lewis rats and secured 1-mm thick silicone sheets sized 15-50% of the wound's surface area. A similarly sized custom-made 3D-printed wound contraction frame made of polylactic acid filaments was placed around the wound bed and the wound edges remained within the exterior notch of the frame to isolate the inner wound environment. Either a 1) split thickness skin graft, a 2) single layer bovine tendon collagen and glycosaminoglycan dermal matrix, or a 3) porcine urinary bladder matrix was used to cover the silicone sheet inside the wound frame. Additional groups with a free flap anastomosed to the vessels in the neck, and skin grafts without an underlying silicone served as controls for the model. The rats were followed for 4 weeks with weekly dressing changes and photography. Samples were retrieved at the endpoint for histologic analysis with H&E and Trichrome.

Results: The total wound surface area was constant throughout the duration of the experiment in all groups and the wound frames were well-tolerated by the rats. Gradual necrosis of the portion of the skin graft and dermal matrices that corresponds to the silicone sheet was observed with eventual complete necrosis and exposure of the silicone sheet at the 4-week endpoint. The free flap provided complete coverage over the silicone sheet. The portion of the skin graft without the underlying silicone sheet also demonstrated coverage of the underlying fascia and histologically integrated epidermis. There were no epidermal elements underneath the silicone sheet in all groups. All experimental groups had similar viability, whereas skin graft controls without the silicone sheet demonstrated 100% graft take ($p<0.001$). When the size of the silicone sheet was reduced from 50% of the wound surface area, the portion surviving over the silicone sheet increased.

Conclusion: We developed a novel model of rodent wound healing that prevents contracture and isolates the wound environment in a clinically relevant complex wound environment with an avascular wound bed. The model was able to maintain the same wound size up to 4 weeks. Skin graft and dermal matrices failed to cover the exposed structure, whereas the free flap was able to provide viable coverage. This cost-effective model will establish an easily reproducible platform to evaluate more complex bioengineered wound coverage solutions.

The Development of Visual Risk Communication Tools for Shared Decision Making in Surgery

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Purpose: Shared decision making (SDM) improves patient satisfaction, adherence to treatment, and overall understanding of perioperative care pathways. A fundamental premise of SDM is effective communication of risk. In the surgical setting, there are gaps in communication regarding surgical complications and risk assessment. Additionally, available surgical risk calculators are suitable for high mortality operations in the setting of significant patient comorbidities and less relevant for common operations in plastic surgery. The aim of this study is to develop graphical risk visualization tools to enhance surgical SDM discussions with patients during preoperative counseling in a plastic and reconstructive surgery setting.

Methods: Complications for reduction mammoplasty as an exemplar surgery were sourced from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Surgical Risk Calculator, American Society of Plastic Surgeons website, and clinical data from the division of plastic surgery at Brigham and Women's Hospital. Pre- and post-operative patient satisfaction data were collected from published literature on Breast-Q patient reported outcomes for reduction mammoplasty. Everyday risk comparisons were collected from a general online database search. Three distinct risk depiction tools (spiral, tile, and scatter plot) were developed in Microsoft Office Suite. Anonymous REDCap surveys were sent to practicing surgeons, and feedback regarding usability and utility of each graphic was collected.

Results: 26 medical professionals responded to the anonymous survey. 24 respondents (92%) agreed that these graphics would be useful for SDM discussions. Nineteen respondents (73%) either agree or strongly agree that these graphics depict risk in a meaningful way. Fifteen respondents (58%) indicated that they would use these graphics in their daily practice. The majority of respondents preferred the spiral design (n = 15; 58%). Areas for improvement included design simplification and written explanation to accompany graphics.

Conclusion: Graphical risk visualization tools meaningfully depict surgical risks for breast reduction and can improve risk communication for informed SDM discussions in a clinical setting. The results of this study support the development of procedure-specific risk communication graphics and further refinement of our existing risk visualization tools.

The Application of Adipose Derived Stem Cells and the Role of Their secretome in the Treatment of Androgenetic Alopecia

Abstract Presenting Author:
Katarina Andjelkov MD, PhD

Purpose: The secretory properties of white adipocytes are thought to contribute to the association between hair folliculogenesis and a hair growth. [1,2] We preset the results of our 10-years' experience in application of Adipose Derived Stem Cells (ADSCs) in treatment of Androgenetic Alopecia (AGA). Also, we analyzed the quantitative and qualitative secretome profiling of ADSCs from different zones of hair growth in patients with AGA.
Method: We included all patients treated with ADRCs from January 2012 till January 2022 in our clinic. Additionally, we present 6 male patients, candidates for follicular unit extraction hair transplantation, all in early stage of AGA. 1mm punch samples of adipose tissue located beneath hair follicles of 3 scalp areas (alopecia, borderline and normal hair growth) and 1 periumbilical sample from each patient were enzymatically digested, centrifuged, washed, and cell pellets were ceded and maintained in culture medium until reached monolayer. {Figure 1] Conditioned media samples were thawed and analyzed with 41plex kit. Results were registered by Luminex platform and calculated with xPonent software.

Results: From January 2012 till January 2022, we had 94 patients treated with ADRCs, 75 male and 19 female, all with confirmed diagnosis of Androgenetic Alopecia. The average improvement in hair growth was 17.5% of terminal hair increase. All patients were in early stages of hair loss.

From punch biopsies taken from different hair growth regions we analyzed the levels of 35 signaling proteins. The levels of Inteleukin-6, Vascular Endothelial Growth Factor, Endothelial Growth Factor and Eotaxin were significantly higher in the alopecia zone in comparison to the periumbilical and occipital. The similar trend was found for Monocyte Chemotactic Protein-3, Interferon gamma-inducible Protein-10 and Macrophage Inflammatory Protein-1 alpha. On the other side, Monocyte Chemoattractant Protein-1 level was the lowest in alopecia comparing to other zones. Other examined proteins did not shown changes.

Conclusion: Dermal white adipose tissue, especially those surrounding hair follicles should be considered a target for any potential therapy that aims to modulate the hair growth, weather to promote or to remove unwanted hair. The cell therapies for hair loss have not fulfilled the expectations so far. The observed differences in these signaling molecules expression could contribute for both, achieving therapeutic goals for hair loss conditions and shading more lights on the AGA etiology but also highlight the need to investigate ADSCs secretory proteome in all other conditions linked to hair loss.

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The Application of Nanofat For Treatment Of Traumatic Fecal Incontinence After Failed Sphincteroplasty - A Pilot Study

Abstract Presenting Author:
Katarina Andjelkov MD, PhD

Purpose: The purpose of this study was to investigate whether the application of mechanically disaggregated fat - nano fat improves the continence in women who previously underwent anal sphincteroplasty with unsatisfactory long-term outcomes. [1,2]

Method: A prospective pilot study was conducted in nine patients with fecal incontinence at the First Surgical Clinic, Clinical Center of Serbia. In all patients sphincteroplasty was previously performed due to the obstetric injury with disappointing long-term results. In all patients the Wexner Incontinence Score (WS), Fecal Incontinence Quality of Life Score (FIQLS), as well as anal manometry and endoanal ultrasound measurements were performed before the procedure and during the follow up. In all patient's liposuction was performed and 50 mL of raw lipoaspirate was obtained and processed using the Nano-kit device. Approximately 20 mL of the mechanically emulsified and filtrated fat was obtained, and anal sphincter complex was infiltrated with it. Patient follow-up was conducted in person or via telephone 6 months and 12 months after the procedure).

Results: The squeeze pressure was significantly increased 6 months after the procedure ($p=0.011$), while basal pressure increment was with the marginal significance ($P=0.090$). The external anal sphincter measured at the 12 o'clock position was significantly thicker ($P=0.035$), while its thickness at the 09 o'clock position did not change significantly. Internal anal thickness measured at the 12 o'clock position was increased with the marginal significance ($P=0.084$), while the same measure at the 09 o'clock position did not change significantly. A significant decrease of WS was observed both 6 and 12 months after the procedure compared to baseline values. ($P<0.05$ for both)

Conclusion: The application of nano fat as an injectable product showed an improvement of continence in patients with unsatisfactory results after sphincteroplasty and presents a promising treatment and an effective therapeutic tool for these patients. The procedure is safe, can be easily performed as an ambulatory procedure.

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A Bibliometric Analysis of Studies Analyzing Publicly Available Databases in Plastic Surgery

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Background: Database studies (DS) have gained popularity across many medical and surgical specialties. Analysis of these large datasets has enabled unprecedented statistical power, allowing researchers to draw stronger conclusions, and explore topics previously unexaminable through single and multicenter studies. Despite the growing popularity of DS, there remains a paucity of literature surrounding the characteristics and methodology of these studies. To address this, we present a bibliometric analysis of DS exploring topics within the scope of plastic and reconstructive surgery.

Methods: A bibliometric analysis of PubMed, EMBASE, and Web of Science was conducted following PRISMA Extension for Scoping Reviews guidelines. Original DS, published prior to September 16, 2021, exploring topics pertinent to plastic and reconstructive surgery, and utilizing a publicly available database were included. A total of 10,184 articles were screened, yielding 759 papers meeting inclusion criteria. Bibliometric data including journal, citations, subspecialty category, database used, and statistical methods employed were extracted and analyzed. Descriptive statistics including means and standard deviations (SD) were reported. One-way Analysis of Variance (ANOVA) with Bonferroni adjustments and independent sample T-tests were employed to determine variables associated with increased/decreased mean article citations.

Results: Analysis demonstrated that 71.8% (545/759) of articles were published in the five years preceding this analysis, with a trend of increasing publications over time ($r = 0.8579$). The most common databases analyzed were National Surgical Quality Improvement Program (NSQIP) (41.4%), National Inpatient Sample (NIS) (19.4%) and IBM Truven MarkeScanTM (8.0%). While the most common subspecialties were Breast Reconstruction (25.2%), Hand/Upper Extremity Surgery (13.6%), and Craniofacial Surgery (11.3%). The mean DS article citations was 15.8 (SD 34.5) while the mean impact factor of the journals was 3.16 (SD 2.8). Two, One-way ANOVA tests were performed to compare the effects of (1) of database analyzed on mean

citations (F = 3.353, p-value = 0.003) and (2) subspecialty category on mean citations (F = 3.482, p-value = 0.002); both ANOVAs were statistically significant between at least two groups. Bonferroni adjustment demonstrated the Surveillance, Epidemiology and End-Results (SEER) database had statistically greater mean citations than those analyzing NSQIP (35.26 vs 13.05 p-value 0.002), NSQIP-Pediatrics (35.26 vs 10.22 p-value 0.021), National Trauma Databank (35.26 vs 11.31 p-value 0.030) and Non-NIS Healthcare Utilization Project (35.26 vs 10.40 p-value 0.042) databases. Further, DS concerning Breast Reconstruction were more impactful than those concerning Craniofacial surgery (27.00 vs. 10. 48 p-value = 0.016) and Head & Neck Reconstruction (27.00 vs. 9.41 p-value = 0.033). DS predominantly utilized traditional statistics (parametric and non-parametric tests, linear and logistic regression) (72.3%,), however articles using complex analysis methods (i.e., advanced statistics, machine learning) demonstrated significantly higher mean citations (18.32 vs. 14.87 p-value = 0.033).

Conclusion: This bibliometric analysis found that DS are growing in popularity. Notably, articles concerning breast reconstruction, those with complex analysis methods, and articles analyzing SEER were cited more often. Craniofacial and Head & Neck reconstruction focused DS were less frequently cited. These findings may be useful for researchers looking to design highly impactful DS or to explore previously understudied topics.

Analysis of the Race, Ethnicity, and Gender of Recipients of Plastic Surgery Foundation Grants

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Background: Over the last eighteen years (2003-2021) the Plastic Surgery Foundation (PSF) has awarded approximately $755,000 in grants annually. As the field of plastic and reconstructive surgery strives for gender parity and racial equity among academic plastic surgeons, there has been increased recognition of the importance that funding plays in achieving these goals. The purpose of this study is to evaluate the racial, ethnic, and gender makeup of recipients of PSF Grants.

Methods: Grants awarded by the PSF from 2003 through 2021 were analyzed. Data sourced from the PSF grants database included recipient name and year of grant award. The gender of grant recipient was determined by photographs, pronouns, and/or explicit statements. Race and ethnicity were determined by explicit statements, photographs, and etymology of names. Race, ethnicity, and gender data were sourced from the PSF grant database, institution biographies, LinkedIn/social media profiles, and physicians' websites. Using the Dimensions bibliometric database, field citation rate (FCR), relative citation rate (RCR), and average article citations (AAC) were gathered for the year of grant receipt and the preceding year. Univariate analysis was conducted for gender, race, and ethnicity.

Results: A total of 541 grants, awarded to 397 recipients (mean 1.36 grants per recipient, range 1 to 9), were included in the study. Gender data was mostly identified by explicitly stated pronouns (73.6%) while race data was most commonly inferred from a combination of pictures and name etymology (48.5%). One hundred twenty recipients were female (38.5%) and received 153 grants (28.3%); 243 recipients were men (61.2%), receiving 387 grants (71.5%). Most recipients were white (61.2%), followed by East Asian (19.1%) and South Asian/Middle Eastern (14.9%). Univariate analysis of grant recipients demonstrated no statistically significant difference between men and women in mean grants received (1.40 vs. 1.28 p-value 0.052). The mean FCR for both the year of grant receipt (2.07 vs 2.27 p-value = 0.006) and the preceding year (2.08 vs 3.01 p-value < 0.001) was less for men than women. Similarly, the RCR at both the time of receipt (1.06 vs 1.31 p-value = 0.026), and preceding year (0.84 vs 1.16 p-value < 0.001) was less for men than women. Analysis revealed no statistically significant difference between white and non-white recipients in number of grants received, FCR, RCR, or AAC; however, when compared to Hispanic recipients, non-Hispanics received more grants on average (1.37 vs 1.00 p-value = 0.010). The percentages of grant recipients who are female (r = 0.6063) and non-white (r = 0.0437) demonstrated increased representation over time.

Conclusions: Analysis of the eighteen-year history of PSF grants found most recipients have been non-Hispanic, white, and male, with recipient make-up closely reflecting the general population of academic plastic surgeons (1,2). Notably, however, male recipients were found to be less impactful than their female counterparts around the time of grant receipt as measured by field and relative citation rates in the year of receipt and the preceding year. Encouragingly, both female and non-white researchers are finding increased representation among grant recipients.

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Artificial Intelligence Powered Models for Prediction of Postoperative Bleeding Transfusion Complications in Plastic Surgery Patients

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Purpose: One of the most common complications in plastic surgery patients is bleeding/transfusion complications [1], which cause over 1-in-4 patients to return to the operating room [2]. We aimed to develop machine learning models to analyze plastic surgery patient data (like patient demographics, history, and preoperative lab values) to predict whether a bleeding/transfusion complication was likely to occur within 30 days of their index surgery. Predicting patients at high risk of bleeding complications, ahead of the bleeding event, can signal healthcare providers to alter clinical management and improve outcomes [3].

Methods: Patients from January 2005 to December 2019 in the National Surgical Quality Improvement Program having a plastic surgery procedure met the inclusion criteria. The data will be preprocessed to omit any variables with over 50% missing values and variables with variance inflation factors >5; missing values were handled with multivariate interactive imputation. Extreme gradient boosting, logistic regression, and random forest models were developed on the data with a 75-25 train-test split. Randomized search was performed in conjunction with 5-fold cross validation on estimators of different hyperparameter values to yield models with maximal predictive capacities [4].

Results: 122 clinical parameters for 210,152 patients were included in the analysis. 3,587 patients had a postoperative transfusion. The extreme gradient boosting model had an area under the receiver operating characteristic curve of 0.98 (95% CI: 0.968-0.974), with an accuracy of 98% and an F1 score of 0.97. The random forest model had an area under the receiver operating characteristic curve of 0.97 (95% CI 0.964-0.971) with an accuracy of 98% and an F1 score of 0.97. The logistic regression model had an area under the receiver operating characteristic curve of 0.95 (95% CI 0.946-0.957) with an accuracy of 98% and an F1 score of 0.98.

Conclusion: Machine learning methods with optimization frameworks can predict bleeding transfusion complications in plastic surgeries with relatively high accuracy. These models pave the way for translating plastic surgery data into a clinical platform that can yield personalized risk scores for patients to help guide clinical management and potentially improve outcomes.

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Which Medical Schools Produce the Most Integrated Plastic Surgery Residents? An Analysis of Current Residents

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Objective: Integrated Plastic Surgery is one of the most competitive specialties in the matching process. There is a lack of research on how medical schools influence their graduates' matching ability. In this study, the authors sought to determine which medical schools produced the most Integrated Plastics residents and to evaluate associations between matching and school characteristics.

Methods: Demographic and bibliometric characteristics were collected for the 1011 current Integrated residents across all accredited US Integrated Plastics programs using publicly available websites. Medical school characteristics were collected for all current residents, including class size, presence of a home program, Doximity rank of home program, number of clinical faculty, research funding, presence of a Plastic Surgery interest group, and school ranking on U.S. News & World Report.

Results: Georgetown University produced the greatest absolute number of Integrated residents (24), followed by New York University (20), University of Pennsylvania (18), Duke University (17) and University of Miami (16). However, Stanford (2.7%) produced the most residents as a percentage of medical graduates followed by Virginia Tech College of Medicine (2.6%) and Duke University (2.6%). Stanford University produced the highest average Doximity rank of matched graduates' residency program (12.14) followed by University of California San Francisco (14.2) and University of Pittsburgh (14.63). A higher number of graduates entering Plastic Surgery was strongly correlated with medical school's amount of home Plastic Surgery clinical faculty, U.S. News ranking for research, Doximity home program ranking, and amount of NIH funding. A higher number of graduates entering Integrated Plastics was also associated with the presence of a home Integrated Plastics department and Plastic Surgery interest group at the medical school.

Conclusions: This research highlights several factors which predict the amount of graduates entering Integrated Plastic Surgery.

Minimally Invasive Harvest of the Latissimus Dorsi Flap for Breast Reconstruction: A Systematic Review and Pooled Analysis

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Purpose: Poor cosmetic and surgical outcomes associated with oncoplastic, and implant-based breast reconstruction have stimulated an interest in Latissimus dorsi flap (LDF)-based breast reconstruction, especially after adjuvant radiotherapy. The incorporation of robotic platforms alongside endoscopy has allowed a minimally invasive approach with faster recovery and relatively shorter length of stay (LOS). In this setting, an endoscopic-assisted LDF (EALDF) and a robotic-assisted LDF (RALDF) are good alternatives when the skin envelope is intact, but an additional layer of vascularized tissue is required. We performed a systematic review of the surgical techniques and outcomes of the LDF harvested with minimally invasive surgery (MIS) for breast reconstruction.

Methods: A literature search was implemented across the medical indices PubMed MEDLINE, Web of Science, Scopus, and Ovid MEDLINE®. The primary outcomes of this study were to

evaluate the surgical and patient-reported outcomes, the rate of donor-site complications, and to characterize the surgical protocols for a minimally invasive LDF harvest in the setting of breast reconstruction.

Results: Thirty-one articles in which 857 reconstructive procedures were performed were included, 497 with EALDFs (58%) and 174 with RALDFs (20.3%) were reported. As part of control groups, 186 LDFs were harvested using the open technique (OT) (21.7%). The average age of patients was 48.08 years (range, 12-83). The indications for breast reconstruction were lumpectomy, quadrantectomy, partial or total mastectomy, and Poland syndrome. For an EALDF, visualization of the surgical field was achieved with a right angle suspension hooks, 25-mm optical retractors, retractor and traction stitches, CO2 gas insufflation, customized retractors, or non-specific endo-retractors. The surgical approach for a RALDF was by means of single port CO2 insufflation, GelPOINT Path mono-trocar device insufflation, and a transaxillary gasless technique.

For an EALDF, the total surgical time was 201.05 min in patients with Poland syndrome, 222.18 min for patients who had a total mastectomy, and 226 min who had a partial mastectomy. The mean LOS was 6.42 days. The rate of seroma and hematoma for a EALDF ranged between 0%–48% and 0%–16.6%. Severe complications included dorsal bleeding (n=1), pneumothorax (n=1), conversion to open surgery for bleeding control (n=1), and sectioning of the thoracodorsal artery (n=1). The satisfaction of the breast shape and symmetry assessed by patients (6.67/10 versus 7.90/10, p=0.22) showed inferior results with EALDF when compared to the OT

For a RALDF, the total surgical time was 343.7 min in patients who had a unilateral robotic-assisted mastectomy, and 320.59-min in patients who had a standard unilateral mastectomy. The overall mean LOS was 3.85 days (range, 2-8). The rate of seroma and hematoma for a RALDF ranged between 0–26.1% and 0–3.4%, respectively.

Conclusion: The main advantage of MIS to harvest the LDF for breast reconstruction is the absence of a large back scar. The surgical outcomes between studies are conflicting regarding the complication rate. Even from an aesthetic standpoint, the volumetric loss associated with the LDF can compromise the shape and symmetry of the reconstruction in some patients.

Technological Advancements in Face Transplant: A Systematic Review of Frontier Technology in Facial Vascularized Composite Allotransplantation

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Purpose: Since the first transplant performed in 2005, facial vascularized composite allotransplantation (fVCA) has been an area of surgical and technological innovation in plastic and reconstructive surgery. This systematic review seeks to capture the current state of technology in the field of face transplant (FT), summarizing landmark studies and discussing opportunities for continued innovation.

Methods: This systematic review was conducted according to PRISMA guidelines. PUBMED, OVID, and Web of Science were searched. All studies published before February 27, 2022 were assessed for eligibility by two independent reviewers. Inclusion criteria were primary prospective or retrospective studies that reported on artificial intelligence (AI), 3D printing, virtual surgical planning, or software and technological advancement in FT or related to fVCA procurement. Reviews, opinions, cadaveric studies, and animal studies were excluded.

Results: 23 papers were included in this systematic review. All studies were published between 2009 and 2021. Articles covered the following topics: virtual surgical planning (n = 9), 3D printing (n = 4), intraoperative guides (n = 2), and postoperative monitoring and assessment of facial function (n = 8). Virtual surgical planning platforms have facilitated time-sensitive and complex preoperative planning, as well as donor-recipient matching. 3D printing protocols have been developed for craniofacial modeling, manufacturing of osteotomy cutting guides, and production of donor face masks. Virtual reality has been used for intraoperative anatomical structure identification during transplant. Software and imaging-based technologies have been used postoperatively to assess functional facial muscle recovery, rejection status, and allograft volumetric and structural changes over time.

Conclusion: Frontier technologies in FT today include AI-driven postoperative motor outcomes analysis, computer-aided design and 3D printing for preoperative planning, and alternate imaging modalities to reduce radiation to allograft structures for long term monitoring. Cost and ethical considerations are relevant when developing these technologies, with special attention to patient accessibility. The transferability of software-based technologies creates opportunities for international collaboration in outcomes research, but lack of protocol standardization in FT is a limiting factor. There remain many opportunities for technological advancement in the field of FT, especially with recent advancements in AI-driven software, rapid, low-cost 3D prototyping platforms, and novel tissue engineering applications.

Role of Vismodegib in the Treatment of Locally Advanced Periocular and Orbital Basal Cell Carcinoma: A Single Latin American Institution Experience

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Introduction: Basal cell carcinoma is the most common malignant skin tumor. Surgical treatment of locally advanced periocular and periorbital basal cell carcinomas can lead to significant morbidity or even mutilating surgeries. We evaluated the use and effectiveness of Vismodegib, a selective inhibitor of the Hedgehog pathway, in the management of periocular and orbital locally advanced basal cell carcinoma. 1,2,3,4,

Material And Methods: Patients with locally advanced periocular or orbital basal cell carcinoma were enrolled between November 2016 and January 2022 in a single Public Hospital of Argentina. 9 patients who received oral Vismodegib (150mg/day) were included, mean age 72 years (52-83) and the female–male ratio was 3:6. Treatment response rate was evaluated as: Complete Response, Partial Response, Progression and Disease-Free Survival. Treatment duration and adverse events were also assessed.

Results: Mean tumor size was 54mm (5-90mm). One patient presented orbital and another one cranial invasion; four patients (44.4%) presented recurrences following previous surgery. The average treatment duration was 6.1 months (2–9 months). Total Response Rate was 100%. Complete Response was evidenced in five (55.6%) and Partial Response in four (44.4%) patients. No Progression was reported. Two patients with Partial Response and considerable tumor size reduction refused surgery: one died due to another disease and the other underwent non-surgical treatment. The other two had surgery with clear margins. The Disease-Free Survival rate was 20.8 months (5–48 months). Grade I–II side effects were evidenced in 8 patients: muscle spasms in 6 (75%), alopecia in 5 (62.6%), and dysgeusia in 5 (62.6%) patients. Only one (11.1%) patient experienced Grade IV muscle spasms which led to treatment withdrawal. CONCLUSIONS: Our study, which represents the largest series recorded to date by a Plastic Surgery Department in Latin America showed that Vismodegib achieved a consistent response in patients with locally advanced periocular and orbital basal cell carcinoma reducing morbidity of surgical resection and avoiding exenteration. Prospective studies to assess neoadjuvant Vismodegib in these patients, with long-term follow-up, are needed.

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Effects Of Platelet-Rich Plasma Infiltration To Donor Area On Harvested Fat Grafts

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Introduction: Fat grafting is a frequently performed procedure in plastic surgery. There are numerous studies conducted with the goal of increasing the survival rate of an existing fat graft at the recipient area. In our research, we have discovered that stimulating the fat tissue at the donor area with biological auxiliary factors and putting it through the priming process prior to harvesting for the purpose of boosting the survival rate of the graft weren't in the literature. In our study, the purpose was to reveal the changes caused by the infiltration of platelet-rich plasma (PRP) to the donor area as well as its effect on the survival rate of fat grafts in rats, using various parameters.

Method: In the study, a total of 30 Sprague-Dawley rats weighing between 300 and 350 grams were used, dividing them into random groups of 6, for a total of 4 groups. 6 rats were used for PRP preparation. The control group was administered saline solution and the study group was administered PRP. After the administration, half of the control and PRP groups were sacrificed in the 1st week by harvesting fat grafts from their left inguinal fat pads, The same procedure was repeated for then 2nd half in the 2nd week. The harvested fat graft samples were evaluated via histological (evaluation of the histological appearance of the fat tissues, inflammation status, fibrotic changes, health, and number of vessels via light microscope examination and immunohistochemistry and biochemical analysis (Measurement of IL-1β, IL-6, TNF-α, EGF, VEGF, CK18-M30, TAS and TOS levels using ELISA kits). For statistical analysis, Shapiro-Wilk, Student t and Mann Whitney U tests were used in SPSS Windows Version 24.0 package program. A value of $p<0.05$ was considered statistically significant.

Results: In our study, the levels of proinflammatory markers such as IL-1β, IL-6, TNF-α, were determined to be significantly lower in both the 1st and 2nd weeks in the PRP group compared to the control group ($p<0.05$). VEGF and EGF levels were determined to be higher both in the 1st and 2nd weeks in the PRP group compared to the control group ($p<0.05$). CK18-M30 levels were determined to be significantly lower in the PRP group compared to the control group both in the 1st and 2nd weeks ($p<0.05$). TOS values of the control group were determined to statistically be significantly higher than the PRP group in the 1st week ($p=0.002$).

Conclusion: In our study, as the results obtained with the utilized parameters revealed that the PRP group had fat cells that were more resistant to oxidative stress, impacted less by inflammation, had less apoptosis and higher neovascularization potential compared to the control group and as the values for the 1st week were even more dramatic for the 1st week has led us to believe that a delay period of 1 week would suffice. We're of the opinion that the data revealed by our current study will grant a new perspective to fat grafting and pave the way for new studies on fat graft survival.

Assessing the Quality of Reporting on Quality Improvement Initiatives in Plastic Surgery – A Systematic Review

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Purpose: There has been a recent increase in the number and complexity of quality improvement studies in plastic surgery. To assist with the development of thorough quality improvement reporting practices, with the goal of improving the transferability of these initiatives, we conducted a systematic review of studies describing the implementation of quality improvement initiatives in plastic surgery. We used the SQUIRE 2.0 (1,2) (Standards for Quality Improvement Reporting Excellence) guideline, which is endorsed by the EQUATOR Network, to appraise the quality of reporting of these initiatives.

Methods: The systematic review protocol was drafted using the Preferred Reporting Items for Systematic Reviews and Meta-analysis Protocols (PRISMA-P) and registered with PROSPERO. English language articles published in EMBASE, MEDLINE, CINAHL, and the Cochrane databases were searched. Quantitative studies evaluating the implementation of quality improvement initiatives in breast reconstruction were included. The primary endpoint of interest in this review was the distribution of studies per SQUIRE 2.0 criteria scores in proportions. Abstracts screening, full-text screening, and data extraction were completed independently and in duplicate by the review team.

Results: We screened 4235 abstracts, of which 101 full texts were assessed, and 55 met inclusion criteria. In our assessment, only 6 studies (10.9%) met all 18 SQUIRE 2.0 criteria. SQUIRE 2.0 criteria that were met most frequently were abstract, problem description, rationale and intervention. The lowest SQUIRE 2.0 scores appeared in conclusions and interpretation criteria. The low compliance in the "Interpretation" criteria (61.8%) was mostly related to the lack of an assessment of costs and strategic trade-offs associated with the implementation of the quality improvement initiative; whereas the low compliance in the "Conclusion" criteria (58.2%) was associated with a lack of discussion about project sustainability and potential for spread to other contexts.

Conclusion: Significant opportunity exists to improve quality improvement reporting in plastic surgery, especially in the realm of costs, strategic trade-offs, project sustainability and potential for spread to other contexts. Improvements in these areas will help to further advance the

transferability (3) of quality improvement initiatives in plastic surgery, representing an enormous potential for impact in patient care.

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Three-Dimensional Video Microscopy in Microsurgery: Improving Ergonomics and Efficiency

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Background: Since the birth of microvascular surgery in the early 1960s, several techniques have emerged to aid microvascular anastomoses. Typically, an operating microscope or surgical loupes are used to establish a magnified view of the surgical field. The use of surgical microscopes by microsurgeons aggravates the ergonomic stress frequently experienced due to sustained static postures and hyperflexion of the cervical spine for prolonged periods of time.[1,2] Exoscopes are high-magnification stereo cameras that project a view of the surgical field onto a three-dimension (3D) high-resolution monitor, viewable from different angles. Outside of plastic surgery, exoscopes have been shown to successfully decrease musculoskeletal complaints, though sometimes with prolonged operating times.[3,4] We compare the benefits, techniques, and operating times for each type of microscope in performing microvascular reconstructive procedures.

Methods: We report on a single surgeon's experience performing free flap procedures from 2020 to 2021 using both a binocular microscope and a 3D exoscope. We identified the first 8 free flap procedures performed with the exoscope and 10 free flap procedures performed with the standard binocular surgical microscope during the same time frame. Operating times and differences in technique were compared between similar procedures performed with each type of microscope.

Results: We identified 18 patients who underwent free flap reconstructions between 2020 and 2021, including the first 8 performed with an exoscope. The total average operating time was 2.4% higher for the standard surgical microscope group in contrast to the free flap procedures that were performed with the surgical exoscope, though this difference was not significant (13.7 hours vs 13.4 hours, $p = 0.34$). Operating times and differences in technique were compared between similar procedures performed with each type of microscope. The type of microscope used for free flap reconstruction was not a significant predictor of total operating time for radial forearm free flap phalloplasty, unilateral, or bilateral DIEP breast reconstruction in our hands. For ALT flap phalloplasty, standard microscope operating time was 12.2% longer than that of the exoscope ($p < 0.001$).

Conclusion: Our early experience with the 3D exoscope indicates that adoption of this novel technology into clinical practice may improve the ergonomics of microsurgery while maintaining the flow of surgery and patient outcomes. Microvascular plastic surgeons have yet to widely adopt the 3D exoscope, but we demonstrate its potential utility while allaying fears that it is difficult to learn and adopt into practice. Ultimately, these efforts may better protect the health and career longevity of the physician workforce.

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Effect Of Recipient Area Ph Change on Fat Graft Survival

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Introduction: Fat tissue graft is the closest ideal soft tissue filler. Although it has many advantages over artificial materials; failure to predict the long-term persistence of adipose tissue graft is one of the problems that plastic surgery deals with most. Factors affecting survival positively in adipose tissue graft applications with similar success rates are investigated intensively. Fat tissue graft, which survives with mechanisms similar to wound healing, is expected to be affected by factors that disrupt wound healing.1-5 In the literature, there is no experimental study showing the effect of pH on fat tissue graft survival. The aim of this study is to determine whether the pH value has an effect on the survival of fat cells and if so, to evaluate those effects.

Material and Methods: Fat graft taken from the infraumbilical region of a male patient with a negative pressure injector was used. Adipose tissue graft was distributed evenly as 30 cc per group. Isolated preadipocytes were incubated in cultures at different pH values between 1-13. Survival of preadipocytes was evaluated with MTS test. Preadipocytes in pH 6, 8, 10, 12 cultures were analyzed by PCR and inflammation and apoptosis rates were evaluated.

Results: In more than two independent groups, one-way analysis of variance (ANOVA) was used because the numerical variables in the groups provided the normal distribution condition. Preadipocyte survival rates in media with pH 8, 6 and 9 respectively, were found to be significantly higher than the control group ($p < 0.05$). Subgroup analyzes were performed with Tukey test. Statistical significance level was accepted as $p < 0.05$. In PCR gene analysis, IL-6, COX-2, and Caspase-3 gene expressions were found to be lowest at pH 8.

Conclusion: Survival of adipose tissue graft with mechanisms similar to wound healing is affected by different pH values. In our study, the highest preadipocyte survival, lowest inflammation and apoptosis rates were observed at pH 8. The aim of this study is to pioneer further studies on in-vivo alteration of recipient area pH values in order to increase the success rates in adipose tissue grafting.

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The Relative Citation Ratio: An Assessment of a Novel National Institutes of Health-Supported Measure of Research Productivity among Plastic Surgeons

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Purpose: Scholarly productivity is a crucial component of faculty advancement. The relative citation ratio (RCR) has been developed by the National Institutes of Health (NIH) as a novel measure of research output that enables comparisons between researchers in distinct fields, thereby addressing a limitation associated with other metrics such as the h-index. [1] However, heretofore no benchmark data have been collated for plastic surgeons. Accordingly, we evaluated the relationship between the RCR and various measures of academic rank and productivity among academic plastic surgeons.

Methods: We identified all physicians associated with Accreditation Council for Graduate Medical Education (ACGME)-affiliated plastic surgery residency programs. Academic rank and additional degrees were obtained using institutional websites and online searches. The iCite database was queried to obtain mean publications, mean RCR (m-RCR), and weighted RCR (w-RCR). The Scopus database was utilized to quantify publication experience (year of first publication) and h-index. Data were compared between groups using the Mann-Whitney U test and Kruskal-Wallis test. Spearman's ρ was used to correlate publication experience and the h-index with RCR scores. A predetermined level of significance was set at $p < 0.05$.

Results: 955 academic plastic surgeons from 94 programs were included for this analysis. Overall, plastic surgeons had a median of 17.00 (IQR, 6.00 – 42.00) lifetime publications, a median m-RCR of 1.20 (IQR, 0.79 – 1.67), and a median w-RCR of 17.68 (IQR, 5.14 – 52.48). Advanced academic rank ($p < 0.001$) was associated with increased m-RCR. Advanced academic rank ($p < 0.001$), PhD acquisition ($p < 0.05$), and publication experience ($\rho = 0.22$; $p < 0.001$) were associated with increased w-RCR. The h-index was correlated with both m-RCR ($\rho = 0.36$; $p < 0.001$) and w-RCR ($\rho = 0.65$; $p < 0.001$).

Conclusions: The RCR offers investigators the opportunity to quantify and assess their academic productivity compared to previous metrics more accurately. Our analysis utilizing this novel measure demonstrated that academic plastic surgeons have significant scholarly output, especially when compared to the NIH benchmark m-RCR value of 1. Established corollaries of research productivity were associated with increased RCR scores, thereby emphasizing its validity for the evaluation of faculty with regards to hiring, promoting, and providing funding. Importantly, the m-RCR did not correlate with publication experience, attesting to this measure's

ability to effectively compare investigators at different career stages. For plastic surgeons specifically affiliated with academic programs where plastic surgery is a division within a larger general surgery department, establishing standardized metrics of comparison is paramount for enabling equitable comparisons amongst themselves and other general surgeons, particularly as measures of academic productivity can play a factor in academic promotion. Our hope is that these data will be useful tools for both physician self-evaluation and institutional evaluation of current and prospective faculty.

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Today's Plastic Surgery Applicant Pays 150% More Than Their Counterparts Four Years Ago

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Introduction: Integrated plastic surgery residency positions are highly sought after and represent some of the most competitive post-graduate positions available. An increasing pool of applicants in conjunction with the transition of the United States Licensing Exam Step 1 examination to pass/fail and the COVID-19 pandemic may have increased the competitiveness and altered applicant behavior. Within, we examine trends in the number of applicants, applications per applicant, and cost over the past five match cycles.

Methods: In total 2,166 applicants to integrated plastic surgery programs were included. The American Association of Medical Colleges (AAMC) and Electronic Residency Application Service (ERAS) databases were examined to determine applicant trends for the years: 2017, 2018, 2019, 2020, and 2021. The ERAS fee schedule for 2021 was used to estimate application cost and a conservative 4.3% interest rate was used to estimate future value of application costs secondary to accrued interest on student loans.

Results: In 2017, there were 564 applicants for integrated plastic surgery residency positions and in 2021 there were 416, a 26% decrease. However, across this same time period the number of applications per applicant nearly doubled (97%) from 29.8 in 2017 to 58.7 in 2021. The largest increase in applications per applicant was seen between 2018 and 2019, a 70% increase. From 2017 to 2021, a 10% increase in the number of female applicants and a

43% in the number of male applicants was observed. No differences among race/ethnicities were seen.

Cost of applications per applicant increased by 158%, from $475 in 2017 to $1,225 in 2021. Collectively, this represents nearly double (90%) the total cost of applications despite fewer applicants. Total application costs in 2021 were $509,683. Given that many students finance their medical education and associated costs with student loans, the future value of these expenditures equal an economic burden of $776,503.47, assuming a 10-year term loan at a conservative 4.3% interest rate.

Discussion: Despite substantial decreases in the number of applicants, the number of applications and resulting cost of applications have increased by large margins since 2017. This is representative of the increasingly competitive application process, heightened in particular by the virtual application seasons of 2021 and 2022. Program personnel are already overwhelmed with the number of highly qualified applicants, and it will be detrimental to applicants and programs alike if the observed trends continue.

Popular ideas to confront this issue include limiting the number of programs an applicant can apply to or implementing a secondary application. We argue that a secondary application is the most tangible mechanism to mitigate this escalating issue, as it will decrease the number of applications each applicant submits by raising the barriers to entry.

It appears that more female applicants are applying to integrated plastic surgery residency positions, increasing their representation in the field. However, this undoubtedly positive step does not address the rising number of applications or cost. Intervention is needed to enhance application efficiency and reduce these issues for residency programs and applicants.

Teaching Hospital Health Equity Varies Widely Across US Plastic Surgery Residencies

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Purpose: Achieving health equity in the US includes training surgeons in an environment that exemplifies access, treatment, and outcomes across the racial, ethnic, and socioeconomic

spectrum. Increased national attention on health equity has generated metrics to compare hospitals as a means of bettering US healthcare. We sought to determine the mean health equity score across training sites of plastic & reconstructive surgery (PRS) residency programs in the US.

Methods: A database was constructed merging the 2021 Lown Institute Hospital Index dataset with all training hospitals affiliated with all accredited US integrated PRS residency programs. The equity category within the Lown dataset is comprised of 3 components: community benefit, inclusivity, and pay equity, and weighted in a ratio of 2:2:1, respectively, to generate a health equity grade for hospitals. [1,2] Equity grades were reported per facility from A-D with A being the best grade a residency program could receive. Mean equity scores (MES) were reported for each residency program and ordinal logistic regression was used to model the effects of number of training programs and region on the MES.

Results: 21% (n=18) of residency programs had a MES=A; 48% (n=40) had a MES=B; and 30% (n=25) had a MES=C; 1% (n=1) had a MES=D. 31% (n=26) of programs had 1-3 training sites, 62% (n =52) had 4-7 training sites, 6% (n=5) had 8-11 sites, and 1% (n=1) had > 12 sites. Number of training sites and region was not associated with MES (residual deviance=176, AIC=190).

Conclusion: Nearly a third of US PRS residency programs train residents in facilitates that fail to demonstrate high equity health care. While no correlation was found between MES and residency program region or training site number, all programs should strive to become more equitable, carefully considering the facilities at which their residents train. The residency programs should also promote health equity by improving care delivery at existing affiliated facilities. This will aid in the creation of a more diverse workforce while also ensuring improved health outcomes for patient populations. While there are inherent limitations in determining a hospital's efforts to promote health equity, these data inform the first study evaluating health equity among training sites of US integrated PRS residency programs.

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Identifying US Plastic Surgery Training Programs that Effectively Establish Gender and Ethnically Diverse Faculty

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Background: Successful strategies to improve the representation of female and ethnically underrepresented in medicine (UIM) physicians among US plastic and reconstructive surgery (PRS) faculty have not been adequately explored. Accordingly, we aim to identify programs that have had success, and in parallel gather PRS program directors' (PD) and Chiefs/Chairs' (CC) perspectives on diversity recruitment intentionality and strategies.

Methods: We conducted a cross-sectional analysis of the demographic composition of female and UIM faculty of PRS residency training programs. Separate lists of programs in the top quartile for female and UIM faculty representation were collated. Additionally, a 14-question survey was administered to PDs and CCs of all 99 Accreditation Council for Graduate Medical Education (ACGME)-accredited PRS residency programs. The questions comprised three domains: (1) demographic information; (2) perceptions about diversity; (3) recruitment strategies utilized to diversify faculty.

Results: Female and UIM faculty representation ranged from 0% to 63% and 0% to 50%, respectively. Survey responses were received from PDs and CCs of 55 institutions (55% response rate). Twenty-five (43%) respondents felt their program was diverse. Fifty-one (80%) respondents felt diversity was important to the composition of PRS faculty. Active recruitment of diverse faculty and the implementation of a diversity, equity, and inclusion (DEI) committee were among the most frequently cited strategies to establish a culturally sensitive and inclusive environment.

Conclusions: These findings reveal that female and UIM representation among US PRS faculty remains insufficient, however, some programs have had success through deliberate and intentional implementation of DEI strategies.

Plastic Surgery Foundation Grants: A Ten-Year Trends Analysis

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Background: The Plastic Surgery Foundation (PSF), alongside the American Society of Plastic Surgeons (ASPS), provides fundamental support for physician scientists through grant funding. The continued financial support towards novel research ideas by surgeon-scientists has fostered clinical advancements in both technology and overall improved patient outcomes within plastic surgery. In 2021, grant applicants requested over $3 million dollars in proposals, with over $755,000 dollars awarded by the foundation for the selected research proposals [1]. The influence of grants in developing physician-scientists is often reflected in their chosen careers and academic contributions to the field. This study evaluates the careers of PSF grant recipients between 2007-2011 to assess the longitudinal impact in career choice and academic productivity following grant receipt.

Methods: Data from grants awarded by the PSF from January 2007 through December 2011 was collected. The variables collected included gender, funding mechanism, grant category, h-index, overall mean field citation rates (FCR) and relative citation rates (RCR), and academic status during grant receipt and post-grant receipt through December 2021. Data was extracted predominantly from Dimensions Author Database and Scopus. Chi-square, Fisher's Exact, and Analysis of Variance tests were used for statistical analysis, and $p<0.05$ was considered statistically significant.

Results: One-hundred ninety grant recipients were included in the analysis. The majority of recipients held an MD alone (70.5%) or an MD in conjunction with another degree such as MBA, MSc, or MPH (21.1%). At the time of receipt, most awardees were attendings (40.5%), of which most were assistant professors (35.1%), closely followed by associate professors (31.2%), and then full professors (18.2%). No recipients were in private practice at the time of receipt. At the time of data collection, more than half of recipients remained in academia (55.3%), and a fifth moved from academia to private practice (21.1%). The majority of those in academia advanced to full professors (44.7%). At time of data collection, the average h-index was 21.4 (SD 14.6), and the overall mean FCR and RCR values were 2.60 (SD 1.33) and 1.67 (SD 0.819) respectively. The most funded grant category was clinical research (33.7%), followed by basic science (27.9%), multi-categorical (22.6%), and others (16%). The primary mechanisms of funding were basic science research grants (27.4%), pilot research grants (21.6%), and the national endowment for plastic surgery (14.7%). Comparing recipients before and after grant receipt demonstrated a statistically significant increase in citations, publications, and patents ($p < 0.05$).

Conclusion: Though available to all the scientific community, PSF grants were primarily awarded to academic plastic surgeons, particularly those earlier in their academic career.

Clinical research projects received more funding than basic science or technology focused research. In the 10-15 years following grant receipt, awardees demonstrated increased research productivity and primarily advanced to full professors or transitioned to private practice. These findings demonstrate the impact PSF grants may play in career advancement and underscores the importance of providing funding earlier in academic careers.

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Telehealth in Plastic and Reconstructive Surgery: A Review of the Current Literature

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Purpose: The purpose of this literature review is to identify how telemedicine has been used in plastic surgery.

Methods: A PubMed search for "telemedicine" and "plastic surgery" compiled the existing literature. This search returned 261 unique articles. After abstract review 49 papers were selected as containing relevant research on the topic of telemedicine's potential uses specific to plastic surgery.

Summary of Results: Use of telemedicine can be partitioned into three key domains within plastic surgery: image sharing, remote treatment, and virtual visits. Image sharing has demonstrated its ability to improve triage efficiency for assessment of traumatic injuries including burns and digital amputations.

1 Remote treatment, collaboration between remote healthcare providers, has been used to improve decision time, diagnostic accuracy, and salvage rate for free flap management.
2 Furthermore, results from the Telewound Program reveal that remote treatment decreases the number of visits, shortens length of stay, and decreases treatment costs associated with wound management.
3 Lastly, virtual visits, telecommunications directly between healthcare providers and patients, have been successfully used for both initial screening and post-operative visits for breast, cosmetic, and reconstructive patients.
4 Although patients initially prefer in person visits, after having one telemedicine visit patients favor its future use.

5 Moreover, telemedicine has led to improvement of patient satisfaction in many areas.

Conclusion: Recent events have expanded the traditional use of telemedicine in plastic surgery. With applications ranging from triaging soft tissue injures to managing wound care and performing cosmetic breast consultations, telemedicine has shown significant potential to change the practice of plastic surgery. Following the changes in practice patterns mandated during the COVID-19 pandemic this review presents an opportunity to define previous uses of telemedicine from which practice guidelines may be generated to ensure patients benefit from this evolving technology.

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Pullulan-Collagen Hydrogel Wound Dressing Promotes Dermal Remodeling and Wound Healing Compared to Commercially Available Collagen Dressings

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Purpose: Developing new therapies to promote wound healing and mitigate scarring has the potential to significantly impact patient morbidity, particularly for those who suffer from chronic non-healing wounds and burns. The primary objectives for any therapy that aims to improve wound healing are to provide protection against external factors and to sustain optimal moisture levels within the wound bed. Biologic scaffolds such as hydrogels provide an ideal, physio-mimetic of native ECM that can improve wound healing outcomes after cutaneous injury. While most studies have focused on the benefits of hydrogels in accelerating wound healing, there is minimal data directly comparing the relative efficacies among different hydrogel material compositions.

Methods: In this study we utilized a splinted excisional wound model that recapitulates human-like wound healing in mice, and treated wounds with three different collagen hydrogel dressings. The first dressing was composed of 90% collagen and 10% alginate. The second dressing was composed of 55% collagen and 44% cellulose. Finally, the third dressing was composed of 5% collagen and 95% pullulan. We assessed the feasibility of applying each dressing during standard dressing changes and measured wound areas over time to determine the relative rate of wound closure. We then performed histologic and histopathologic analysis on the explanted scar tissues to assess the effects each hydrogel dressing on collagen architecture, fiber alignment, and cellular response.

Results: The days to closure of wounds treated the collagen-pullulan hydrogel (~11.2 days) was significantly shorter than the collagen-cellulose treated (~13.2 days; *$p<0.05$) and control (~13.8 days; *$p<0.01$) wounds. Quantitative analysis of collagen architecture demonstrated that collagen-pullulan treated wounds had a lower proportion of mature collagen within the healed scar and significantly more randomly aligned collagen fibers compared to collagen-cellulose treated wounds. Furthermore, we found that collagen-pullulan hydrogel treated wounds displayed significantly shorter fiber length and greater tissue porosity compared to the other wound groups. Finally, histopathologic analysis revealed lower levels of immune cell infiltration and overall tissue response in collagen-pullulan hydrogel treated wounds relative to other groups.

Conclusion: Our data indicate that the material composition of hydrogel dressings can significantly influence healing time, cellular response, and the resulting architecture of healed scars. Collagen-pullulan hydrogel therapy accelerated wound closure and promoted tissue with less dense, more randomly aligned, and shorter collagen fibers with lower collagen intensity, similar to the natural "basket-weave" architecture of unwounded skin. Further understanding of how specific hydrogel properties affect healing and the resulting tissue architecture of wounds may lead to novel insights and further optimization of the material properties of wound dressings.

Assessing Scar Outcomes Using Objective Scar Assessment Tools: An Adjunct to Validated Scar Assessment Scales

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Objective: We aimed to validate the use of a Delfin technologies' SkinFibrometer, Elastimeter, and SkinColorCatch in the assessment of scar outcomes.

Background: Assessing scar outcomes is important in-patient care and research to assess the results of medical and surgical interventions. The Vancouver Scar Scale (VSS) and Patient and Observer Scar Assessment Scale (POSAS) are validated and relatively simple instruments to assess scars. However, these subjective scales have shortcomings. The VSS fails to capture patient perception and has indeterminate validity and reliability.[1] The POSAS captures patient perception, but the observer scale has been shown to have moderate amounts of interrater variability.[1] Studies highlighting the ability of objective scar assessment tools to produce reliable and reproducible results are needed.[2]

Methods: We prospectively followed patients at our institution receiving laser and topical corticosteroid treatment for their scars. VSS and POSAS assessments were conducted at the initial visit and at every subsequent treatment session occurring in 6–8-week intervals. Fibrometer (Delfin Technologies), Elastimeter (Delfin Technologies), and SkinColorCatch (Delfin Technologies) measurements of scars were taken. Correlation coefficients were calculated between scar assessment tool measurements and VSS and POSAS scores. A p-value <.05 denoted statistical significance.

Results: Fibrometer measurements showed significant correlation with the patient POSAS total ($r = .34$; $p < .05$), overall opinion ($r = .35$, $p < .05$), observer total ($r = .32$; $p < .05$), observer vascularity ($r = .31$; $p < .05$), and observer surface area ($r = .31$; $p < .05$) scores. Elastimeter measurements showed significant correlation with the patient POSAS total ($r = .42$; $p < .01$), patient irregularity ($r = .32$; $p < .05$), patient overall opinion ($r = .29$; $p < .05$), observer total ($r = .52$; $p < .001$), observer vascularity ($r = .42$; $p < .01$), observer pigmentation ($r = .39$; $p < .01$), and observer surface area ($r = .49$; $p < .001$) scores. The absolute difference in SkinColorCatch measurements between scars and normal skin showed significant correlation with the observer POSAS total ($r = .38$; $p<.05$), observer pigmentation ($r = .36$; $p<.05$), and observer relief ($r = .34$; $p < .05$) scores. No instrument showed significant correlations to the VSS score or its individual categories.

Conclusion: The Fibrometer and Elastimeter measurements showed significant correlation with the patient's overall opinion and total POSAS scores of their scars indicating the validity these devices have in tracking patient improvement in scar treatment and research. The SkinColorCatch showed significant correlation with observer POSAS pigmentation supporting its role in tracking improvements in hyperpigmentation or hypopigmentation of a patient's scar. Unexpected correlations between Fibrometer/Elastimeter measurements and vascularity/pigmentation of scars indicate that scoring of these categories may be influenced by how severe the scar looks to the observer subjectively further necessitating the need for reliable objective scar assessment tools.

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Ranking of Plastic Surgery Units with Residency Training Programs Based on Academic Productivity Metrics

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Purpose: Residency program rankings are highly influential and assist residency applicants in selecting training programs. Unfortunately, existing ranking systems are limited in scope and utility. The Doximity Residency Navigator, for example, ranks programs in an opaque manner. Some recent literature has employed scholarly productivity to objectively and transparently rank programs by academic achievement; however, given the continual shift of faculty members across institutions and their ongoing scholarly activities, it is paramount to provide updated rankings to residency programs and applicants. The objective of this study is to refresh the rankings of integrated and independent training programs by utilizing more comprehensive measures of scholarly productivity.

Methods: A catalog of all integrated and independent plastic surgery residency programs was obtained from the American Medical Association Fellowship and Residency Electronic

Interactive Database Access (FREIDA) and the American Council of Academic Plastic Surgeons (ACAPS). Names of faculty members affiliated with each program were individually extracted from program websites. Lifetime h-index, 5-year h-index, and date of first publication were collected from the Scopus online database for each faculty member. Subsequently, each individual's m-quotient (h-index divided by number of years since first publication) was calculated. Two field-normalized metrics, the mean relative citation ratio (m-RCR) and weighted relative citation ratio (w-RCR), were acquired from the iCite database for each individual. Based on their faculty's averaged metrics, institutions received a relative score between 0 and 1 for each of the five variables (the highest-ranked program for each variable received a 1 and the lowest-ranked received a 0). Metrics were compared across institutions by summing each program's five scores (weighted equally), and their corresponding residency programs were ranked accordingly.

Results: 94 programs were included, encompassing a total of 1120 plastic surgery faculty. Overall, plastic surgeons were academically productive, with an average lifetime h-index of 11.2, 5-year h-index of 3.4, and m-quotient of 0.58. In comparing institutions, the program with the highest lifetime h-index was Weill Cornell (26.65), followed by Brigham and Women's-Harvard (26.28) and Stanford (26.24). The programs with the highest average 5-year h-indexes were Stanford (9.14), Brigham and Women's-Harvard (8.81), and the University of Michigan (8.35). The highest average m-quotient scores belonged to Stanford (1.31), Weill Cornell (1.18), and Brigham and Women's-Harvard (1.15). The University of Kansas (2.78), Louisiana State University (2.39), and the University of Washington (2.15) held the three highest average m-RCR values. Leading with the highest w-RCR scores were Brigham and Women's-Harvard (151.81), Stanford (140.78), and the University of Michigan (130.80).

Conclusions: Academic productivity, quantified by bibliometric indices, was used to develop a ranking list of the academic productivity of plastic surgery residency programs, both integrated and independent. The overall top-ranking institutions are Stanford, Brigham and Women's-Harvard, Weill Cornell, the University of Michigan, and Beth Israel Deaconess-Harvard. This complete list, which is transparent, reliable, and can be updated, provides a valuable resource to assist applicants in making informed decisions when considering residency programs and career planning.

The Implications of Virtual Learning on Plastic Surgery Education During the COVID-19 Pandemic

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Purpose: Graduate medical education during the Coronavirus Disease 2019 (COVID-19) pandemic has seen the shift to a "virtual learning" format in many aspects including didactics, skills sessions, and grand rounds.1 Innovative adaptations have been made to sustain learning, and such alterations have permanently restructured education despite the return to in-person activities. The purpose of this study is to describe the perceived strengths and weaknesses of virtual learning compared to the conventional, in-person format through a national survey of plastic surgery residents and fellows.

Materials & Methods: A 45-question survey was sent to independent and integrated plastic surgery residents and fellows nationally. Question types included Likert scale, sliding scale, multi-select checkboxes, and dichotomous questions. Likert scale responses were rated on a 5-option scale (1= Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 =Agree, 5= Strongly Agree). The survey evaluated five general categories of virtual learning in comparison to an in-person format: (1) demographics, (2) learning styles, (3) time efficiency, (4) learning proficiency, and (5) collaboration. Data were analyzed utilizing t-tests, MANOVA, and Pearson correlation.

Results: A total of 81 surveys were submitted from 48 different training programs. Participants were more likely female (n=44, 54.3%) than male (n=37, 45.7%). The mean age was 30.7 ± 5.7 years with no significant difference between male and female participants ($p=0.72$). Due to the COVID-19 pandemic, the plastic surgery curriculum was conducted more often in a virtual setting ($p < 0.001$). Higher levels of desired learning outcomes (proficiency) were positively correlated with increased levels of collaboration among peers ($r(79)= .472$, $p<0.001$) and the perception of virtual learning being more time-efficient ($r(79)=.560$, $p<0.001$). Participants (n=30, 37%) that started training during the pandemic (2019-2020) had lower responses in the collaboration category (e.g. expressing opinions, forming connections) than participants (n=51, 63%) that started training before the pandemic (2.7 ± 0.6 vs. 3.1 ± 0.6, $p <0.001$). Overall, participants (n=32, 39.5%) who were required by their institution to have cameras "always on" or "mostly on" had lower self-reported levels of multitasking during virtual learning than participants (n=32, 39.5%) who were able to keep their cameras "always off" or "mostly off" (4.8 ± 2.6 vs. 6.63 ± 2, $p=0.005$). Reported activities engaged in during virtual learning included reviewing patient information (n=60, 74%), eating (n=58, 71.6%) or talking to colleagues (n=48, 59.3%).

Conclusions: A virtual and in-person hybrid approach toward plastic surgery education may be beneficial for encouraging flexibility in learning. However, the advantages and disadvantages of virtual learning in the context of plastic surgery education have not been well characterized. Our results indicate that improvements in learning outcomes are significantly related to collaborative efforts among colleagues and the perceived increase in the time afforded by virtual learning. Collaboration was significantly more challenging for residents and fellows who started training during the pandemic, possibly due to restrictions in face-to-face interactions and establishing rapport with attending physicians and colleagues.

Lastly, institutional requirements regarding cameras significantly decrease levels of multitasking and distraction during didactic sessions.

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Exhale And Decell: Environmentally Sustainable Sterilization And Decellularization Of Cartilage Grafts Via Supercritical Carbon Dioxide

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Purpose: Current decellularization techniques have important limitations, including obligatory use of harsh ionized substances or detergents that deplete bioactive cytokines and compromise the physical integrity of the resulting extracellular matrix (ECM) scaffold. Furthermore, the detergents used are increasingly recognized as harmful to the environment and are poised to be restricted from commercial use. Supercritical carbon dioxide (scCO2) is an appealing alternative, applying the principles behind supercritical fluid extraction and sterilization to the removal of immunogenic cellular components. We endeavor to evaluate the efficacy of scCO2 in both sterilization and decellularization of ovine costal cartilage xenograft and human costal cartilage allograft to develop a highly efficacious, environmentally sustainable, and biocompatible alternative to currently available decellularization strategies.

Methods and Materials: Xenograft preparation: Racks of lamb were purchased from a local butcher. Floating ribs were minced into ~8 mm3 cubes or zested into flakes (1 mm × 1 mm).

Allograft harvest: Human costal cartilage was obtained from patients undergoing microsurgical breast reconstruction necessitating partial rib resection and processed via mincing or zested as above. All samples were subjected to: 1) sterilization; 2) sterilization and decellularization; or 3) sterilization, decellularization, and a pretreatment wash. Sterilization: Samples were placed in a NovaSterilis™ Nova2200 unit and subject to standard NovaSterilis™ sterilization parameters. At least 3 samples with biologic indicators were placed within the packaging and processed with each run. Decellularization: Samples were subject to the standard parameters of the Nova2200 system as previously described by NovaSterilis™ with an ethanol to scCO2 volume ratio of 1:3.3. Wash: Samples were serially soaked in saline and agitated with exposure to 16 mL 3% H2O2 and a 30-minute scCO2 run at 35 °C and 1,436 psi. Histology: After treatment, H&E, DAPI, and safranin-O staining were performed. DNA Quantification: DNA content was quantified in unprocessed and decellularized graft samples using the DNeasy Blood & Tissue kit (Qiagen Inc.).

Results: Sterilization conditions were sufficient for a 6 log10 sterilization of B. atrophaeus. H&E staining revealed preservation of tissue architecture after both sterilization and decellularization in both allograft and xenograft cartilage. DAPI staining demonstrated depletion of nuclei in the decellularized zested samples, but persistence of visible nuclei in the minced samples. Safranin-O staining revealed immunogenic GAG depletion after decellularization. DNA content in minced and zested samples was 192.2 ng DNA/mg tissue and 321.6 ng DNA/mg tissue, respectively, while DNA content in sterilized and decellularized minced and zested samples were 24.8 ng DNA/mg tissue and 11.6 ng DNA/mg tissue, respectively (industry standard requirement for decellularization <50 ng DNA/mg tissue); after sterilization, decellularization, and the chemical wash, minced and zested samples contained 17.6 ng DNA/mg tissue and 4 ng DNA/mg tissue respectively.

Conclusions: These preliminary data suggest that scCO2 sufficiently sterilizes and decellularizes cartilage derived from both human and animal sources, thereby supporting scCO2 as an efficacious, commercially appealing, and ecologically responsible alternative to current decellularization strategies. Biomechanical testing on treated samples, as well as the evaluation of scCO2 as a decellularization agent for human nasal septal cartilage are ongoing.

How Will Numeric Step 1 scores be Compared to Pass/Fail Reports: Plastic Surgery Residency Program Director Perspectives on Upcoming Application Cycles

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Background: On January 26, 2022, the scoring system for the United States Medical Licensing Exam (USMLE) Step 1 changed to pass/fail from a 3-digit numeric scale. Aside from its intended use as a licensing exam, the USMLE Step 1 examination has evolved into a screening tool for residency programs across many specialties. As a result of the recent change, in the upcoming application cycle, some students will have a three-digit Step 1 score and some will have a pass/fail report, leaving residency programs to decide how to compare applicants with and without scores. In this study we aim to analyze perspectives of plastic surgery program directors (PDs) regarding evaluation of applicants in upcoming application cycles with respect to Step 1 scores.

Methods: A 16-item survey was distributed to integrated plastic surgery PDs to assess how Step 1 and Step 2 scores will be weighed in upcoming application cycles compared to the current cycle. The relative importance of research experiences and other factors for applicant evaluation were also queried.

Results: A total of 36 (40%) PDs completed the survey. In upcoming application cycles, 32 (88.89%) of respondents anticipate continuing to incorporate numeric Step 1 scores into applicant evaluation. In the most recent application cycle 44% of PDs rated Step 1 as carrying more weight than Step 2, 11% rated Step 2 as carrying more weight than Step 1, and 44% rated them as carrying equal weight. For the upcoming cycle, 28% of PDs stated Step 1 will carry more weight, 19% stated Step 2 will carry more weight, and 53% stated they will carry equal weight. In the last application cycle, 50% of PDs stated having a cutoff score for Step 1 and 22% stated having a cutoff for Step 2. For the upcoming cycle, 47% of PDs stated they will have a cutoff score for Step 1 and 45% for Step 2. With comparable Step 2 scores, 47% program directors would rate an applicant with a low Step 1 score at a disadvantage relative to an applicant with a "pass". Moreover, 25 (69%) program directors would rate an applicant with a high Step 1 score at an advantage relative to an applicant with a "pass". When evaluating residency applicants, letters of recommendations had the highest ranking in terms of order of importance, followed by previous knowledge of the applicant, clerkship and sub-internship grades, and research experience. Most program directors 19 (53%) predicted that research experiences will carry more weight going forward.

Conclusions: With the recent change in the USMLE Step 1 exam from a numeric to a pass/ fail scoring system, the vast majority of programs will still consider numeric Step 1 scores. In upcoming cycles, more programs will likely have a cutoff score for Step 2 and give Step 2 equal to or greater weight than Step 1. For students who have a numeric Step 1 score, a high score will still yield an advantage, but low scores may be less likely than in the past to be a detriment.

Gender Differences in Scholarly Productivity and Promotion among Academic Plastic Surgeons

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Purpose: Gender differences in scholarly output among plastic surgeons have previously been quantified using the h-index.1 However, this metric possesses several limitations that include an inability to compare researchers within distinct fields and an inability to account for publication experience. The National Institutes of Health (NIH) has developed a novel measure, the relative citation ratio (RCR), that addresses these concerns, thereby providing additional granularity to bibliometric evaluations of investigators.2 Our objective was to assess gender differences in academic productivity among plastic surgeons, as indicated by academic rank and RCR scores.

Methods: All plastic surgery residency programs were identified using the American Medical Association's (AMA) Fellowship and Residency Electronic Interactive Database Access (FREIDA) and American Council of Academic Plastic Surgeons (ACAPS) database. We queried institutional websites to identify academic rank and gender for affiliated physician faculty. Individual bibliometric profiles were created using the iCite (mean RCR [m-RCR] and weighted RCR [w-RCR]) and Scopus (publication experience [year of first publication]) databases. Between-group analyses were performed using the Mann-Whitney U test and Kruskal-Wallis test, with a predetermined level of significance set at $p < 0.05$.

Results: 724 (75.81%) plastic surgeons were male, and 231 (24.19%) plastic surgeons were female. Males had significantly greater median w-RCR (19.71 vs. 11.20; $p < 0.001$); however, no differences in median m-RCR (1.20 vs. 1.20; $p = 0.60$) were observed. Stratification by academic rank indicated females comprised 30.71% of assistant professors, 24.34% of associate professors, and 10.26% of professors. There were no significant gender differences in m-RCR and w-RCR noted at any rank ($p > 0.05$). After accounting for publication experience, there were significant differences in w-RCR between males and females who began publishing ≤1980 ($p < 0.05$), 1991 – 2000 ($p < 0.05$), and >2010 ($p < 0.01$).

Conclusions: There has been much recent interest in promoting gender equality in academic medicine, particularly among surgical fields. Our results are encouraging in that they suggest female plastic surgeons who achieve faculty status have an equivalent research impact, as

assessed by m-RCR, as their male counterparts despite males having greater lifetime research productivity, as assessed by w-RCR. Although scholarly output is merely one component of an individual's academic performance, utilizing the RCR may provide additional granularity for evaluations, especially when compared to other metrics such as the h-index. Our investigation additionally indicated that gender differences in overall productivity partially stem from decreased publications during the early career stages for females. These findings may partly contribute to the observed discrepancies in gender representation among senior academic positions. Recognition of these differences should enable more equitable evaluations of female plastic surgeons for the purposes of academic promotion.

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Zooming In: A Plastic Surgery Interest Group-Led Virtual Curriculum For Teaching Plastic Surgery Principles

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Introduction: Studies have shown that early exposure to plastic surgery in medical school increases student interest in and knowledge of the specialty. However, plastic surgery concepts are often neglected in traditional preclinical medical school curricula. Medical students are often exposed to plastic surgery through alternative means such as direct clinical shadowing and observation or attending live conferences, which have been limited by the Covid-19 pandemic. In an effort to combat this lapse in plastic surgery exposure and learning opportunities in the post-Covid-19 medical curriculum, our institution designed a plastic and reconstructive surgery student interest group (PRSIG)-led virtual curriculum to provide medical students with a foundational knowledge of plastic surgery and research principles. Following the implementation of our proposed curriculum, we hypothesize that there will be

a significant improvement in medical student knowledge, satisfaction, and confidence in knowledge of basic plastic surgery concepts.

Methods: Medical student volunteers were recruited for a prospective cohort study in which participants engaged in a virtual, PRSIG-run curriculum. "Introduction to Plastic Surgery" workshops encompassed basic plastic surgery concepts and principles, wound healing principles, and introduction to research. Students were administered pre- and post-intervention assessments of confidence in and knowledge of plastic surgery concepts. Students also had the opportunity to be paired with mentors and research projects. Student Evaluations of Educational Quality (SEEQ) surveys assessed student satisfaction with the virtual PRSIG curriculum. Dependent-samples t-testing was performed to compare pre- and post-intervention confidence and knowledge. Independent-samples t-testing was performed to evaluate satisfaction.

Results: Forty survey responses were recorded following completion of "Introduction to Plastic Surgery" virtual workshops (pretest n=20 $\bar{x}$=63.00 ± 20,29, posttest n=20 $\bar{x}$=82.00 ± 15.42). There was a significant increase in post-intervention plastic surgery knowledge scores (mean difference: -19, $p < 0.001$). There was a statistically significant increase in confidence in knowledge of plastic surgery ($p < 0.003$). Satisfaction scores revealed that students significantly favored the virtual PRSIG plastic surgery curriculum for learning about plastic surgery as compared to the traditional medical school curriculum ($p < 0.001$). Satisfaction scores revealed that students found virtual learning to be significantly clearer and more interesting than in-person learning for learning about plastic surgery ($p < 0.05$). There was a significant improvement in student satisfaction with their ability to learn about plastic surgery via virtual resources compared to in-person ($p < 0.05$). Students were significantly more likely to recommend learning in the virtual vs. in-person format ($p < 0.05$). There was no significant difference in satisfaction with the effectiveness of virtual vs. in-person learning about plastic surgery, or in satisfaction with how stimulating virtual vs. live resources were ($p > 0.05$).

Conclusions: The PRSIG-run virtual foundational plastic curriculum resulted in high satisfaction and significant improvements in knowledge acquisition of plastic surgery concepts. Virtual learning through PRSIGs can be an effective framework for teaching plastic surgery concepts to medical students in the absence of in-person learning opportunities. Virtual, PRSIG-led learning can also serve to foster mentorship between students and mentors. Such platforms appear to aid students in navigating the path towards plastic surgery.

The Difference in the Occurrence of Capsular Contracture According to the Characteristics of the Tissue in Contact With the Breast Implant in an Irradiated Rat Model

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Background: Implant-based breast reconstruction has various techniques with various planes and various materials. In order to determine the superiority of these surgical methods, it is necessary to know how each type of tissues in contact with the silicone implant would affect the capsule as well as to have a clinically analogous small animal model to understand the effect of the tissue and radiation on the capsule formation.(1,2,3) In this study, it was hypothesized that the capsule formation varies according to the radiation dose in the muscle tissues; chest wall tissues, including the ribs; and acellular dermal matrices (ADM) that are in contact with the silicone implant.

Methods: This study consists of 20 SD rats that underwent submuscular plane implant reconstruction using ADM. They were divided into four groups: Group 1 as the un-radiated control (n = 5), Group 2 with non-fractionated radiation in a dose of 10 Gy (n = 5), Group 3 with non-fractionated radiation in a dose of 20 Gy (n = 5), and Group 4 with fractionated radiation in a dose of 35 Gy (n = 5). Three months after surgery, hardness was measured. Moreover, the histology and immunochemistry of the capsule tissues of the ADM, muscle tissues, and chest wall tissues were analyzed.

Results: As the radiation dose increased, the silicone implant became harder. But no significant difference in capsule thickness according to the radiation dose was observed. Based on the tissue in contact with the silicone implant, ADM has a thinner capsule thickness compared with the muscle tissues and less inflammation as well as less neovascularization compared with the other tissues.

Conclusions: In this study, we described a new small animal model that mimics human irradiated implant-based breast reconstruction surgery using ADM. As the radiation dose increased, the silicone implant became harder, but the difference in capsule thickness according to the radiation dose was not significant. Based on the tissue in contact with the silicone implant, ADM had a thinner capsule thickness compared with the muscle tissue and had less inflammation than the other tissues. The ADM in contact with the silicone implant showed less neovascularization, less inflammation, and less fibrosis than the other muscle or chest wall tissues. Therefore, it was confirmed that the ADM in contact with the silicone implant, even after irradiation, was protected from radiation compared with the other muscle or chest wall tissues.

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Differences in Applicant Perceptions of Virtual Interviews Between Integrated Plastic Surgery and Subspecialty Fellowship Applicants

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Background: Due to COVID-19, in-person interviews for residency and fellowship programs were changed to a virtual process. The pandemic has offered a unique opportunity to survey and compare differences in the virtual interview experience between medical students and residents applying for the integrated plastic surgery positions and plastic surgery subspecialty fellowship positions respectively.

Methods: An IRB-approved survey study was conducted on applicants that applied to an integrated plastic surgery residency or a plastic surgery subspecialty fellowship (craniofacial surgery, hand surgery, microsurgery, burn surgery) during the 2020-2021 application cycle. Survey administration and data collection was performed using the Qualtrics platform.

Results: 94 surveys were completed by residency applicants and 55 by fellowship applicants. After the interview season, 80% of fellowship applicants recommended virtual interviews compared to 61.7% of residency applicants ($p = .03$). Fellowship applicants had significantly fewer issues with self-advocacy and did not view the virtual interview process as a significant detriment to meeting program residents/staff, viewing the hospital/surrounding area, and learning about the program ($p < .05$). A higher percentage of fellowship applicants interviewed at multiple programs during a single day compared to residency applicants (56.4% vs.27.7%; $p < .001$).

Conclusion: The majority of both integrated plastic surgery residency and subspecialty fellowship applicants recommend virtual interviews. However, a higher proportion of fellowship applicants prefer virtual interviews with key differences in perceptions, expectations, and priorities. Our data supports that fellowship programs may wish to continue virtual interviews even after COVID-related restrictions are lifted, because fellows are equally able to self-advocate in a virtual format while benefiting from cost and time savings; fellowship programs would also gain the cost and time savings from this model as well.

Forging the Flow In Vitro: Engineering a Customizable, Low-cost, Macroscopic Vascular Channel

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Background: Plastic and reconstructive surgeons rely heavily on autologous donor tissue as a source of replacement tissue to restore form and function following trauma, burns, oncologic resection, congenital abnormalities, and infection. The downfall of autologous tissue is consequent donor site morbidity and potentially unavailable tissue for that specific application. Tissue engineering efforts that aim to generate soft tissue are constrained in size by their reliance on vasculature and the complexity associated with fabricating microvascular networks capable of promoting cell survival. Currently, research is focused on the inclusion of mature microvascular networks within tissue constructs, however, their small scale is not readily clinically translatable. Here, we present the creation of a customizable tissue construct with a larger-scale (1.5mm in diameter) vascularized channel that is compatible with a low-cost perfusion chamber.

Methods: Tissue constructs are housed in a custom molded PDMS base compatible with our perfusion chamber. Both the mold and chamber were fabricated using 3D-modeling software (Fusion 360) and constructed using a 3D printer (Prusa i3 MK3S) in poly-lactic acid (PLA). Tissue constructs were set within perfusion chambers made from PDMS and glass cover slides and held together with bolted PLA frames. Vascularized channels were created by the sacrifice of custom designed Pluronic F127 loops in 1% type I collagen. Following collagen crosslinking, channels were flushed with 20mL PBS at 1mL/min to remove all residual Pluronic F127. The channels were then sequentially seeded with RFP-transfected Human Aortic Smooth Muscle Cells and GFP-transfected E4-Human Umbilical Vein Endothelial Cells. Cellularized constructs were maintained in static culture for 3 days before starting perfusion at 2 mL/min. Perfusion devices were maintained in static or perfusion cell culture for 5-7 days and monitored with fluorescent microscopy.

Results: Tissue constructs were maintained in static culture for 7 days and perfused with media for 5 days. Fluorescent microscopy of static constructs revealed collagen loops properly seeded with confluent endothelial and smooth muscle cells. After 7 days in static culture, collagen loops maintained high cell viability with elongation of smooth muscle cell morphology. After 5 days of media perfusion, endothelial cells and smooth muscle cells aligned with the direction of flow and began to form a barrier at the collagen edges.

Conclusion: The creation of this large-scale tissue construct holds great potential for the field of microvascular tissue engineering. This work shows proof of concept of a large vascular structure embedded in a collagen ECM offering researchers the potential to create a vascular channel with the design of their choice, a cell-laden or non-cell-laden collagen ECM, and compatibility with a low-cost perfusion circuit. This device may be replicated and customized to individual needs, making it very valuable for translational research laboratories and holds potential for building human scale tissue constructs with hierarchical vascular architecture.

Embrace the Machine: A Risk Factor-Based Machine Learning Approach to Target Breast Skin Necrosis

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Background: Mastectomy skin flap necrosis is a common complication that requires prolonged wound care and possible re-operation. This study aims to compare the rates of mastectomy skin flap necrosis between patients undergoing autologous and device-based reconstruction and to establish independent risk factors for breast skin necrosis. In addition, this study aims to create a risk factor-based machine learning approach to predict mastectomy skin necrosis based on patient characteristics and operative details.

Methods: The authors retrospectively identified patients who underwent immediate breast reconstruction using either the deep inferior epigastric perforator flap (n = 373 breasts) or tissue expanders (n = 529 breasts) by two surgeons at a single institution between 2011 and 2021. Variables collected include patient characteristics, oncologic regimen, and surgical techniques. Multivariate regression analysis was used to compare rates of mastectomy skin flap necrosis between autologous and tissue expander cohorts and to identify risk factors. These risk factors, along with operative techniques and breast measurements, were then used as features of machine learning models. Supervised learning algorithms, including logistic regression, Gaussian Naïve Bayes, K-Nearest Neighbors (KNN), Decision Tree Classifier, Random Forest, and Support Vector Machine (SVM), were tested, and the three models that achieved highest accuracies were further evaluated using 10-fold cross validation. Model performances were then compared using receiver operating characteristic (ROC) curves.

Results: There was no significant difference in rates of skin flap necrosis between DIEP and tissue expander groups after controlling for cohort differences (26.8 percent versus 15.5 percent, $p = 0.052$). Across all patients, obesity (BMI > 30) and hypertension were found to confer a significantly higher risk of skin necrosis ($p < 0.001$, $p = 0.024$, respectively). On subgroup analysis, mastectomy specimen weight was a significant risk factor for necrosis in the DIEP cohort ($p = 0.001$) while a higher DIEP flap weight was not a risk factor. In our analysis of machine learning models, KNN, SVM, and Random Forest models achieved the highest accuracies (83 percent, 81 percent, and 81 percent, respectively). After 10-fold cross validation, SVM model achieved the best results (AUC = 0.71) compared to KNN and Random Forest models.

Conclusions: In one of the most comprehensive analyses of patient- and breast-level variables across reconstructive modalities, our results demonstrate that immediate autologous reconstruction does not place patients at higher risk of skin necrosis. Hypertension and obesity (BMI > 30) were independent risk factors for necrosis in all patients while mastectomy specimen weight was a significant predictor of necrosis in DIEP flap patients. Our SVM-based machine learning algorithm with 81 percent accuracy offers individualized risk assessments and can help guide surgical planning and postoperative care for high-risk patients, such as using intraoperative laser angiography to definitively assess skin viability or delaying reconstruction if these technologies are not available.

Assessing Sentiments and Emotions in #PlasticSurgery and #CosmeticSurgery in Twittersphere: Two Year Analysis

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Purpose: Plastic and reconstructive surgery (PRS) patients' communications through social media provide valuable insight into public attitudes, experiences, and values related to PRS. While there have been multiple studies of PRS-related content on Instagram and Facebook, however, to date, there are limited studies of PRS-related content on Twitter. Hence, this

study aims to investigate U.S. located Twitter users' perceptions and sentiments towards PRS, focusing on cosmetic surgery.

Methods: All tweets using #Plasticsurgery or #Cosmeticsurgery and posted from October 01, 2019, to February 20, 2022, were retrieved from Twitter's Application Programming Interface v2. We excluded all tweets with geolocation outside of the U.S., retweets, and language other than English. Sentiment analysis was conducted by using the R library "syuzhet" package to find specific words associated with two sentiments (positive and negative) and eight emotions (anger, fear, anticipation, trust, surprise, sadness, joy, and disgust). Emotional word clouds, the number of tweets related to emotions and feelings, and trends over time were generated. Negative binomial regression and linear regression models were conducted to assess differences between #Plasticsurgery and #Cosmeticsurgery tweets.

Results: A total of 99,986 tweets were extracted, of which 77,735 and 22,251 tweets were #Plasticsurgery and #Cosmeticsurgery tweets, respectively. Regarding bipolar sentiments, both groups had approximately 80% of the tweets expressing positive feelings. "Trust" was the predominant emotion expressed in tweets among both groups, followed by "joy" in the #Plasticsurgery group and "fear" in the #Cosmeticsurgery group. For #Plasticsurgery tweets, the highest frequency emotion and associated words were as follows: joy - "beauty," surprise - "good," fear - "procedure," sadness - "surgery," disgust - "fat," anger - "scar." For #Cosmeticsurgery tweets: joy - "beauty," surprise - "good," trust - "website," fear - "procedure," sadness - "surgery," disgust - "nose," anger - "fraud." A statistically significant difference was evidenced between the two groups when comparing each individual emotion and positive and negative sentiments, except for anger. #Plasticsurgery vs #Cosmeticsurgery tweets had a statistically significant difference in sentiment score ($p < 0.001$).

Conclusion: Our findings revealed that patient perceptions and concerns differ depending on the scope of plastic surgery practice. Sentiments and emotions among Twitter's users related to #Plasticsurgery and #Cosmeticsurgery were mainly positive with the majority expressing feelings of trust in their tweets. This data can assist in patient counseling and education, such as setting expectations for scar outcomes, or appreciating how surgeon websites can aid in building patient trust in cosmetic surgery. Further research is required to compare how these associations may differ on other social media platforms, and how these associations can be used in the pre-operative setting to achieve improved patient satisfaction.

The Role of General Surgery Training in Integrated Plastic Surgery Residency Training Programs

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Background: Since their development, integrated plastic surgery (PRS) residency training programs have established a diversity of methods for incorporating general surgery training into their residencies.1 Over time, institutions have questioned the necessary duration, composition and timing of general surgery exposure given the recommendations from the American Board of Plastic Surgery (ABPS).2 The aim of this study is to assess the landscape of general surgery exposure in integrated PRS residency programs.

Methods: 36 integrated PRS residency programs were included based on the availability of PGY-level rotation data. Rotations were measured in units of weeks, with descriptive titles maintained as advertised by the program. If a program included a rotation with only location information but not rotation name, that rotation was excluded from analysis. Integrated program curriculum requirements were aggregated from the ABPS 2021 Booklet of Information, where Required Clinical (RC) and Strongly Suggested (SS) Rotations are delineated.

Results: All 36 programs evaluated required general surgery rotations in years PGY 1-2, with the most common durations being 32 and 20 weeks, respectively. By PGY-3, only 58% of programs required general surgery, and by PGY-6, 25%, and these were limited to 4–6-week rotations in burn, breast, or trauma. Across all 6 years, the minimum number of weeks spent in general surgery rotations was 32, and the maximum number was 119, with an average of 61 weeks (+/- 21).

Programs were subcategorized into two groups based on whether they spent more (n=16) or less (n=20) than 61 weeks in general surgery. Individual general surgery rotations were also categorized as being PRS-aligned, ABPS RC, or ABPS SS Rotations. We found no significant difference in the relative proportion of PRS-aligned general surgery across groups, meaning programs with more general surgery did not favor PRS-aligned general surgery rotations more-so than those programs with less general surgery.

Programs with <60 weeks of general surgery had a relatively greater proportion of ABPS RC and SS rotations ($p<0.05$). Similarly, these programs had more weeks of plastic surgery subspecialty exposure than those programs with more than 60 weeks of general surgery ($p<0.00$).

Conclusions: Our data demonstrates that there exists significant variability in overall duration of general surgery training across integrated PRS training programs. When controlling total general surgery exposure for variables of interest like PRS-aligned exposure or compatibility with ABPS requirements, we found no discernable educational model or patterns to explain the observed range in exposure. These results warrant reexamination of an

ideal general surgery exposure within the integrated plastic surgery training model that optimizes training for the PRS resident.

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Independent Department Status in Plastic Surgery has Improved Academic Productivity

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Purpose: Recent trends indicate a transition from plastic surgery divisions within larger general surgery departments toward independent plastic surgery departments. Benefits of independent departmental status include greater financial, academic, educational, and administrative autonomy. [1] However, there is a dearth of research regarding faculty advancement and research output among these organizational units. The goal of this study was to understand the comparative states of scholarship at departments and divisions of plastic surgery.

Methods: All independent and integrated residency programs were identified via American Medical Association Fellowship and Residency Electronic Interactive Database Access and the American Council of Academic Plastic Surgeons. From each institution's website, department or division status, and names of faculty members were extracted. For each faculty, bibliometric profiles were created using the Scopus and iCite databases. Lifetime and five-year h-indexes, and subsequently, m-quotients (h-index divided by years since first publication) were acquired from the Scopus database. Mean relative citation ratio (m-RCR) and weighted relative citation ratio (w-RCR) were obtained from the iCite database.

Institutions were then categorized under either a department or division and data were compared between groups using a Mann-Whitney U test with a predetermined level of significance of $p<0.05$.

Results: 94 institutions with integrated or independent training programs were included in the analysis. Of these, 77 had a division of plastic surgery and 17 had independent departmental status. All departments had an integrated plastic surgery program, and seven departments (41%) had an additional independent program. Of the divisions, 66 (86%) had an integrated program and 40 (52%) had an independent residency program. Collectively, these institutions had 1120 plastic surgery faculty. Overall, plastic surgeons had an average lifetime h-index of 11.20, 5-year h-index of 3.40, and m-quotient of 0.58. Stratification by organizational structure revealed significance in academic productivity in departments compared to divisions in the lifetime h-index (14.06 vs. 12.95; $p = 0.045$) and 5-year h-index (4.36 vs. 3.97; $p = 0.018$) metrics. There was no significance when considering the m-quotient (0.68 vs. 0.65; $p = 0.083$), m-RCR (1.36 vs. 1.19; $p = 0.22$), and w-RCR (31.67 vs. 21.04; $p = 0.13$).

Conclusions: Previous literature suggests that the organizational transition of plastic surgery toward departmental status confers quantifiable benefits in academic performance for faculty.[2] These previous studies were limited in scope and are outdated. Here, we observed statistically significant differences in academic productivity between departments and divisions of plastic surgery, when analyzing Scopus' lifetime and five-year h indexes. These findings, in conjunction with the other metrics that were not significant but trended toward increased academic productivity for independent plastic surgery departments can be used to substantiate the benefit of departmental status and for benchmarking the academic productivity of faculty and programs at different institutions.

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Initial Size of The Graft: The Real Culprit Behind Primary Contraction of Skin Graft

Abstract Presenting Author:
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Introduction: Primary contraction of full-thickness graft has been traditionally quoted to be 40 %. There are lacunae in literature to elaborate on the factors influencing it ever since.

Materials and Methods: About 75 subjects who underwent full-thickness grafting procedures to resurface small defects were included in the study. The initial and final graft dimensions after primary contraction were traced on x-ray templates and the percentage of contraction was evaluated using the graphical method. This was further correlated with age, collagen, elastic MMP1 and 2 content along with the dermal thickness of the skin specimen sent from the graft.

Result: The Primary contraction of the graft had a very significant correlation only with the initial size of graft harvested with a linear regression of 33.3 % and a Pearson's correlation of 0.587 significant at a p-value of 0.001.

Conclusion: This study though preliminary tries to highlight an important factor that Primary contraction of grafts is a physical phenomenon independent of its contents like collagen, elastin, or MMP1 and 2 or age and dependent on its initial size of harvest instead.

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Does Plastic Surgery Need to Hit Refresh? A Survey and Systematic Review of Robot-Assisted Surgery Reveals Growing Interest and Utility Within Plastic Surgery

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Background: This is a paucity of data regarding plastic surgeons' opinions on robotic-assisted surgery (RAS). We developed a questionnaire aimed to survey plastic surgeons regarding training in robotics, concerns about widespread implementation, and new research

directions. Results from the survey directed a systematic review of RAS in plastic surgery in microsurgery, abdominal wall and pelvic/perineum reconstruction.

Methods: A survey was created using Google Forms and sent to practicing plastic surgeons and trainees. Responses regarding desired conference proceedings about robotics, robotic residency training, and perceived barriers to implementation were elicited. PubMed, Scopus, Web of Science, Embase, and Cochrane were queried for relevant studies.

Results: The survey received 184 responses (20.4%; 184/900). The majority (92.8%) of respondents were/are plastic surgery residents, with the most common fellowships being microsurgery (39.2%). Overall, 89.7% of respondents support some integration of robotics in the future of plastic surgery, particularly in pelvic/perineum reconstruction (56.4%), abdominal reconstruction (46.5%), microsurgery (43.6%), and super microsurgery (44.2%). Many respondents (66.1%) report never using a robot in their careers. Respondents expressed notable barriers to widespread robotic implementation, with cost (73.0%) serving as the greatest obstacle. Respondents believed increased operative time (62.9%), lack of level 1 evidence (56.2%), and lack of adequate training (55.6%) to also be significant barriers. A total of 10 studies (pelvic/perineum = 3; abdominal = 3; microsurgery = 4) were included after full-text review. Two abdominal wall and two pelvic/perineum studies showed improved outcomes and lower complication rates when compared to traditional methods, however statistical testing was not performed. One study reported the average disposable material cost of robotic harvest of deep inferior epigastric perforator flaps was $1500 compared to $500 and $250 in laparoscopic and endoscopic approaches, respectively. Findings were inconclusive in regard to the effect of using RAS on operative time. One study reported no significant difference in operative time between RAS and traditional varicocelectomy whereas another found that RAS operative time was longer than endoscopic and laparoscopic cohorts but did not evaluate for significant differences across the three groups.

Conclusions: Evidence from our survey and systematic review supports the growing interest and utility of RAS within PRS and mirrors the established trend in other surgical subspecialties. Our review shows that RAS is safe with few complications across three types of plastic surgery. Cost analyses will prove critical to implementing RAS within PRS. With validated cost benefits, RAS can be incorporated into plastic surgery programs through validated curricula.

Establishing Content Validity in a Novel Scar Assessment Tool Evaluating the Career and Sexual Well-being Impact of Scars

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Introduction: Patient Reported Outcome (PRO) measurements are used to assess scar impact which can have negative physical and psychosocial consequences for patients.[1] Currently, scales focus on psychosocial well-being, symptoms, and appearance.[2] There remains a need to develop a broadened measure of scar impact on patients focusing on sexual and career aspects which have not been studied before, and have been deemed important by patients.[3] This study will investigate the content validity of a novel Career and Sexual Well-being (CS) Scar Impact Scale.
Method: The CS scale contains five questions and was developed from previous patient thematic analysis interviews describing scar impact, and includes sub-themes of self-conscious behavior, new partners, hiding of the scar, being hindered in the workplace as well as concerns regarding unprofessional appearance.[3] Cognitive interviews were used to ensure that the scale was comprehensive. Established cognitive interview guidelines were utilized for the evaluation of question wordings, instructions, content coverage, and response options.[4]

Results: 86 patients completed cognitive interviews. Patients had a clear understanding of the questions and elicited their intent in the interviews. In relation to the impact of scarring on sexual health and career, 86% of patients rated the content coverage at a 3 or above out of 4. 95% said the instructions were not confusing and 97% said they would not alter the instructions of any questions. Similarly, format and length were not concerns with 92% stating it took them less than four minutes to complete the scale in its entirety. Overall, patients found the scales easy to answer and denied any confusion with the phrasing of questions. After the first round of interviews, a question about "perception/self-consciousness in a professional environment" was added based on patient suggestions.

Conclusions: The Career and Sexual Well-being scar scale demonstrated face validity, acceptability, and field-readiness through cognitive interviewing of patients at our instituion. Sexual well-being and career performance are important yet often neglected themes with which scars should be assessed. Usage of these tools would serve to improve current scar scales.

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Crowdsourcing in Plastic & Reconstructive Surgery: A Systematic Review with Reporting Recommendations

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Introduction: Crowdsourcing uses online platforms to collect large data from laypersons and has been increasingly leveraged to answer questions about aesthetic and functional outcomes in plastic and reconstructive surgery. This systematic review evaluated crowdsourcing studies in plastic surgery to describe best-practices and present standardized reporting recommendations.

Methods: A systematic search strategy was developed with a licensed librarian and attending plastic surgeon to query all manuscripts using crowdsourcing in plastic and reconstructive surgery: ("Reconstructive Surgical Procedures"[Mesh] OR "Surgery, Plastic"[Mesh] OR "plastic surgical" OR "plastic surgery" OR plast* OR cranio* OR cleft OR breast* OR microsurgery OR aesthetic* OR cosmetic* OR "hand surgery" OR "gender surgery" OR "gender affirmation" OR transgender) AND ("Crowdsourcing"[Mesh] OR crowdsourc* OR "crowd sourc*"). The covidence systematic review manager was used by two independent reviewers to import articles, screen abstracts, evaluate full texts, and extract data.

Results: The search strategy generated 168 studies, of which 45 were ultimately included. 48,153 laypersons, 248 surgeons/experts, and 127 patients participated. The number of published studies increased significantly over time when evaluated by month of publication ($r2 = 0.898$) with two thirds published in 2020 and early 2021 alone (2016: n = 2; 2017: n = 2; 2018: n = 6; 2019: n = 5; 2020: n = 17; early 2021: n = 13).

Demographics reporting across studies was highly variable, with 37 (82.2%) studies reporting sex, 36 (80.0%) reporting mean or median age range, 26 (57.8%) reporting race, 23 (51.1%) reporting median income, 23 (51.1%) reporting highest education, 21 (46.7%) reporting country of origin, and three (6.7%) reporting sexual orientation. Participants in plastic surgery crowdsourcing studies are more commonly from the US, female, straight, 25 to 35 years old, have completed college, and earn 20,000 – 50,000 USD per year.

Of the 45 included manuscripts, craniofacial surgery made up nearly one third of all studies (n = 14, 31.1%, p = 0.020). Aesthetic surgery (n = 9, 20.0%) and breast surgery (n = 6, 13.3%) were also highly represented. Studies paid participants an average of $0.34 ± 0.38 USD ($0.05 – 1.25) and cost an average of $358.78 ± 391.03 ($49.60 – 1413.00), running over the course of 30.1 ± 45.9 days (8 hours – 182 days, median 9 days).

Seven studies included both laypeople and surgeons or experts, and concordance of layperson and surgeon/expert ratings was variable: in three studies ratings between groups agreed, in three studies ratings disagreed, and in one study the findings were mixed.

Conclusions: Crowdsourcing is a relatively new, low-cost method of garnering high-volume data from laypersons that may further our understanding of public perception in plastic and reconstructive surgery. As with other nascent fields, there is significant variability in number of subjects utilized, subject compensation, and methodology, indicating an opportunity for quality improvement. Robust understanding of crowdsourcing participant background and demographics will be important for establishing meaningful conclusions from crowdsourcing studies in plastic surgery.

BreastGAN: Artificial Intelligence-Enabled Breast Augmentation Simulation

Abstract Presenting Author:
Christian Chartier

Goals/Purpose: Managing patient expectations is important to ensuring patient satisfaction in aesthetic medicine. To this end, computer technology developed to photograph, digitize, and manipulate three-dimensional (3D) objects has been applied to the female breast. However, the systems remain complex, physically cumbersome, and extremely expensive. The authors of the current study wish to introduce the plastic surgery community to BreastGAN (Breast Generative Adversarial Network), a portable, artificial intelligence-equipped tool trained on real clinical images to simulate breast augmentation outcomes.

Methods/Technique: Charts of all patients who underwent bilateral breast augmentation performed by the senior author were retrieved and analyzed. Frontal before and after images were collected from each patient's chart, cropped in a standardized fashion, and used to train

a neural network designed to manipulate before images to simulate a surgical result. AI-generated frontal after images were then compared to the real surgical results.

Results/Complications: Standardizing the evaluation of surgical results is a timeless challenge which persists in the context of AI-synthesized after images. In this study, AI-generated images were comparable to real surgical results.

Conclusion: This study features a portable, cost-effective neural network trained on real clinical images and designed to simulate surgical results following bilateral breast augmentation. Tools trained on a larger dataset of standardized surgical image pairs will be the subject of future studies.

Using Breastgan v2.0 to Improve Patient Selection in Single- Stage Augmentation/ Mastopexy

Abstract Presenting Author:
Christian Chartier

Goals/Purpose: The controversy surrounding single- stage breast augmentation mastopexy is well- described in the plastic surgery literature. When performed individually, breast augmentation and mastopexy are safe and reliable, incurring relatively few complications and achieving predictably high patient satisfaction scores. However, the single- stage combined augmentation mastopexy juxtaposes two procedures exerting opposing forces on the skin envelope of the breast: expansion by way of breast volume augmentation but reduction concurrent with pedicled nipple repositioning to lift the breast. This opposition has earned the augmentation mastopexy its degree of difficulty and revision rate, both among the highest across all plastic surgery procedures. Carefully balancing these conflicting vectors may be challenging for plastic surgeons. The authors of the present study propose BreastGAN (Breast Generative Adversarial Network), an artificial intelligence- equipped tool designed to simulate results of breast surgery from a single frontal preoperative image. It outputs separate images reflecting plausible breast augmentation and combined augmentation mastopexy results. This may provide patients with more tangible insight into the proposed procedures and allow them to provide more informed consent.

Methods/Technique: All patients with signed research consents who underwent primary breast augmentation or combined augmentation mastopexy performed by one of the authors (E.H.F.) between 2003 and 2018 were included. In total, before and after image pairs were collected from 1,235 breast augmentation patients and 389 augmentation mastopexy patients, constituting two separate databases. BreastGAN was evaluated on all images in both test sets, or 309 pairs of augmentation patient images and 97 pairs of augmentation mastopexy patient images. Images generated by the tool were compared to the corresponding true postoperative images.

Results/Complications: BreastGAN (trained to output augmentation and augmentation mastopexy results, respectively) was deployed across preoperative images of patients presenting with a wide array of breast morphologies who each underwent either breast augmentation or augmentation mastopexy. Simulated results were comparable to true postoperative results across a sample of patient.

Conclusion: This study features a potential low- cost alternative to costly surgical simulators. If adopted, it may provide surgeons with a tool with which to obtain more informed consent by giving them a tangible example of a plausible postoperative result for multiple procedures. GAN training on more images provided by a complete distribution of plastic surgeons will be the subject of future study.

Should We Train Robotic Surgery Skills During Plastic Surgery Residency?

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Background: Robotic Surgery remains an exciting avenue and increasingly having a significant impact on all surgical specialties, including Plastic Surgery (1). We have noted a mounting interest among surgeons throughout the world for varying indications. Nonetheless, true change and uptake can only come from training and increased exposure during the surgeon's formative years. Exposure, in turn, can lead to new innovations and indications for robotic surgery. To this aim, we designed a survey to gauge awareness, interest, and future perspectives of Belgian residents on Robotic Plastic Surgery.

Methods: A 31-point questionnaire was designed by the Belgian Plastic Surgery Resident Organization in cooperation with the Organization of Robotics and Surgical Innovation (ORSI) Young Professionals Board. Questions were designed as Likert scales from 1 to 5 (low to high). This was sent to all Belgian residents by e-mail, followed by a reminder one and two weeks later.

Results: 40 of 60 residents (67%) with an average age of 29 years replied to the questionnaire. 20% had witnessed robotic procedures during their plastic surgery residency, most of which were for robotic DIEP flap harvest. The average rating (out of 5 on Likert scales) for current utility in robotic surgery was 2.4 and for cost effectiveness 1.6. When asked about future utility this rose to 3.3 ($p < 0.01$) and future cost-efficiency to 3 ($p < 0.01$). Robotic training as an added value for residency was rated highly (4 or above) by 66% of residents with an average rating of 3.6. Residents rated their current knowledge on robotic

surgery as 2.2. Interest in learning more about robotics in plastic surgery was rated 4 and 4.4 for linked novel innovations in plastic surgery such as virtual surgical planning and augmented reality.

Conclusions: Our findings underline that robotic surgery enjoys a limited exposure in plastic surgery, with only 27% having seen at least one procedure performed with a robot during residency. Current utility and cost efficiency are rated averagely; however, there is a significant increase when questioned on the future. This, coupled with a high interest in learning about robotics, shows that residents look favorably at the evolution of robotic plastic surgery. Increased exposure at an early stage during the formative years can help in expanding knowledge and surgical skills allowing plastic surgeons to remain at the forefront of surgical innovation.

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Validation of a New Measure for Academic Achievement: The SINAIndex

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Background: Academic achievement is an important metric to appraise a physician's scholarly activity, yet its definition and scope remains difficult to quantify. [1,2] The introduction of the Hirsch-index (h-index) in medicine sparked debate on what constitutes an 'academic achievement' and whether it's components should become the standard. Here, authors sought to design a comprehensive measure of academic achievement beyond the number of publications and citations. An algorithm was designed and validated that generated a score which serves as a novel measure of academic achievement, termed the Standardized Inclusive Numeric Academic Index (SINAIndex).

Methods: Thirty curriculum vitaes (CVs) of academic surgeons were anonymized and ranked in order of increasing academic achievement by six volunteers. Inter-rater reliability was assessed by Krippendorff's alpha, where 0 signifies perfect disagreement and 1 signifies perfect agreement. The CVs were then mined for information relating to academic achievement which was entered into the algorithm. Rank ordering was compared to the

average rankings from the raters. Utilizing the score and ELO rating for each criterion established by our previous study, the SINAIndex was computed by adding the h-index to the sum of the product of the scores and inputs for each criterion (where the input is the number of instances each criterion is met in the CV), divided by 1000: SINAIndex = Sum (Score*ELO*Input)/1000 + h index

Results: Inter-rater reliability for the six rankers was found to have a Krippendorff's alpha of 0.843. The inter-rater reliability between the average rater ranking and the algorithm-generated ranking had a Krippendorff's alpha of 0.925. The difference between the two rankings exceeded 5 ranks on four occasions.

Conclusion: The present study demonstrates a satisfactory level of agreement between the SINAIndex algorithm and our raters. The SINAIndex is a valid and reliable comprehensive measure of academic achievement. Interestingly, the agreement between the algorithm and the aggregate rankings of the raters was higher than the agreement among raters.

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Simulation in Microsurgery: 3D Printed Anatomic Models and Materials Engineering to Simulate Operative Exposures for Resident Training

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Background: Microsurgery requires high technical skills, precision, dexterity and associated with a steep learning curve. To gain adequate proficiency the role of simulation may now be more critical to better prepare trainees. This pilot study presents how 3D printing and

materials engineering can offer an innovative approach to develop to simulate the ergonomics with anatomical operative exposures for microsurgery training.

Methods: Prototypes to practice anastomosis in a neck and breast reconstruction model. For the neck, a forensic Computed Tomography (CT) data was used to create a two-part model: neck and lower face and an inset for the biosynthetic vessel mount (Figure). An illustration of exposed anatomy was 3D printed on the surface using texture mapping. A clear silicone sheet was affixed over the surface of the model to provide a soft surface around the inset. Further model development used a combination of a 3D printed base component and silicone surface. The surface model was re-cast in clay and moulded in a urethane casting material, fibre-glass cloth then injected with tinted silicone and painted. The silicone moulding was used for the breast reconstruction model. Replaceable biosynthetic vessels were used to perform the anastomosis, using an adjustable height bench to allow the participant to stand while using the operating microscope. A short survey and feedback were obtained during development.

Results: 7 participants, from junior to expert level, were included in the pilot model development. Both models demonstrated suitability of 3D anatomic models in surgical education and simulation training that can simulate the ergonomics and increased difficulty level when performing a micro anastomoses in real case situations. There was agreement in cost-effectiveness and utility for trainee microsurgery skills practice.

Conclusion: 3D printing can offer a customizable, cost-effective, and reproducible solution for non-biologic, high fidelity simulators for microsurgery training, that can also to better simulate the ergonomics of the OR environment. We are conducting a prospective study to assess and evaluation the utility and translation of this model to assess performance and proficiency among surgical residents. These models may provide solutions for greater accessibility for microsurgery skills acquisition and in education on a national or global platform.

Automated Machine Learning for Risk Prediction of Incisional Hernia In Abdominal

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Introduction: Incisional hernia (IH) is a common, morbid long-term complication following abdominal surgery.1 Its incidence is estimated to be 500,000 annually.2 Our group

previously developed a logistic regression model to predict risk of IH.3 The purpose of this study was to determine if automated machine learning (AutoML) is superior to logistic regression (LR) in assessing risk of incisional hernia, and understanding which clinical features are salient for IH formation.

Methods: This retrospective cohort study reviewed adult patients who underwent colorectal surgery at our institution from 2005 - 2016. Development of IH was noted. Two sets of clinical features were tested: a limited set of 18 features previously studied, and an expanded set of 246 clinical features. The four models generated were: LR with limited features, LR with expanded features, AutoML with limited features, and AutoML with expanded features. Primary outcome was the AUC generated by each model. Secondary outcomes included differences in predictions at varying true positive rates and Shapley values for feature importance.

Results: 20,516 patients were included, of which 12.3% developed IH (n=2,519). 67% of patients were used to train the models (n=12,871). The other 33% were the test cohort (n=6,340). AUCs were calculated: LR limited 0.599, LR expanded 0.682, AutoML limited 0.706, AutoML expanded 0.747. At a true positive rate of 0.8, the AutoML expanded had a False Positive Rate (FPR) of 0.64, compared to AutoML limited FPR of 0.71, LR expanded of 0.78, and LR limited of 0.82 (all $p < 0.0001$). Shapley values of both the limited and expanded feature sets revealed the most critical factors predicting risk of IH were age and BMI followed by others. However, feature importances shifted moving from limited to expanded features.

Discussion/Conclusion: Automated machine learning is better at predicting IH development over logistic regression. Predictions generated from expanded features are also better than from limited features. Finally, the importance of clinical features shift when using a larger feature set.

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Mechano-Immunomodulation of Fibrosis and Healing

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Background: Repair after tissue injury involves a dynamic interplay among not just tissue resident cells (e.g., fibroblasts)1, but also cells recruited from the circulation. Myeloid cells, such as monocytes and macrophages, are derived from hematopoietic precursors and migrate to sites of injury where they play a role in modulating all stages of wound healing and scar formation2. There is mounting evidence that mechanical stimuli are also able to modulate monocyte and macrophage response during tissue healing, but the exact mechanisms behind this "mechano-immunomodulation" remain incompletely understood3.

Methods: We attached a mechanical strain device to the mouse dorsum to initiate a uniform and consistent strain profile across an incisional wound to create hypertrophic scar (HTS) formation in mice4. These devices are steel palatal expanders with rod extender arms that are attached to the backs of the mice to impose mechanical strain and promote HTS. To analyze the scar tissue, we took photos of the scars before we explanted. We also performed histology and used computer algorithms to analyze collagen architecture.

To investigate mechano-responsive immune cells, we performed parabiosis of wildtype (WT) and GFP+ mice, allowed the mice to develop a shared blood circulation, initiated HTS formation in the WT mouse, and analyzed the cells using single cell RNA sequencing (scRNA-seq), fluorescent-activated cell sorting (FACS), and immunofluorescent staining. We also bred macrophage specific focal adhesion kinase (FAK) knockout (KO) mice, as well as treated mice with FAK inhibitor (FAKI).

Results: Utilizing these devices created scars in wildtype mice with increased levels of fibrotic tissue and highly aligned collagen as compared to the control wildtype mice without extension. Mechanical modulation significantly upregulated the presence of inflammatory subtypes within the healing tissue, characterized by an increase in infiltrating GFP+ immune cells from 5.4% to 12.2%. In the GFP+ circulating immune cells, mechanical strain directly increased the proportion of fibrotic myeloid cells, primarily defined by the monocyte marker Ly6c2 as well as the TGFB responsive and macrophage activating gene Thbs1 (which codes for the protein Thrombospondin 1).

With gross photography, we took measurements of both the length and width of the scars to compare the myeloid FAK KO scars with wildtype HTS scars. We observed that KO generated visually less scarring than in wildtype mice. Furthermore, FAKI treated wounds

also improved healing and reduced fibrosis compared to HTS groups. Using picrosirius red staining, we observed that the HTS collagen fibers were also significantly longer and more highly aligned than FAKI treated and FAK KO scars, as well as unwounded skin.

Using scRNA-seq, we found that FAK inhibition inhibition reduced the proportion of Thbs1+/Ly6c2+ fibrotic cells and Ccl+/Il6+ inflammatory myeloid cells within the healing murine wound and instead promoted a unique subset of regenerative myeloid cells. Regenerative myeloid cells primarily upregulated anti-inflammatory myeloid markers Mrc1, Cd163, and Selenop, as well as regenerative marker Egr1 (encoding early growth response protein 1).

Using immunofluorescent staining, we confirmed that the scars in the HTS mice had significantly elevated levels of a pro-fibrotic extracellular matrix marker Thrombospondin1 compared to FAKI treated and KO scars. We also confirmed an upregulation of Selenoprotein P (encoded by Selenop) with FAK modulation.

Conclusions: Tissue injury activates a cascade of signaling pathways to recruit and orchestrate various cell types during healing. Our study indicates that modulating mechanical stress directly affects myeloid cell phenotypes and interactions with other cell types in the complicated, multicellular milieu of wound healing. This principle has been previously unexplored in the context of fibrosis and regeneration, with most previous studies focused on fibroblast heterogeneity and transcriptional profiles. To our knowledge, this is the first study to directly investigate the effects of modulating Mechantransduction on immune cell response at the single cell level utilizing parabiosis and wound healing. Collectively, we demonstrate that mechano-immunomodulation of the "early responders" of healing can trigger a cascade of downstream regenerative healing.

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A Systematic Review of Surgical Simulation in Gender Affirmation Surgery

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Introduction: The burgeoning field of gender affirmation surgery (GAS) has become increasingly complex, challenging plastic surgeons to meet a high set of functional and cosmetic standards for their patients. During the COVID–19 pandemic, rates of elective surgery declined with fewer patients receiving treatment for gender dysphoria. Correspondingly, there were fewer opportunities for residents to develop technical skills for these complicated and innovative procedures. The new emphasis on remote learning ushered in an increase of surgical simulation training, offering residents the opportunity to become familiar with challenging procedures before translating practice into patient care. As the field of GAS continues to evolve and the COVID-19 pandemic quells, there will be an increase in demand for GAS along with the expectation for surgeons to maintain the clinical prowess to master these techniques. We sought to review the literature for surgical simulations related to GAS to help residents and program directors alike improve their skills and enhance their curriculum.

Methods: A systematic review was conducted according to PRISMA-P guidelines using the following databases: PubMed, Medline, Scopus, Embase, Web of Science, and Cochrane. Selected search terms included procedures relevant to the field of GAS and various types of surgical simulation training. Inclusion criteria were English language peer-reviewed articles about surgical simulation techniques or training related to the field of GAS. Abstracts, conference proceedings, non-English literature, and reviews were excluded. Metrics including skills/techniques taught and assessed, model type, equipment, and cost were entered into an electronic database and analyzed.

Results: Our search identified 1,650 articles, 10 of which met inclusion criteria for data extraction. Simulation models included cadavers (n=2), synthetic benchtop or 3-Dimensionally printed models (n=6), and augmented/virtual reality interfaces (n=2). The most common procedure involved breast/pectoral reconstruction and/or augmentation (n=6), followed by vaginal reconstruction and/or repair (n=3). One simulation model involved facial GAS. All models focused on surgical technique and involved anatomical education.

Conclusions: The evolving field of GAS requires that plastic surgery trainees be well versed in this scope of practice. Surgical simulations not only teach residents to master techniques but also help address the sensitive nature of GAS. This systematic review revealed both a paucity in the literature, given relatively few publications, and identified a need to expand simulator options to benefit trainees and patients alike. In the COVID-19 era, with an increasing emphasis on remote learning, implementation of surgical simulation infrastructure adjacent to clinical training may benefit resident education with practical considerations for complexity and cost.

Implementation of Pipeline Program Curriculum for Early Exposure of Diverse Students Interested in Medicine to Plastic Surgery

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Background: Healthcare Early Access for Diverse Students Underrepresented in Plastic Surgery (HEADSUP) is a surgical pipeline program implemented by a group of residents, medical students, and undergraduate students in the Atlanta area. Previous study findings emphasize the benefit of targeted mentorship programs for improving access to experiences in competitive surgical subspecialties, including plastic and reconstructive surgery, although limited data documents such interventions.1 Programs focused on empowering traditionally underrepresented candidates have been suggested to promote pursuit of these subspecialties.1 In this study, we outline the structure of our curriculum for students in the Metro Atlanta Area. Its implementation not only teaches plastic surgery concepts, but also bridges the gap in recruitment of racially underrepresented trainees that better mirror US patient populations.

Methods: URM students from the Metro Atlanta Area attending either Georgia State University (GSU) and Morehouse School of Medicine (MSM) were recruited. A structured curriculum was followed at each event. This curriculum consisted of: 1) an introduction to the HEADSUP program and objectives, 2) basic concepts in plastic surgery, 3) case presentations with explanation of reconstructive concepts and anatomy, 4) cadaver dissection identifying key anatomical structures related to the case presentation, and 5) discussion of professional mentorship. The program was led by a team of residents and medical students from both Emory and MSM.
A survey was given to participants at the beginning and end of each event to assess interest in and familiarity with plastic and reconstructive surgery (PRS). Data collection is ongoing.

Results: Students representing GSU and MSM, including undergraduates, graduate students, and first year medical students participated in the program (N=35). We successfully recruited student participants with diverse backgrounds by promoting the program in pre-medical interest groups, class emails, and flyers in the anatomy lab. Preliminary data suggests an increased interest in a career in plastic surgery as well as improved comprehension of plastic surgery basic concepts. Feedback from students indicated high satisfaction with the program with room to further expand in the future.

Discussion: This curriculum allows students to be exposed to plastic surgery concepts, increasing interest at an early stage. The model also serves as a structured mentorship program for URM students as well as an educational pipeline into the field of PRS.

Conclusion: The HEADSUP program curriculum is a structured method designed to increase interest and knowledge of plastic surgery amongst racially underrepresented trainees. The curriculum was designed for replication in other cities and residency programs throughout the US with the goal of increasing the number of URM applicants to plastic surgery residency programs.
We will continue collecting data to objectively measure the outcomes of this ongoing program with future assessment of changes to the applicant pool. With sustained effort and collaboration, we can successfully empower a traditionally underrepresented range of candidates to pursue plastic surgery.

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Racial Disparity And Social Determinants In Melanoma Survival

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Background: Although uncommon in darker-skinned ethnic groups, skin cancer does occur and has higher morbidity and mortality when compared to Caucasians. [1] This has been stipulated to be a consequence of delayed diagnosis and treatment, possibly as a result of socioeconomic barriers hindering access to care and preventive screenings, as well as a misconception that darker races never develop skin cancer. [2] Despite a recent increase in population studies examining and recognizing the higher mortality rates of melanoma in people of color, studies lack to clearly identify the social determinants that play a role in the delayed diagnosis and treatment of melanoma.

Methods: An IRB-approved chart review was performed on patients 18 years old and older with melanoma diagnosis from January 2000 to December 2010 with a minimum follow-up of five years (unless deceased) at our institution. When deceased, cause of death was obtained from the Ohio Death Records to ensure melanoma specific death. Patient demographic data collected included age, race, ethnicity, zip code and medical insurance. Education and income level were calculated from patient's zip code or address, when not provided on medical records.

Results: A total of 1,482 patients matched inclusion criteria. 817 patients were deceased and 713 were found to have a melanoma related death. The non-deceased patients were almost entirely Caucasian (95.6%) while from the deceased patients, 33% were Caucasian. 72% of those patients lived in a low to medium income area. Caucasian patients were more commonly diagnosed with earlier stage melanoma (stage I-II) than non-Caucasian (stage III-IV) and had a shorter time span from diagnosis to treatment (2 weeks vs. 4 weeks, respectively). Overall, 87% of non-Caucasian patients had public insurance in comparison to only 26% of Caucasian patients.

Conclusion:
This study is the first to analyze several social determinants and their association with racial disparities in melanoma survival. Income level, possibly a consequence of education level, and time from diagnosis to treatment appear to affect patient survival. There is an unmet need particularly in the medical field to recognize these risk factors, consequence of racial disparity, in order to create intervention strategies that can result in improved survival rates.

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The Ethics Landscape of social media Within Plastic Surgery Research

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Background: Since the conception of the Healthcare Insurance Portability and Accountability Act (HIPAA) in 1996, the US Department of Health and Human Services has focused on safeguarding Protected Health Information (PHI). While PHI is often used in research settings, review and approval of such use falls under the jurisdiction of Institutional Review Boards (IRBs). With the emergence of multiple social media platforms over the past two decades, social media has increasingly served to integrate health marketing, research distribution, medical communication, and health-related campaigns and support. Particularly in pathologies that are relatively rare, social media can serve as a powerful tool to generate increased sample sizes for more robust data collection. However, as the role of social media

in medical and scientific research expands, we will face novel ethical considerations about the use of social media-derived PHI in research, considerations which may have not been on the forefront of IRB efforts to date. Thus, the purpose of the present study is to investigate the current landscape of using publicly available data from personal profiles for research in academic plastic surgery research.

Methods: To explore the current role of publicly available data from social media in plastic surgery research, we conducted a bibliometric analysis using the Scopus database. Key terms included "plastic surgery", "social media images", "twitter", "facebook", "instagram", and "social media," and papers were eligible for inclusion if they were published by the end of 2021. Keyword analysis was performed on included studies. Cluster groups, differentiated by colors, were generated based on link strength between terms.

Results: A total of 89 results were generated and included articles were published between 2010-2021. There was a steady increase in the number of published articles, with the greatest number published in 2021 (n=30). The most productive journals for publication were the Aesthetics Surgery Journal and Plastic and Reconstructive Surgery. The most common funding sponsors were the Eunice Kennedy Shriver National Institute of Child Health and Human Development and the National Institutes of Health. The majority of the articles (n=63) were published by research groups in the United States, with Canada having the next highest number of articles (n=6). The Keck School of Medicine of the University of Southern California was the most productive department within this topic (n=5). Author keyword analysis identified three clusters: 1) "marketing," "facebook," and "instagram" 2) "twitter," "social media," and "surgery" 3) "plastic surgery." There was considerable link strength between all three clusters.

Conclusion: As the role of social media in plastic surgery research grows, new regulations must be developed governing the use of any images and information extracted from these novel sources. Future studies should work with IRBs to develop and standardize these new guidelines.

CPT Coding and Database-Tracking in Gender-Affirming Surgery: Are Patients Falling Through the Cracks?

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Background: Gender-affirming surgery (GAS) is a rapidly growing field in the United States, fueled by recent insurance coverage and the shift of care into the academic sector with many centers now offering comprehensive gender affirmation care. (1,2) Despite this growth, there is still limited data on standard surgical complications for common interventions such as vaginoplasty, a form of GAS known as bottom surgery. Thus, the aim of this study is to examine the risk factors for deep venous thrombosis (DVT) or pulmonary embolism (PE) within 30 days of transfeminine vaginoplasty.

Methods: Transgender patients undergoing vaginoplasty were identified by using relevant International Classification of Diseases (ICD) and Current Procedural Terminology (CPT) codes on the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database from 2010 to 2019. Patient information, clinical variables, and postoperative variables were recorded to assess independent risk factors for postoperative complications.

Results: There were 7,492,051 total cases recorded in ACS-NSQIP between 2010 and 2019. 4,226 possessed relevant ICD codes. After filtration with relevant CPT codes, 457 cases were identified as vaginoplasties. Within this cohort, there were zero cases of DVT or PE, 24 cases of wound dehiscence, 17 cases of unplanned reoperation, 12 cases of surgical site infection. With no cases of DVT or PE, the primary outcome of interest, risk factor analysis was deferred.

Conclusion: Due to the heterogeneity of coding practices, a large portion of patients are not captured by querying relevant ICD and CPT codes. This presents a danger to transgender patients as it is difficult to isolate patients and inhibits quality improvement research from taking place. Thus, we advocate for procedure-specific CPT codes for each of the gender-affirming operations as well as a new ICD codes for gender transition that does not convey a pathologic diagnosis associated with gender dysphoria. With updated coding options, these operations can be databased, studied, and improvements can be made in the surgical care of transgender patients.

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Improving the Electronic Health Record Experience in Plastic Surgery: Lessons from the Arch Collaborative

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Background: While intended to improve the quality of patient care, electronic health records (EHRs) are a source of frustration for many clinicians. The KLAS Arch Collaborative is an international effort to benchmark the clinical user experience with health IT tools across all provider organizations. The purpose of this study is to better characterize the HER experience of plastic surgeons based on Arch Collaborative survey data, in order to identify key areas for improvement.

Methods: Survey data captured by the KLAS Arch Collaborative between 2017 and 2021 was analyzed. Their base HER survey assesses more than 40 aspects of the clinician-HER experience, including user satisfaction based on ten key attributes, which include the HER's ability to: facilitate efficiency, provide specialty-specific functionality, minimize system lag and downtime, and be easily learned. Only U.S.-based physicians were included for analysis. Multiple chi-square tests of independence were performed to examine the relationship between perceived HER efficiency and HER usage patterns and user characteristics.

Results: Plastic surgeons represented 486 of the 58,368 total physician-respondents. As the base survey has changed slightly since its inception, some physicians did not respond to all questions. Among 297 plastic surgeons who responded to the questions pertaining to burnout, 30.3% reported experiencing some level of burnout, the second highest of any surgical subspecialty; an additional 40.4% described themselves as under stress, but not burned out. Bureaucratic tasks, workload (particularly after-hours), and HER/IT inefficiency were the most commonly described contributors to burnout among plastic surgeons (16.5%, 11.5%, and 10.3% of respondents, respectively). Of the ten key attributes used to assess overall user experience, respondents were least satisfied with HER efficiency. Respondents who felt that their initial training ($p<0.0001$), ongoing training ($p<0.0001$), and personal efforts to learn the EHR system ($p<0.0001$) were sufficient were more likely to agree that EHRs facilitated efficiency. The relation between perceived HER efficiency and use of templates, report views, order lists and filters within the HER was also significant on chi-square analysis ($p<0.05$). All demonstrated increased satisfaction with HER efficiency, as did the use of the Epic HER (Epic Systems, Verona, WI).

Conclusions: HER optimization can increase efficiency, diminish after-hours workloads, and thus likely reduce rates of stress and burnout. It is also conceivable that some bureaucratic tasks could be automated through HER improvements. Ensuring optimal HER training also

requires an experience that is designed to be directly relevant to a clinician's specialty. Given the time-investment required to optimize the HER for our specialty, meaningful improvements will likely require engagement from plastic surgeons at both the institutional and the national level. One possible model for improvements are the "Specialty Steering Boards," which have demonstrated success in other specialties.1

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Utilizing Deep Learning to Predict Surgical Candidacy on Burn Wound Images: A Prospective Study

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Background: A critical component of burn wound management is determining whether a burn wound will require surgical intervention. This determination is reliant on the visual inspection of a surgeon, which is not always accurate and varies depending on the surgeon's experience.

Methods: This was a prospective study at a large, verified burn center conducted on burn patients seen between December 2021 to February 2022. De-identified burn wound images, treatment, and outcomes data were recorded. Images were labeled as burns that required (class 1) and did not require (class 0) surgery. A ResNet-50 model was fine-tuned using the images to predict surgical candidacy. HOG-based support vector machine (HOG-SVM), ORB descriptor-based SVM, and convolutional neural network (CNN) were used as baselines.1,2 This model had previously been developed and applied retrospectively in patient burn images, demographic, and injury data. Our goal is to verify the accuracy of our previous work and apply it to data obtained prospectively using our mobile application – DL4Burn. Accuracy and area under the curve (AUC) metrics were

used to evaluate performance. ResNet-50's performance was also evaluated across burn depths.

Results: We utilized a pre-trained model from a previous study which trained on data of 400 patients admitted between Jan 2015 and Dec 2016 using 5-fold cross-validations. This model was trained on 4-folds (80% of the data) and tested on the last fold (20% of the data), reporting high performance of ~81% accuracy with high area under the precision-recall curve (AUPRC). Using the trained model, we evaluated its performance on data from patients evaluated between Dec 2021 to Feb 2022.

Conclusion: Our deep learning model showed a test accuracy of 81% in predicting burn surgical candidacy for the training cohort and a test accuracy of 83% for the new cohort. Though encouraging at first, metrics for AUROC and AUPRC strongly indicated that the model is not performing well. AUROC measures how well the model ranks class 1 vs. class 0 patients probabilistically while AUPRC measures how well the model predicts class 1 patients in imbalanced settings. Both metrics decreased for the new cohort and we hypothesize that this phenomenon is due to the percentage of patients needing surgery in the new cohort being extremely low ~(10%) compared to the training cohort. The high accuracy achieved is due to the model simply outputting class 0 for most of the cases, where a trivial solution can reach 90% accuracy. This problem is well-known as the distributional shift problem in machine learning where the testing data differs from the data that the model was trained on. This abstract serves as a caution to practitioners to not only examine multiple evaluation metrics but also to evaluate across time-periods to ensure model's fidelity.

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USMLE Step 1 Pass/Fail is Here: Are Plastic Surgery Applicants Really Better Off?

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Background: As of January 26, 2022, USMLE Step 1 score reporting has changed from a numeric to a pass/fail scoring system. Although the new scoring policy is expected to benefit medical students, there is concern that it will also amplify preexisting disadvantages and worsen disparities for students applying into the already-competitive plastic surgery match. Whether the reporting change will tangibly benefit applicants to plastic surgery has yet to be elucidated. This study aims to assess medical student opinions on the impact of this scoring change on their stress, expectations, and behaviors regarding plastic surgery residency applications.

Methods: A cross-sectional survey was distributed to medical students and graduates via social media platforms from July 7th to October 22nd, 2020. The survey consisted of multiple-choice and free-response questions aimed at gauging student opinions and expectations regarding the Step 1 scoring change. Data were analyzed using Student t test and Chi-squared statistics, with an alpha level set at 0.05. For questions inquiring about likelihood of exhibiting a certain behavior, Net Likelihood Score (NLS) was used to grade aggregate sentiments.

Results: Of 120 participants interested in plastic surgery, a majority were MD candidates (n = 83, 69.2%). Responses were split nearly equally between American Medical Trainees (AMTs) and International Medical Trainees (IMTs) (49.2% v. 50.8%). Of the 29 (24.2%) trainees who had already completed Step 1 (post-Step 1 students), 65.5% scored at least a 240. The average number of months spent studying for Step 1 in this cohort was 3.7±2.9 months. A plurality of respondents was against the new Step 1 score reporting (AMT: 40.7%; IMT: 44.3%). Most IMTs (60.7%) felt that the reporting change would make HCS more competitive, whereas only 47.8% of AMTs expressed this opinion ($p = 0.016$). Similarly, there was a statistically significant association between training group and impact of the scoring change on stress levels ($p < 0.001$), with a greater percentage of AMTs expressing that the change will decrease stress levels compared to IMTs (71.2% vs. 24.6%). Overall, respondents felt that the pass/fail scoring system would increase their likelihood to engage with more research (49.2%; NLS = 48), dual apply (51.7%; NLS = 53), prioritize studying for Step 2 CK (74.2%; NLS = 77), and consider a dedicated research year (66.7%; NLS = 67).

Conclusions: While a pass/fail reporting system for Step 1 may alleviate some stress for medical trainees, other issues arise that may perpetuate disparities in access to adequate resources for a successful plastic surgery match. Residency programs should offer anticipatory guidance regarding prioritization of aspects of application to ease this psychosocial and financial pressure, as well as help students reorganize their constrained time.

Exogenous Testosterone, Scarring and Wound Healing in Chest Masculinization Surgery: Analysis of Demographics, Hormone Profiles and Outcomes in 146 Patients

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Introduction: Chest masculinization surgery (CMS) is a commonly performed gender affirming surgical procedure (GAS). Prior literature has shown CMS is associated with reduced gender dysphoria. CMS is associated with hypertrophic scarring, which itself leads to reduced patient quality of life and need for revision surgery. Transgender male and non-binary individuals who undergo CMS are an understudied population. There is a growing need to characterize the effect of testosterone on surgical outcomes after CMS as some animal data suggests that testosterone negatively affects wound healing. We conducted an assessment of patients who underwent CMS at our institution to study associations between demographic factors, exogenous testosterone levels and outcomes.

Methods: Patients undergoing GAS were enrolled into an IRB-approved prospective patient registry. 146 patients who underwent either double incision mastectomy +/- free-nipple graft (DIFNG) or keyhole/circumareolar mastectomy (KC) by 3 surgeons at one institution over 4 years were assessed. Data regarding patient demographics, exogenous hormone regimen information (type of testosterone, dose, duration of regimen, preoperative testosterone, and estrogen levels), scarring co-morbidities, surgery details and incidence of complications were collected. One-way ANOVA was used to test for associations between mean total testosterone levels and various demographic factors. Photographs of the patient's post-operative scars were independently assessed and scored by two raters using the SCAR scale (Choo et al., 2021).

Results: The majority of patients undergoing CMS were of White or Caucasian (65%), followed by Black or African American (19%) and Asian (6%). Most patients were of non-Hispanic or Latino ethnicity (95%). More identified as transgender (84%) as compared to non-binary (12%), genderqueer (3%) or fluid 1%). 90.4% of patients were on exogenous testosterone therapy (60.6% testosterone cypionate 200 mg/mL injection, 25.8% testosterone cypionate 100 mg/mL injection, 5.3% testosterone enanthate 200 mg/mL injection, 3.8% dermal patch, and 4.6% topical). Average pre-operative total testosterone serum level of 505.6 ng/dL (SD = 346.7 ng/dL). A difference in mean total testosterone level was found between patients from different races ($p = 0.023$, $F = 3.02$;

Figure 1). Non-testosterone treated patients formed scars that were less widened and erythematous than patients on testosterone and KC patient scars were less widened and erythematous than DIFNG. The most common reason for re-operation was scar revision (3%). 9 patients (6%) underwent steroid or 5-fluorouracil injection for scarring.

Conclusion: Chest masculinization has been shown to yield a significant improvement in patient quality of life. Our study confirms that most transgender patients undergoing CMS receive exogenous testosterone therapy. Hypertrophic scarring is the most common reason for re-operation, in contrast to other forms of breast surgery. We found an association between race and patient testosterone level which should be studied further, particularly because testosterone may impact wound healing and scarring. Differential testosterone levels may be one potential source of differences in scar formation between races in this population.

The Relative Citation Ratio: A Modern Approach to Assessing Academic Productivity within Plastic Surgery

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Introduction: The accurate assessment of physician academic productivity is paramount and is frequently included in decisions for promotion and tenure. Current metrics such as h-index have been criticized for being biased towards older researchers and misleading. The relative citation ratio (RCR) is a newer metric that has been demonstrated within other surgical subspecialties to be a superior means of measuring academic productivity. We sought to demonstrate that RCR is a valid means of assessing academic productivity among plastic surgeons as well as determine demographic factors that are associated with higher RCR values.

Methods: All Accreditation Council for Graduate Medical Education (ACGME)-accredited plastic and reconstructive surgery (PRS) residency programs throughout the United States (U.S.) were compiled from the American Council of Academic Plastic Surgeons (ACAPS) website. Demographic information was obtained for each surgeon via the program's website and RCR data was obtained utilizing iCite, a bibliometrics tool

provided by the National Institutes of Health. Surgeons were excluded if any demographic or RCR data was unavailable.

Results: A total of 785 academic plastic surgeons were included in this analysis. Surgeons who belonged to departments with greater than 6 members had a higher median RCR [1.23]. Increasing academic rank [assistant: 12.27, associate: 24.16, professor: 47.58], chief/chairperson status [47.58], male sex [25.59] and integrated model of residency training program [24.04] were all associated with higher median weighted RCR.
Conclusion: RCR is a valid metric for assessing plastic surgeon academic productivity. Further research is warranted in assessing disparities among different demographics within academic plastic surgery.

Who Publishes in Plastic and Reconstructive Surgery?

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Purpose: This study aims to profile the authorship of Plastic and Reconstructive Surgery (PRS) to elucidate trends in plastic surgeon representation and academic productivity.

Materials and Methods: The senior authors on all manuscripts accepted to PRS between January 2018 and September 2021 were assessed. Data was collected by two authors from online resources including academic and private-practice physician profiles, PubMed, Google Scholar, the NIH RePorter, the American Board of Plastic Surgery website, and PRS publications. Each author was independently assessed by both authors for race/ethnicity and occasions of disagreement were decided by a third author. Gender was assessed using the Gender-API online tool which provides a presumed gender based on one's first name, along with an accuracy estimate. Any accuracy estimates less than 90% were manually verified using images and pronouns.

Results: We analyzed a total of 959 accepted PRS articles published by 959 unique U.S.-based senior authors. The cohort of senior authors was majority male (78.2%), white (75.3%), and non-Hispanic (95.0%). Male senior authors had significantly more

publications per year than their female counterparts (3.8 vs. 2.9, $p = .012$). There was no significant difference in publications per year between Caucasian and non-caucasian authors ($p = .156$).

Seventy seven percent of authors were plastic surgeons, of whom 63.1% were board certified in plastic surgery. General surgeons, orthopedists, and dedicated researchers each comprised approximately 4% of senior authors. There was no significant change in the proportion of plastic surgeon senior authors over time ($p = .442$).

Ninety-two percent of senior authors had an M.D. degree, with 21.8% possessing two graduate degrees and 1.3% possessing three degrees. Authors with more than one graduate degree besides their M.D. had significantly more publications per year (4.6 vs. 3.4, $p < .001$) and a higher h-index (12.8 ± 22.5 vs. 6.1 ± 15.3, $p < .001$). Furthermore, those with more than one graduate degree were significantly more likely to be in academics, whereas those with just an M.D. were more likely to be in private/community-based practice ($p = .002$). There was no significant difference in academic institutional ranking ($p = .454$) based on number of degrees.

Plastic surgeons had significantly more PubMed indexed publications per year (4.0 vs. 2.2, $p < .001$) than other specialists. Analysis by fellowship training revealed pediatric/craniofacial surgeons had significantly more publications than non-plastic surgeons ($p = .013$) and plastic surgeons without any fellowship training ($p = .005$).

Chi-squared post-hoc testing revealed significantly more non-plastic surgeons than expected publishing in Cosmetic, Hand/Peripheral Nerve, and Plastic Surgery Focus ($p < .001$).

Conclusions: Three-fourths of senior authors publishing in PRS are plastic surgeons, which is stable over time. A gender disparity in academic productivity was identified; however, no racial disparity emerged. Surgeons with more graduate degrees were more academically productive and more likely to practice at an academic institution. Plastic surgeons publishing in PRS demonstrated more productivity than other specialists, with Pediatric/Craniofacial trained plastic surgeons demonstrating the most overall productivity.

Cutaneous Microcirculatory Flow Sensing for Flap Monitoring in a Porcine Model of Arterial and Venous Occlusion

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Purpose: Cutaneous devices employing near infrared spectroscopy (NIRS) for continuous free flap tissue oxygenation (StO2) monitoring have several limitations. Confounding factors like skin pigmentation and thickness, ambient light incursion, and inconsistency at the skin-sensor interface can alter StO2 measurements. As an alternative means for peripheral free flap monitoring, we present a novel probe that calculates microvascular blood flow velocity by measuring tissue thermal diffusion. This device is cutaneous, wireless, and not subject to the same confounding variables as NIRS.

Methods: The cutaneous perfusion sensor includes 5 thermistors, a Bluetooth chip, and small battery mounted on circuit board. A thermal actuator (4-mm diameter) delivers a small amount of thermal power to the surface of the skin. The device is cutaneously mounted with a silicone acrylate adhesive onto target tissue. The diffusion of heat is measured and analytically converted into a measurement of microcirculatory blood flow velocity. Rapid thermal diffusion occurs in situations of high tissue perfusion, while slower thermal diffusion indicates slower or absent near-surface blood flow.

This device was tested alongside Vioptix T.Ox in a porcine rectus abdominus myocutaneous flap model of arterial and venous pedicle occlusion. After flap elevation, the flow device and T.Ox were applied to the skin. Acland clamps were alternately applied to the flap artery and veins to achieve conditions of flap ischemia and congestion, each lasting 15 minutes, with a 15 minute intervening recovery period. In total, 10 devices were tested on 16 flaps in 10 separate pigs over 60 unique vaso-occlusive events

Results:
Continuous monitoring was accomplished and no connection loss was observed with either T.Ox or the novel devices. Flow measurements were responsive to both ischemia and congestion, and returned to baseline during recovery periods. Flow measurements corresponded with vascular occlusion and release, and closely followed StO2. Cross-correlation at zero lag showed agreement between these two sensing modalities, ranging from 0.76 to 0.83. Two novel devices tested simultaneously on the same flap showed only minor variations in flow measurements, with a cross-correlation of 0.87.

Conclusions:
This novel probe is capable of detecting changes in tissue microcirculatory blood flow. This device performed well in a swine model of flap ischemia and congestion and shows promise as a potentially useful clinical tool. Because flow measurements are not affected by the variable lighting and light absorbing properties of tissue, this monitoring strategy

has the potential to provide more consistent information than NIRS. Future studies will characterize longevity of the device over a period of several days.

The First Hybrid Educational Comprehensive Cleft Care Workshop

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Purpose: Describe the first hybrid global simulation-based comprehensive cleft care workshop, evaluate workshop impact on participants, and compare participant experiences based on in-person versus virtual attendance.

Materials and Methods: Cross-sectional survey-based evaluation during a Three-day educational simulation-based hybrid comprehensive international cleft care workshop. Data regarding participant demographic and specialty data, perceived barriers and interventions needed for global comprehensive cleft care delivery, participant workshop satisfaction, and perceived short-term impact on practice were collected and stratified by in person versus virtual attendance.

Results: The workshop included 489 participants from five continents. The survey response rate was 39.9%. Participants perceived financial factors (30.3%) and improvement in training (39.8%) to be the biggest barrier and intervention respectively, facing and required for comprehensive cleft care delivery in low to middle income countries. All participants reported a high level of satisfaction with the workshop and a strong positive perceived short-term impact on their practice. Importantly, while this was true for both in person and virtual attendees, in person attendees reported a significantly higher satisfaction with the workshop (28.63 ± 3.08 vs. 27.63 ± 3.93; $p = 0.04$) and perceived impact on their clinical practice (22.37 ± 3.42 vs. 21.02 ± 3.45 $p = 0.01$).

Conclusion: Hybrid simulation-based educational comprehensive cleft care workshops are overall well received by participants and have a positive perceived impact on participant clinical practices. In person attendance is associated with significantly higher satisfaction and perceived impact on practice suggesting that the hybrid rather than purely virtual model is the way forward. Future efforts will focus on making in person and virtual attendance more comparable.

Impact of a Novel Dynamic Imaging Capture System on Patient Satisfaction

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Background: Accurate photographic documentation helps patients effectively communicate their desired cosmetic outcome while assisting surgeons in making meaningful comparisons, documenting pertinent anatomy, planning the surgical approach, and improving patient trust and satisfaction. While two- and three-dimensional photography remain the most commonly used methods to compare pre-and post-operative images, new imaging modalities have recently gained popularity. Dynamic imaging is a novel capture system that rotates 360° around the patient while recording 30 frames per second, producing a video that captures a patient's form, functionality, and skin elasticity while controlling factors such as positioning, light and distance. This study aims to determine patients' satisfaction after being imaged using a dynamic imaging system.

Methods: A retrospective study was conducted on 15 patients who underwent pre- and post-operative imaging with the dynamic imaging system (oVio 360®) in January of 2022. An in-office pre-operative scan of the area of interest followed by a physician consultation was performed prior to the cosmetic intervention. During the consultation, all patients were shown images of patients with similar complexion and undergoing similar procedures, in addition to images which display phases of healing, bruising, and swelling in similar operations. A 14-question survey was provided once to all patients after their post-operative scan.

Results: Nearly all participants underwent a surgical face and/or neck procedure (n = 13), while 3 had a non-surgical face and/or neck procedure and one underwent a non-surgical body procedure. 73% of patients indicated that this was their first time being imaged prior to having a cosmetic procedure. All patients reported that the dynamic imaging system allowed them to visualize all aspects of their areas of concern, and 93% indicated that they would rather be imaged using a dynamic video than a still image in future visits. 86.6% of patients either strongly agreed or agreed that the imaging system allowed them to make meaningful comparisons between their pre- and post-operative results. The majority of patients (90%) indicated having more realistic expectations about their procedure, and 93.3% reported a better understanding of the phases of healing they should expect after their procedure due to the imaging system. All respondents either strongly agreed or agreed that their images improved their patient quality experience, and 80% indicated an improved trust in their surgeon because they were able to see every detail of their results.

Conclusion: Dynamic imaging represents a novel way of accurately comparing pre-and post-operative images. After being scanned with the system, patients reported more realistic expectations and a better understanding of the healing process, primarily indicating that they would choose dynamic imaging in the future. Additionally, patients

reported that the imaging system allowed them to better assess their cosmetic outcome and was also important in improving trust in their provider.

A Novel Method for Quantitative Analysis and Staging of Lymphatic Function Using Indocyanine Green (ICG) Lymphography

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Purpose: Lymphatic insufficiency is one of the earliest pathological findings in lymphedema. Recent studies have explored the utility of indocyanine green (ICG) lymphography for surgical planning and staging of lymphedema. However, current staging systems are qualitative in nature and limit our ability to longitudinally measure changes following surgical intervention. The purpose of this study was therefore to accurately quantify the functional changes in lymphatic collecting vessels in breast cancer-related lymphedema patients (BCRL) using a novel quantitative analysis method.

Methods: ICG lymphography videos and images were recorded 5 mins and 30 mins after dye injection, respectively, for both the lymphedema and the unaffected arm. Pumping frequency was quantified using Image J. Regions of interest (ROI) were drawn on each vessel, the mean intensity of the pixels in each ROI was be plotted, and the graph was used to determine the mean pumping frequency for each arm. Dermal Backflow rate was quantified using Image J. Both 2D and fluorescence images were thresholded and used to create a binary mask of each aspect of the arm. The ratio between the area occupied by dye and the total area of the patient's arm was calculated to provide the dermal backflow rate for each aspect of the arm. The mean value between the dorsal and volar aspects was calculated, with the unaffected arm acting as a control. Lymphatic Clearance Capacity was evaluated 10 days after dye injection, quantifying the percentage of dye left in each arm using the same methods utilized for dermal backflow analysis.

Results: 55 subjects with BCRL were included in this study. The mean pumping frequency of the lymphatic collecting vessels in the lymphedema arm was 1.3±0.6 pumps/min, and the unaffected arm 2.0±0.6 pumps/min ($p<0.001$). The mean dermal backflow rate in lymphedematous arms was 32.3±27.4%. Total clearance capacity 10 days after injection was 76.5±25.4% in the lymphedema arm compared to 100.0±0.0% in the unaffected arm ($p<0.001$). Pumping frequencies in lymphedematous arms were positively correlated with clearance capacity rates ($r=.38$, $p=0.171$). A negative

correlation was demonstrated between clearance capacity rates and dermal backflow rates ($r=-.80$, $p<.001$).

Conclusions: ICG lymphography holds promise as a novel method for accurate analysis of lymphatic function in BCRL patients using a simple set of quantitative parameters. These findings set the stage for the development of a practical, universal, ICG-based quantification system for the staging of lymphedema, a significant advancement in the field of plastic surgery.

A Systematic Review of Surgical Simulation in Burn Surgery: Education, Assessment, Management

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Background: Proper assessment and management of a burn's patient is a high stress situation that requires practical knowledge and immediate action. Low- and high-fidelity burn simulations have become an increasingly popular way to educate burn care physicians and their teams in a safe environment without compromising care and endangering patients. Although much of burns care emphasizes critical care, the patient population is nuanced from those being cared for by a surgical intensivist. The aim of this report is to systematically review the literature for simulations related to burns care.

Methods: A systematic review was conducted using the following databases: PubMed, Scopus, Embase, Web of Science, and Cochrane. Selected search terms included: escharotomy, fasciotomy, tangential excision, skin graft, scar, contracture, local tissue rearrangement, debridement, burn, burn critical care, burn resuscitation, burn reconstruction, electric burn, chemical burn, computer simulation, high fidelity, low fidelity, simulation training, models, cadaver, animal models, augmented reality, and virtual reality. Conference proceedings, non-English literature, and reviews were excluded.

Results: Our search criteria identified 2,453 articles, 44 of which met the inclusion criteria. Simulations included cadavers (n=6), synthetic benchtop or 3-Dimensionally printed models (n=3), augmented/virtual reality interfaces (n=2), simulation course

(n=23), curricula (n=6), and other digital simulation (n=4). Most common topics covered were burn assessment and management (n=10) and airway and intensive care (n=26) whereas the most common procedures were escharotomy (n=4), central line placement (n=7), bronchoscopy (n=9), and ventilator management (n=7).

Conclusions: Burns care requires an expansive breadth of knowledge across intensive care and surgical skills. Although many simulation models exist, the majority focus broadly on critical care rather than burns-specific skills. With only 32% of the models unique to burns surgery, our review revealed a paucity in the literature for burns-specific models and identified a need to expand simulator options to provide training in skin grafting, burns reconstruction, and burns-specific intensive care management. Given the new emphasis on remote learning, surgical simulation infrastructure adjacent to clinical training may better prepare trainees for the complexity of burns care.

Galvanotactic Flexible Closed-Loop System for the Interrogation of Wireless Wound Healing through Single Cell Analysis

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Introduction: Approximately thirty million people in the United States suffer from diabetes. The prevalence of diabetic foot ulcers (DFUs) in this population is 13%. Current standard of care wound dressings is passive and cannot actively respond to variations in the wound environment. Smart bandages are well positioned to address these challenges. To our knowledge there have not been significant advancements in incorporating sensing technologies to deliver active wound care and evaluate the biology of wound healing in real time. We believe this can be achieved using a multidisciplinary approach combining electrical, biological, and chemical engineering with the fundamentals of cellular and biomolecular processes in wound healing directed towards high resolution, in situ tissue regeneration.

Materials and Methods: A flexible printed wireless stimulator was designed and fabricated to deliver directional energy across a wound gradient. Subsequently a low impedance PEDOT: PSS electrode was designed to optimize the skin and stimulator interface, producing a robust gel with tunable adhesion properties. The smart bandage

was evaluated in an excisional diabetic and C57BL6/J murine wound healing model. A parabiosis model was used to evaluate circulating cell migration into the wound bed. Single cell analyses were performed to evaluate changes in cell populations as a direct result of induced electrical stimulation. In vitro validation was performed to elucidate in vivo results.

Results and Discussion: Wireless electrical stimulation resulted in significantly accelerated wound closure, when compared to controls, in both a diabetic and C57BL6/J murine excisional wound healing model. Complete epidermal recovery was observed, with a thicker collagen network and increased dermal thickness. Greater neovascularization and appendage formation were observed in the treatment groups. Single cell analyses revealed higher proliferation and remodeling regulatory markers expressed across treated groups. In vitro co-culture validation experiments demonstrated accelerated proliferation, mitotic rate and tube formation when compared to controls.

Conclusion: Our data demonstrates the functionality of a robust wireless interface for wound healing. This novel treatment modality will integrate AI processing components for the development of a closed-loop functional stimulator that was used to evaluate wound healing in real time, measuring the biologic cellular response. By combining the domain expertise of nanofabrication, mechanotransduction, fibrosis and molecular/cellular analyses, we are developing a novel chronically stable and robust smart bandage that will pave the way for the next generation of palliative wound care.

Utilizing Amazon Mechanical Turk to Gauge Understanding of Risk of Burns While Using Home Oxygen

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Purpose: Home oxygen therapy (HOT) is often prescribed to patients with pulmonary dysfunction to improve their survival and quality of life. However, patients on HOT may be at risk for burn injury using their HOT around an open flame or while smoking. Many patients and their family members are still unaware of the risks of HOT despite being informed by their prescribing provider. Furthermore, broader education by the public

regarding HOT burns has not yet been assessed. With HOT being utilized by more than one million Medicare recipients, [1] it is crucial to gauge layperson understanding of the risks of HOT burns so that providers can better tailor future educational efforts.

Methods: An IRB-approved survey was distributed via the Johns Hopkins University Qualtrics system through the Amazon Mechanical Turk (mTurk) system. mTurk workers were included in the study if they were 18 years of age or older and who possessed qualifications of a Human Intelligence Task (HIT) Approval Rate greater than 90% and number of HITs approved greater than 10,000. The survey was divided into three portions: experience with smoking and HOT; knowledge of HOT risks, including risk of HOT burns; and demographic information. Statistical analysis, including chi-square tests and Student's t-test, was conducted on the survey results.

Results: A total of 487 mTurk workers responded to the survey, with 299 (61.4%) being former or current smokers and 295 (60.6%) indicating they know someone who previously used or currently uses HOT. The person using HOT was a family member for 146 respondents (49.5%), while 41 (13.9%) respondents used HOT themselves. Most often, the HOT was prescribed at a hospital (n = 157, 53.2%) or the patient's primary care doctor (n = 122, 41.4%). Regarding identification of risks of HOT, the most common risk recognized by survey respondents were falls (54.4%) or burns/fire hazard (51.7%). Comparing respondents who either use HOT or know a HOT user ("HOT exposed" group, n = 295) versus those who do not ("unexposed group", n = 192), a lower percentage of HOT exposed respondents identified "burns or fire hazard" as a risk of HOT compared to the unexposed group (42.7% vs. 65.6%, $p<.001$). Further, a higher proportion of the unexposed group compared to the HOT-exposed group selected "no" when asked if it was safe to smoke (59.7% vs. 85.4%, $p<.001$), cook (49.8% vs. 71.4%, $p<.001$), or have an open flame (51.2% vs. 80.2%, $p<.001$) around someone on HOT.

Conclusion: This survey demonstrates that education regarding HOT burns in the general population is still lacking. HOT-related burns, especially secondary to smoking, are largely preventable. Education may play an important role in preventing these burns. Furthermore, understanding where patients are being prescribed HOT may guide potential interventions to improve physician communication about the risks of HOT and prevent future harm in these patient populations.

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Training a Plastic Surgeon: The Cost of Residency and Its Implications

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Introduction: Developing and maintaining a surgical residency program entails significant financial obligations. The costs associated with plastic surgery residency training and accreditation by regulatory bodies are yet to be delineated. This study seeks to explore the costs associated with plastic surgery residency training as mandated by the American Council of Graduate Medical Education (ACGME) and the American Board of Plastic Surgery (ABPS). We aim to elucidate potential areas for improvement and innovation of funding resources to ensure the continuation and growth of proper plastic surgery training.

Methods: Cost-associated mandates per the 2020 ACGME and ABPS booklet were identified. These costs were separated into labor, opportunity, and fixed costs. Calculations reflected the minimum cost of training two plastic surgery residents, which is an estimate of the average number of residents per year per program from 2017-2021, according to the National Residency Match Program Data. Salaries were based on data from the Association of American Medical Colleges. Relevant costs reflected data from our department and institution.

Results: Our calculations demonstrated a minimum cost of $472,519 to train two residents per year in accordance with the ACGME and ABPS mandates, with an average cost of $236,260 per resident. This includes labor, opportunity, and fixed costs. Labor costs totaled $279,560 with resident salary being the highest contributor ($128,000). Opportunity costs were the highest cost category at $176,529, of which grand rounds ($120,238) was the highest contributor. Fixed cost was the lowest ($16,430) with the highest contributor being ABPS-required costs for board certification ($8,490). In order to reflect the financial spectrum between large and small programs, we adapted our calculations to estimate costs of one ($367,427) and five ($763,687) residents per year.

Conclusion: Training future plastic surgeons is associated with significant direct and indirect financial costs. Plastic surgery represents an essential field in healthcare, and we hope that by providing cost estimates for resident education, the medical community may continue to think creatively about alternative funding sources to ensure continued quality training that meets the nation's needs.

Autologous Fat Grafting Promotes Sustained Release of IL-13 and TGF-Beta by Septal Cartilages to Enhance Post-Operative Healing in Rhinoplasty

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Purpose: Autologous fat grafting is a well-known effective and reliable technique for reconstructive and aesthetic surgeries. The addition of fat grafting to crushed septal cartilage in rhinoplasty and nasal reconstruction has been shown to have a solid association with strong graft retention, patient satisfaction, rapid swelling resolution, and nasal aesthetics. However, there is a paucity of translational research on how the septal chondrocytes are behaving and what are potential paracrine factors they are secreting in the presence of Autologous fat grafts. Our objective was to evaluate how fat grafts may influence chondrocyte paracrine secretion profile.

Methods: Crushed and intact native septal cartilage samples, along with autologous abdominal fat, were obtained from 15 patients undergoing rhinoplasty at Yale New Haven Hospital, CT. Each patient's tissue samples were divided into 6 groups: intact, crushed, and crushed-at-lab cartilages +/- fat graft. The samples were incubated in MEM-α serum-free medium for 48 hours. 1ml of culture medium was collected at 12h, 24h, and 48h. ELISAs were performed to analyze chondrocyte IL-4, IL-10, IL-13, and TGF-Beta levels in culture medium samples.

Results: Il-4 and IL-10 failed to demonstrate any significant difference between the cartilage-only and cartilage with autologous fat graft. In the absence of adipose grafts, chondrocytes that were crushed exhibited significantly less IL-13 secretion throughout the 48 hours (p value= 0.043). While the same group of chondrocytes that were incubated with adipose grafts did not exhibit a significant drop in IL-13 secretion. Furthermore, uncrushed chondrocytes without the protection of adipose grafts decreased TGF-beta secretion (p value= 0.0008) while cartilages with adipose grafts maintained and slightly increased in TGF-Beta secretion.

Conclusion: The presence of fat graft with septal cartilage aided the sustained release of Il-13 and TGF-Beta to create an anti-inflammatory and chondroprotective environment that ultimately resulted in enhanced post-operative healing in rhinoplasty. Il-13 exhibits numerous functions such as being an immunoregulatory cytokine, preventing cartilage matrix degradation. Those Il-13 properties may potentially be an underlying cause of strong graft retention, inhibition of cartilage resorption, and maintaining nasal aesthetics. TGF-Beta is involved in wound healing, angiogenesis, and anti-inflammation, which would help to promote healing and quicken swelling resolution. Furthermore, Il-13 also stimulates the production of TGF-Beta, which may explain the slight increase in TGF-Beta production in cartilage incubated with fat grafts. These findings

demonstrated the potential cellular symbiotic process of fat graft and crushed cartilage that may explain the superior clinical results of using fat grafts in rhinoplasty.

The Role of Virtual Reality in Operative Learning of Zygoma Fractures: Description and Validation

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Background: Operative management of facial fractures is a three-dimensional (3D) educational challenge faced by surgery residents. Currently, most knowledge-based learning is acquired outside the operating room using textbooks and videos, and occasionally cadavers and 3D models (1). We hypothesized that use of immersive virtual reality (VR) could offer a realistic, reproducible, and feasible, 3D learning environment to fill in the gap between conventional learning modalities and experiential learning in the OR. Secondarily, we hypothesized that the gamified experience would improve residents' learning.

Methods: A VR module was programmed from a CT scan of human skeleton with an isolated zygomaticomaxillary complex (ZMC) fracture. Twenty participants completed a pre-intervention questionnaire assessing their demographics and gaming/surgical backgrounds. After watching a platform demonstration and completing a trial game, participants were asked to complete the module by identifying, segmenting, reducing, and plating the ZMC fracture using IVR. Participants then completed a post-intervention questionnaire to assess their experience with the VR environment and its effectiveness for surgical learning and planning as well as its realism and content accuracy.

Results: The module was considered useful for conceptualization of operative anatomy (mean 4.3±1 out of 5; 5 being strongly agree), being an effective learning tool (mean 4.1±0.9), and its potential use in other training areas (mean 4.2±1). Senior residents indicated particular support for VR's benefit in improving operative competence and confidence (mean 3.6, $p=0.02$), and supported using VR to replace other surgical training modalities (mean 3.6±0.7; $p=0.03$). The module was described as effective for surgical planning (mean 4.2±0.8). The anatomy and 3D perception of the module were found to be realistic (means 4.4±0.6 and 4.4±0.9, respectively).

Conclusion: The use of immersive VR in surgical training shows promising potential to fill the gap between knowledge-based and experiential learning of facial fractures. VR provides a reproducible, digitally modifiable, and feasible modality, which utilizes patient-specific anatomy for pre-operative rehearsal and deliberate practice (2). The gamified experience associated with

immersive VR may play a role in motivating residents and improving learning dynamics (3). More studies focusing on content validity and measuring objective performance metrics will help establish VR's validity as an innovative surgical training tool. Also, a financial analysis of VRs feasibility against traditional learning modalities would be beneficial.

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The Impact of Author Profile on Publication Level of Evidence in PRS

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Background: Plastic and Reconstructive Surgery (PRS) began incorporating use of the Level of Evidence pyramid into publication evaluation in 2011. This system was integrated with the aim of creating a highly visible way of promoting and advancing evidence-based medicine in plastic surgery.1 This Level of Evidence classification system is outlined by Rohrich et al.1 This study aims to assess the relationship between the profile of senior authors publishing in PRS and the Level of Evidence of publications.

Methods: All accepted publications to PRS between January 2018 and September 2021 were classified by Level of Evidence as outlined by Rohrich et al. [1] Publications excluded from evaluation included animal studies, cadaver studies, basic science studies, review articles that were non-systematic or not related to clinical topics, diversity and plastic surgery education publications, CME courses, editorials, viewpoints, and correspondences. Data on all senior

authors was collected using publicly available online resources including PubMed, Google Scholar, institutional/practice websites, and the American Board of Plastic Surgery website.

Results: A total of 637 articles were screened of which 322 (50.5%) were eligible for Level of Evidence classification. The distribution of Level of Evidence was as follows: I: 0.9%, II, 11.8%, III, 42.9%, IV, 23.3%, V, 21.1%.

There was no impact of gender, race, or ethnicity of senior author on level of evidence ($p > .05$ both). There was no significant difference in level of evidence based on whether the senior author was a plastic surgeon, although this relationship approached significance for randomized controlled trials (adjusted standardized ratio 2.1, $p = .008$), with non-plastic surgeons authoring more randomized trials than plastic surgeons.

The number of degrees possessed by the senior author did not impact level of evidence of publications ($p = .098$); however, having a PhD. was significantly associated with a higher level of evidence of publications (ASR 3.3, $p = .022$). Board certified plastic surgeons were significantly more likely to have published Level III evidence papers than their non-board-certified counterparts (adjusted standardized ratio 3.3, $p = .012$), who comprised approximately one-third of senior authors. Non-academic surgeons were significantly more likely to publish Level V evidence (ASR 4.3, $p = .029$). Furthermore, physicians working in an academic setting were significantly more likely to publish Level III evidence than their private/community-based counterparts (ASR 3.4, $p = .006$).

Solicited content was significantly more likely to contained Level V evidence (ASR 9.7, $p < .001$), whereas breast papers constituted significantly more Level III evidence (ASR 3.6, $p < .001$), and hand/peripheral nerve papers constituted significantly more Level I evidence (ASR 2.9, $p < .001$).

Conclusions: The majority of publications in PRS contain Level III-V Evidence. Senior author gender, race, and ethnicity did not impact Level of Evidence of publications. Plastic surgery board certification, possession of a PhD, and academic appointment were significantly associated with higher Level of Evidence of publications.

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Health Equity Ratings US of Burn Centers—Does For-Profit Status Matter?

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Introduction: Achieving health equity is forefront in national discussions on health care delivery. Burn injuries transcend racial and socioeconomic boundaries and burn center funding ranges from safety-net to for-profit without an understanding of how funding mechanisms translate into equity outcomes. We hypothesized that health equity would be highest at safety-net facilities and lowest at for-profit centers.

Methods: All American Burn Association verified, and non-verified burn centers were collated in 2022. Safety-net, for-profit status, and health equity rating were extracted from datasets furnished by the Lown Institute. Equity ratings were compared across national burn centers and significance was determined with comparative statistics and ordinal logistic regression.

Results: On an equity grade of A to D (A is the best), 27.6% of centers were rated A, 27.6% rated B, 41.5% rated C, and 3.3% rated D. 17.1% of all burn centers were designated as for-profit compared to 21.1% of centers that were safety-net. 73.1% of safety-net center scored an A rating and 14.3% of for-profit centers scored an A rating. Safety-net centers were 21.8 times more likely ($p<0.001$) to have the highest equity score compared to non-safety-net centers. There was an 80% decrease in the odds of having a rating of A for for-profit centers compared to not-for-profit centers ($p=0.04$).

Conclusion: Safety-net centers had the highest equity ratings while for-profit burn centers scored the lowest. For-profit funding mechanisms may lead to the delivery of less equitable burn care. Burn centers should focus on health equity in the triage and management of their patients.

Modulation of Fibrosis in Murine Diabetic Wounds Using Negative Pressure Wound Therapy

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Background: Scarring is a fibroproliferative sequela of surgery with significant functional and esthetic morbidity. Prior research has established a connection between mechanical cues and fibroproliferation, linking the mechanical signaling factor Yes-associated protein (YAP) to Engrailed1 (En1), a transcription factor that shifts fibroblasts to a pro-scarring phenotype. Negative Pressure Wound Therapy (NPWT) is a commonly used wound therapy that relies on micromechanical force application, but its effects on the pathophysiology of scarring have not been explored. In this study we use a murine diabetic excisional wound model to investigate the use of NPWT on the fibrosis pathway.

Methods: We induced 1 cm2 full-thickness excisional dorsal skin wounds on 20 obese and diabetic (db/db) mice, half of which were then treated with continuous NPWT at -125 mmHg for 7 days (NPWT, n=10) or simple occlusive covering (Control, n=10). On day 10 post-surgery the mice were sacrificed, and the wound tissue was harvested for histological and biochemical analysis.

Results: YAP was significantly higher in the NPWT group (p=0.04) but En1 was significantly lower in the NPWT group (p=0.0001) compared to the control. Deposition of fibronectin was increased with NPWT (p=0.01) but deposition of Vimentin (p=0.04) and Hsp47 (p=0.0008) was decreased. Overall collagen deposition was decreased with NPWT (p=0.02). NPWT was associated with an increase in cellular proliferation as assessed by Ki67 probing (p=0.002) and a decrease in cellular apoptosis as assessed with TUNEL (p=0.03). Western blotting verified increased YAP (p=0.02) and identified an increase in RhoA (p=0.03) and a decrease in Caspase-3 (p=0.03) with the use of NPWT.

Conclusion: The mechanical forces exerted by NPWT are shown to modulate various pro- and anti-fibrotic factors. NPWT appears to uncouple YAP from En1, via a downregulation of Caspace-3, a pro-apoptotic factor associated with keloid scarring. In addition, a decrease in En1, Hsp47, and cellular apoptosis was seen alongside decreased collagen deposition. Therefore, through these actions, NPWT may play a significant role in final scar appearance.

Nature Versus Nurture: A Formal Assessment of Integrated Plastic Surgery Resident Productivity and Residency Research Structure Across the United States

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Introduction: Structured on mathematical equations, bibliometrics is an efficient method to objectively assess publication productivity. 1The larger research community utilizes Hirsch's index to measure an individual's productivity level and m-quotient to assess productivity since the timing of first publication. These metrics represent valuable tools as research demonstrates that academic productivity plays a role in applicant selection for plastic surgery fellowship and correlates with career trajectory. 2 Several factors may influence publication productivity such as formal research training, a dedicated research program, and training pathway.3,4 However, there is a paucity in the literature regarding resident productivity and assessment of how residency structure impacts publication productivity. Our project aims to (1) establish the publication productivity of current integrated plastic surgery residents and (2) evaluate the plastic surgery residency program's environment that may affect residents' publication productivity. We hypothesize that program structure does not impact the resident research productivity.

Methods: H-index, m-quotient, and publication count were collected and calculated for each plastic surgery resident from the 2021-2026 classes using Scopus. Program directors were surveyed regarding each program's education environment, assessing specifically for protected research time, type of protection (complete vs. incomplete), research requirement, funding/travel resources, and ancillary support. The data gathered was then divided and assessed between junior level and senior level residents of each program to assess whether program structure impacted resident productivity.

Results: 27 (33.3%) out of 81 integrated plastic surgery program directors completed the survey. Of those programs, 11 (40.7%) had a yearly abstract submission or publication requirement, 13 (48.1%) had a mandatory-dedicated research block during residency, 10 (37.0%) programs had protected research time with four (14.8%) programs that guaranteed fully protected research time. Nine (33.3%) programs had dedicated financial research support however 25 (92.6%) programs offered a research stipend for travel. 14 (51.8%) programs had a resident research award, 8 (29.6%) programs had dedicated research faculty, and 7 (25.9%) had designated statisticians.

There was no statistical difference in the m-quotient if there was requirement for abstract submission or publication (0.59 vs 0.48, p=0.19), dedicated research block (0.53 vs 0.57, p=0.57), financial support provided (0.58 vs 0.48, p=0.26), research award offered (0.50 vs 0.59, p=0.27), dedicated research faculty (0.55 vs 0.55 ,p=0.95), or designated statisticians (0.54 vs 0.59, p=0.60) Additionally, there was no difference in junior versus senior resident m-quotients for each category assessed.

Discussion: These results support our hypothesis that research productivity is not impacted by mandatory research requirements, dedicated research blocks, or submission requirements. Given m-quotients did not statistically differ between junior and senior residents, it demonstrates that residency structure does not alter resident productivity.

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"That Looks Great": Learning from Creative Professionals to Manage Patient Expectations of Reconstructive Surgery

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Introduction: Plastic and reconstructive surgery is a unique specialty in that procedural outcomes are often visible to the patient and therefore susceptible to their immediate judgement. Though a surgeon may deem an operation a success patients can dislike the appearance of their reconstruction leading to a mismatch of perceptions of treatment outcomes. It is likely this misalignment of perceptions emanates from a divergence of expectations, meaning there is potential for the surgeon to manipulate interactions with patients to preclude patients from viewing their outcome negatively.

Cross-disciplinary research offers new insights into existing issues in surgical practice and has led to significant system improvements in healthcare in recent years. The work of many creative professionals share characteristics with reconstructive surgeons in that their work involves the design of bespoke products and services. This study explores their expert-client interactions to help illuminate lessons we can translate to the world of reconstructive surgery to better align our perceptions of success with our patients.

Methods: This was a qualitative research project exploring the interpretations of the expert-client interactions of 9 creative professionals - ranging from architects to designers and sculptors - who design bespoke products and services. The project involved the analysis of

data from semi-structured interviews with all participants. Themes were identified, using the methods of reflexive thematic analysis, to provide answers to why expert and client perceptions can be mismatched and how we can learn to optimize our interactions with patients to better align our views of reconstructive surgery. Results were analyzed using an educational theoretical lens of social constructivism.

Results: Four themes were constructed from the interview data: "setting the brief", "the unspoken emotions of the creative process", "the creative process as a journey" and "shared decision making". The reasons for a misalignment of perceptions of creative work identified were deficiencies of communication, failure to foster a creative journey with clients and the failure to recognize who should be making creative decisions, and when. The findings of this study have implications for how we train plastic surgeons to address this non-technical but crucial aspect of plastic and reconstructive surgery and should influence how we seek to communicate with our patients ahead of surgery.

Conclusions: This study draws on the insights of creative professionals to shape interactions with patients to correlate expectations and perceptions of reconstructive surgery. The findings show that our ability to learn through social interaction offers an opportunity to improve our patients' experiences of what can often be complex and technically demanding surgery in an emotionally charged setting and demonstrates an opportunity to tailor training to address how plastic surgeons learn to deal with unmet patient expectations.

Identification of Novel Circulating Non-Hematopoietic Cells Orchestrating Tissue Fibrosis After Injury

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Purpose: The majority of circulating cells that are recruited to sites of injury are derived from the hematopoietic system, mainly consisting of myeloid and lymphoid cells. Whether non-hematopoietic mesenchymal cells are present in the circulation and play a role in tissue remodeling after injury has remained a topic of debate.

Methods: We used lineage tracing with transgenic Col1-GFP as well as VavCre-mTmG mouse models, parabiosis, flow cytometry, confocal microscopy, and single-cell RNA

sequencing (scRNA-seq) to analyze circulating cellular subpopulations recruited to excisional wounds and ischemic skin flaps at acute (3 and 7 days) and chronic (1, 3, and 6 months) stages. Next, GFP-expressing circulating collagen producing cells were systemically depleted using GFP-specific CD8+ T killer cells (Just eGFP death inducing, or JEDI) and the effect on tissue repair was determined using scRNA-seq and analysis of collagen ultrastructure.

Results: We identified non-hematopoietic circulating fibroblast-like cells, termed "fibrocirculators", that exhibit stem cell characteristics and produce collagen. These cells were most abundant during the chronic remodeling stage of tissue repair (1 month after injury) and persisted within the tissue up to 6 months after injury. Fibrocirculators exhibited multiple interactions with myeloid cells and their recruitment was triggered by the tumor necrosis factor (TNF) pathway, specifically by TNFSF12/TWEAK. Targeted systemic depletion of fibrocirculators using JEDI T cells accelerated wound healing, decreased fibrotic collagen architecture, and reduced pro-fibrotic gene expression of wound fibroblasts.

Conclusion: We have identified a novel population of circulating non-hematopoietic mesenchymal cells that are recruited to sites of injury and exhibit pro-fibrotic characteristics. Targeted depletion of these cells may lead to novel therapeutic opportunities for chronic fibrotic conditions such as hypertrophic scars and pulmonary fibrosis.

Anomaly Detection and Appraisal of Cleft Faces Using A Pixel-wise Subtraction Machine Learning Technique

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Purpose: Our goal is to design machine learning systems that will consistently gauge faces in a manner similar to human judgement, providing for a universal, objective measure of facial difference and reconstructive surgical outcome [1,2]. Here we demonstrate a novel technique of automatic facial anomaly detection and image rating that matches human deformity scoring and simulates patterns of spontaneous eye-tracking.

Methods: Thirteen raw images of individuals with cleft lip scored by volunteer human raters (1 abnormal to 7 normal) and were then inputted into a generative adversarial network artificial facial generator (StyleGAN2). The latent vector most closely matching the original deformed face was then retrieved. An iterative algorithm was utilized to jointly update the latent vector and optimize weights of the generative model so as to more closely represent

distinctive features of the raw image. This was achieved through back-propagation of the difference loss between the abnormal face and the image generated in each preceding step. The operation was repeated for a sufficient number of iterations to obtain the desired facial details, absent the original anomalous features.

Pixel-wise subtraction (YCbCr color) between the native image and its transformed counterpart facilitated calculation of an anomaly score and generation of an anomaly heat map. The oronasal region of interest was isolated for analysis by using a masking protocol. The relationship between human ratings of the cleft images and the machine generated scores was calculated using Pearson's correlation.

Results: Using our pixel-wise subtraction machine learning technique we were able to generate heat maps the finely discern anatomic anomalies. The anomaly scores that we obtained from the computer model correlated closely with the human ratings of facial difference, with a Pearson's r score of 0.936.

Conclusion: Using a generative adversarial network to produce normalized transformations of cleft-affected faces allows for subsequent measurement of deformity using a pixel-wise subtraction approach. Using this shallow machine learning technique, we obtained meaningful heat map representations of facial difference, and a high correlation between machine and human ratings. We note that 10 of the 13 images analyzed in this study were unrepaired cleft lips with a substantial level of overt deformity. When considering secondary cleft deformities, factoring in only pixel color intensity may be insensitive to the more subtle structural changes that the human eye can instinctively detect. We continue with development of further feature detection using this shallow model (as well as deeper machine learning methods) with the objective of ultimately being able to move away from the use of subjective facial assessment in both the clinical and research realm.

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In Vitro and In Vivo Studies on the Biosafety and Efficacy of Biodegradable Magnesium Alloy for Skin Staple

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Summary: Skin staples were applied for wound closure for decades. The most commonly used material for staples is stainless steel because of its excellent process, mechanical properties, corrosion resistance, and biocompatibility. 1. However, the staples should be removed several days later with an annoying pinching sensation. The other common problem of current skin staples is retention of the staple in the wound. In recent years, the application of degradable magnesium alloys was developed for pre-clinic and clinical studies for its biodegradability, high biocompatibility, and appropriate mechanical strength. 2. Therefore, the aim of this study was to evaluate the safety and mechanical properties of skin staple made of magnesium alloy (Mg-skin staple).

A prototype of Mg-skin staple was produced by using Mg-Zn wire with a diameter of 0.55 mm. The mechanical property of Mg-Zn wire was evaluated using universal testing machine with a speed of 2 mm/min. The safety evaluation including in vitro cytotoxicity, cutaneous irritation and subcutaneous implantation study were performed in accordance with the ISO-10993 standard. 3. Additionally, the functional test was also carried out.

The ultimate tensile strength and elongation of Mg-Zn wire are 258.4 MPa and 6.9%, respectively. Over 95% cell viability of L929 cells was noted under the treatment of Mg- Zn extract for 24h, which represented no cytotoxicity in vitro. Moreover, no tissue irritation was noted in vivo by the polar and non-polar extract in rabbits. No difference of the wound healing in the Mg-skin staples and control (stainless steel) group for 1 and 3 weeks after wound closure in the cutting wound over the back of New Zealand rabbits. Moreover, some Mg-skin staples dropped off the skin 2 weeks later, and the others were easily removed. Mg-skin staple could be an alternative device for stainless steel skin staples with a good biocompatibility. In the future, patients could be provided with a absorbable metal staple that will not be retained in the wounds.

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Are In-Office Procedures Under Local Anesthesia A Feasible Alternative To Ambulatory Surgery For Pediatric Patients?

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Background: Many surgeries are offered to adults in-office under local anesthesia (IO); However, with regards to children, Plastic Surgery procedures are often exclusively offered in ambulatory surgical centers under general anesthesia (AS). The merit of IO pediatric procedures depends on their safety and feasibility. Many assume that younger children, particularly aged less than 10, do not tolerate IO procedures due to anxiety, making it challenging to maintain safety and efficacy. However, a risk benefit analysis of pediatric IO and AS procedures is necessary to corroborate this.

Methods: A retrospective review assessed outcomes of 864 children who underwent IO and AS procedures by one plastic surgeon from 2017-2021. Office procedure settings are prepared by offering children video and audio distraction, parental comfort, and reward for remaining calm. Procedures include branchial vestige, polydactyly, hemangioma, nevus and pilomatrixoma removal, along with hypertrophic scar revision. Procedure location, past medical and surgical history, time between initial consult and procedure, anesthetic type, and complications were recorded.

Results: 751 children (mean age: 5.5y) had procedures done IO, and 113 (4.5y) had them done AS. 71% (536) of the IO children were younger than 10 years, with 290 of them aged between 1-6. The pediatric IO and AS groups were statistically similar in terms of sex, age, ICD codes, number of comorbidities and pervious surgeries. Of the 468 benign masses that were removed IO, 25% were between 2-4cm in size and 25% were greater than 4cm. 48% of all masses that were removed IO were located on the face, with 30% of the facial masses sized greater than 3cm. With regards to safety, there were only five complications in 113 pediatric AS patients, and 21 in 751 IO patients; these amounts were statistically similar. Furthermore, there was no significant association between complication rate and increasing mass size or mass location. In terms of feasibility, no parent requested abortion of any ongoing pediatric IO procedure, and none requested a switch from IO to AS for second stage and revision surgeries. The overwhelming majority of kids were calm due to the prepared IO setting. The IO group also had an average time from consultation to procedure of 26 days, significantly less than the 68 days of the AS group. Furthermore, the IO group averaged significantly fewer clinics follow up visits (1.8) compared to the AS group (2.9). Surgeons also stand to gain 10-35 minutes of time per 60-minute operation due to bypassing variables like induction and extubation.

Conclusion: IO procedures are equally safe for children as AS procedures. Furthermore, IO removal is consistently feasible with proper preparation of setting. IO removal saves the

patient significant time, while dramatically decreasing cost. IO removal also offers physicians time flexibility which may maximize CPT codes billed/year.

Comparing Extracorporeal Shockwave and Hyperbaric Oxygen Therapy in Enhancing Wound Healing in a Streptozotocin-Induced Diabetic Rodent Model

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Abstract: Studies have revealed that both extracorporeal shock-wave therapy (ESWT) and hyperbaric oxygen therapy (HBOT) can accelerate wound healing. This study aimed to compare the effectiveness of ESWT and HBOT in enhancing diabetic wound healing. A dorsal skin defect (area, 6×5 cm2) in a streptozotocin-induced rodent model of diabetes was used. Fifty male Wistar rats were divided into five groups (n=10 in each subgroup): normal control rats, diabetic control rats receiving no treatment, diabetic rats treated with one session of ESWT (ESWT-1) and two sessions of ESWT (ESWT-2), and diabetic rats treated with HBOT. Postoperative wound healing was assessed once every three days. Histologic examination was performed with hematoxylin and eosin staining. Ki-67, eNOS, vascular endothelial growth factor (VEGF), and 8-hydroxy-2-deoxyguanosine (8-OHdG) were evaluated with immunohistochemical (IHC) staining. The wound area was significantly reduced in the ESWT and HBOT groups compared to that in the diabetic controls ($P < 0.001$). However, the wound healing time was significantly increased in the HBOT group compared to the ESWT-2 group. Histological findings showed a significant increase in neovascularization and suppression of the inflammatory response by both HBOT and ESWT compared to the controls. IHC staining revealed a significant increase in Ki67, VEGF, and eNOS but suppressed 8-OHdG expression in the ESWT group compared to the HBOT group. Two sessions of ESWT facilitated diabetic wound healing more effectively than HBOT by suppressing the inflammatory response and enhancing cellular proliferation and neovascularization and tissue regeneration.

Quality or Quantity? Results of a Conference Hosted by HBCU Medical Students

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Background/Purpose: Despite representing less than 2% of medical colleges in the United States, historically black colleges and/or universities (HBCUs) educate more than 20% of Black medical students.[1] To date, there are no efforts focused on HBCU inclusion within Plastic & Reconstructive Surgery (PRS) literature. A search for (plastic surgery) AND (HBCU) in PubMed yields zero results.

Medical students from HBCUs face challenges in obtaining opportunities that are readily available to students with home PRS programs. In order to help facilitate overcoming these barriers, a group of HBCU medical students created Operation Diversify Plastics (ODP). This virtual conference featured 13 sessions held over a span of two weeks. Plastic surgeons from different ethnic/racial backgrounds, practice settings, and career positions (resident, program director, division chair, and the current president of American Association of Plastic Surgeons) served as keynote speakers. Sessions were recorded for a planned YouTube channel. A post-survey was distributed to participants who attended Week 2, to assess the effectiveness of ODP and to further analyze barriers to inclusion.

Methods: social media (Twitter, Instagram, Facebook, and GroupMe) was used to promote the event. A post-survey of 15 open ended and multiple-choice questions was distributed to people who registered for Week 2 of ODP. Week 2 consisted of 11 sessions and featured 15 speakers. Open-ended answers were analyzed qualitatively using a grounded theory approach, and later tallied for frequency of themes that emerged. Correlations between quantitative and qualitative data were also recorded.

Results: There were 132 registrants with 90 attendees. 28% of participants completed the survey. Medical school representation included 9 countries, 6 continents, and 13 U.S. states. Educational background ranged from pre-medical students, medical students, medical residents, and international medical graduates (IMGs). Surprisingly, only 8% of respondents attended an HBCU. 24% of respondents reported no prior interaction with a plastic surgeon of color prior to attending ODP. Notably, the session with the largest attendance (40%) focused on scholarships and opportunities for medical students interested in PRS. Emergent themes reinforced the difficulty of obtaining PRS exposure for students underrepresented in medicine (UIM), the need for practical help acquiring a mentor, and difficulty finding research opportunities relevant to PRS.

Conclusion: What began as a means to elucidate barriers to inclusion for medical students at HBCUs, ultimately illustrated a need for inclusion of all UIM students who face barriers to matriculating into a U.S. based PRS residency program. Navigating the path to PRS without a home program requires autonomy, courage, and ingenuity as evidenced by responses and themes retrieved from our survey. A small group of UIM students saw a problem and developed an intervention with a global reach. Given the frequent turnover and impermanence of student-led interest groups, we encourage the establishment of formal PRS opportunities designed for UIM students without home PRS programs.

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Adipocytes Said, "When I Grow Up, I Want to be in Three-Dimensional Space": Adipose Tissue Fabrication with Isolated Primary Human Adipocytes for Breast Cancer Study

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Purposes: Mature primary adipocytes are notoriously difficult to culture, and most in vitro adipocyte culture relies on adherent ceiling cultures. However, fibroblast-like cell dedifferentiation or a rapid phenotype loss often occurs due to hypoxia, structural change, or inflammation in this synthetic media-based culture method. Thus, the development of a three-dimensional ex vivo model is necessary for adipose tissue-associated studies, such as breast cancer, in which adipose tissue plays a crucial role in pathogenesis. Herein we fabricated a tissue-engineered three-dimensional patient-derived breast adipose tissue model, incorporating breast cancer cells and all the other cell components of the breast microenvironment (glandular epithelial organoids and stromal vascular fraction) within which are embedded engineered vascular channels. This high-fidelity ex vivo model which closely resembles the local breast tumor microenvironment may be used to develop more effective breast cancer therapeutics for clinical application.

Methods: Polydimethylsiloxane (PDMS) molds were created using custom designed 3D-printed Poly lactic acid (PLA) molds. 3D-printed PLA stamps and 22G catheters were used for the fabrication of tumor spheres and putative vascular channels within the same Z coordinate. Tumor spheres may then be placed precisely at predetermined distances between the vessels allowing for detailed studies of the tumor/vessel interactions. The adipose tissue model was fabricated using 10% (w/w) adipocytes and other patient-derived tissue components mixed within 1% (w/v) Type I collagen to form the main structure in PDMS molds; red-fluorescent MDA-MB-231 cells at 40,000 cells/1.6uL were added into the wells that were pre-formed with PLA stamps in the adipocyte-enriched collagen bulk to create the tumor spheres. Twenty-four hours after plating, red-fluorescent smooth muscle cells (SMC) and green-fluorescent endothelial cells (EC) were seeded sequentially within the channels at

5 million cells/mL. Control constructs were made by generating vascular structures and tumor spheres within a collagen-only matrix. Constructs were sacrificed for 7, 14 and 21 days for further analysis.

Results: The engineered adipose tissue model presented a similar porous structure as the native breast tissue from which it was derived, and the viability of adipocytes in the constructs was verified by perilipin staining. Patent vascular channels lined with SMC and EC were visualized within the channels the day after seeding and SMC sprouts had formed from pre-formed channels over 21 days in culture. Concurrently, the tumor spheres were noted to invade into surrounding collagen matrix over time. Immunofluorescent staining of Ki67 revealed an increased tumor cell proliferation in the adipose tissue model on Day 7, 14 and 21 when compared to tumors cultured in a plain collagen matrix.

Conclusion: We have successfully engineered an advanced ex vivo, patient-specific, adipose tissue model of the breast cancer microenvironment that not only replicates patient tissue characteristics, but also includes vascular structures and cancer spheres that closely resemble early tumors. The increased tumor proliferation noted within the model underscores the importance of recapitulating the TME ex vivo and shows significant promise to investigate both the pathogenesis of cancer growth and metastasis as well as potential therapeutic interventions.

The Impact of social media on Perceptions of Plastic Surgery Training Programs Among Future Applicants

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Purpose: Given the rise of social media usage, plastic surgery training programs are left to optimize their presence on social media platforms in order to interact with future applicants and the medical community as a whole. Given recent COVID-19 restrictions on in-person visiting sub-internships and interviews, this study sought to evaluate what program information was most influential to future plastic surgery applicants as they researched residency programs on social media.

Methods: We designed an electronic survey targeting medical students interested in plastic surgery to assess the importance of various information sources in forming perceptions of plastic surgery residency programs. Prior to the 2022 Match, future plastic surgery applicants were invited to participate through multiple mediums to maximize responses, including through an Instagram "Story" (where the survey was embedded) on a single residency program site, through an electronic survey link promoted by multiple Plastic Surgery Instagram accounts, via email, and during a virtual social event prior to interviews at the study site.

Results: There were 82 respondents, among which 65% were current fourth year medical students applying to Plastic Surgery in the 2022 match, and 27% were first through third year medical students planning to apply to Plastic Surgery in the future. The remaining 8% of respondents note other statuses, including taking research time or switching specialties, for example. The most utilized resources or factors that informed program interest were: mentors (86%), peers/partners (60%), and geographic location preference (55%). Respondents also used electronic sources to inform interest, including program social media accounts (36%), program websites (36%), and "Top" editorial lists (26%). Among social media content, applicants most desired posts about resident life (66%) and team bonding activities (61%). There was mixed interest in posts about upcoming events (37%), OR/clinic photos (32%), innovative advancements (31%), program news (29%), faculty introductions (27%), geographic location advantages (25%), and commitment to diversity & inclusion (24%). 72% of respondents agreed/strongly agreed that social media played a role in informing their interest to apply to a specific residency program, and 94% of respondents agreed/strongly agreed that a social media presence is increasingly important for a residency program to maintain in light of the COVID restrictions on visiting sub-internship opportunities and virtual interviews.

Conclusion: The study demonstrated that prospective plastic surgery applicants expect programs to have a social media presence, and thus, programs should invest time and thought in their social media strategy. While electronic sources are not the most important sources of information rated among applicants, social media plays an influential role in guiding interest in specific programs. To best inform applicant perspectives during the recruiting process, programs should prioritize content that gives a picture of "resident life" and team dynamics.

The Better to Ear You With: Bioengineering Full-scale Auricles Using 3D-printed External Scaffolds and Decellularized Cartilage Xenograft

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Purpose: Faithful reconstruction of the human auricle is a notorious challenge for the plastic surgeon. While the gold standard remains harvest and shaping of autologous costal cartilage, such procedures obligate donor site morbidity, scarring, and prolonged operative time, often coupled with suboptimal aesthetic results and biomechanical properties that bear little semblance to the structure they intend to replicate. In response, we have endeavored to bioengineer neo-ears utilizing decellularized ovine costal cartilage as a biocompatible xenograft placed within a full-scale, 3D-printed human ear external scaffold to foster tissue growth that predictably mimics the size, shape, and biomechanical properties of the native human auricle.

Methods and Materials: Polylactic acid (PLA) ear scaffolds were fabricated to match the anatomy of an adult human ear using 3D photo capture and subsequent modeling. All scaffolds were printed on a 3D printer (Prusa i3 MK3S) and sterilized. Ovine costal cartilage was isolated and processed either through mincing (1 mm3) or zesting (<2 mm3) and decellularized in-house through our usual protocol. Decellularized cartilage was packed into the ear scaffolds and implanted subcutaneously on the dorsa of immunocompetent Sprague-Dawley rats. After 3 and 6 months in vivo, the constructs were explanted for gross, histologic, biochemical, and biomechanical analyses.

Results: Upon de-molding, both the minced and zested neo-ears maintained the size and contour complexities of the native human ear through 6 months in vivo. Massing of minced and zested ears, respectively, revealed a 1.45 ± 0.09-fold increase ($p=0.05$) and 1.11 ± 0.07-fold increase in construct mass with respect to preimplantation mass after 3 months in vivo. Zested ears implanted for 6 months in vivo revealed a 1.20 ± 0.18-fold increase in construct mass over time, while preliminary explantation of a minced ear revealed a 1.21-fold mass increase after 6 months in vivo. Micro-CT scanning revealed de-caged auricular explant volumes of 4,237.9 mm3 and 4,838 mm3 for zested and minced ears after 3 months in vivo, while zested and minced ears after 6 months in vivo exhibited volumes of 4,053.2 ± 256.7 mm3 and 3,987.7 mm3, respectively. H&E staining confirmed a mild inflammatory infiltrate and corresponding fibrovascular tissue ingrowth enveloping individual cartilage particles, while safranin-O staining revealed an expected depletion of glycosaminoglycans (GAG) secondary to the decellularization process. All constructs were pliable and resumed their native conformation when twisted or bent and detailed biomechanical studies are ongoing.

Conclusions: Utilization of decellularized ovine xenograft has proven highly efficacious at generating neo-ears that maintain their size and shape after 6 months in vivo. The use of scaffolds as a means of protecting grafted material after implantation allows for fibrovascular tissue formation between cartilage particles that successfully resists contractile forces, thereby producing a nonimmunogenic, full-scale construct that strongly resembles the adult human ear. Such constructs have demonstrated mass increases secondary to neo tissue

formation as well as grossly favorable biomechanical properties and deformability. Multiple ears fabricated using the same in vivo bioreactor approach will be explanted over the ensuing several months to provide further insight into construct longevity.

Gender, Racial, and Socioeconomic Determinants of Choosing a Surgical Career

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Purpose: Across all specialties we see a leaky pipeline for diversity, from applying to residency to matriculating to residency and ascending in the ladder of academia [1]. These disparities in representation often disproportionately affect surgical specialties, for which long training programs, socioeconomic stressors, and cultural influences may dissuade qualified but underrepresented students from pursuing a surgical career. This study examines how demographic and socioeconomic variables affect the choice of specialty.

Materials and Methods: A Qualtrics survey was disseminated via email to a listserv of all residents at a single institution between September 2021 and February 2022. The survey queried (1) demographic information, (2) childhood socioeconomic information, (3) residency socioeconomic information, and (3) reasons for specialty choice. Data analysis was performed using SPSS and included chi squared analysis, Fisher's exact test, and multiple logistic regression with subgroup analysis comparing medical and surgical specialties, and the Top 10 earning specialties (of which 7 are surgical).

Results: A total of 294 responses (86 in surgical fields, 204 in medical fields) were collected, with a response rate of 46%. Seventy-six individuals (25.9%) identified as belonging to a disadvantaged group. The average amount of student debt was $183,000. Residents pursuing a Top 10 earning residency were more likely to cite loan repayment (45%, 23%, $p<0.001$) and potential salary after residency (72%, 55%, $p=0.013$) as concerns factoring into their specialty decision. Medical residents were significantly more likely to cite concern with length of training as a deciding factor in choosing a specialty than surgical residents were (S:35%, M:59%, $p<0.001$). Surgical residents were significantly more likely to be pursuing a fellowship than medical residents (S:69%, M:49%, $p=0.013$). In a multiple logistic regression, race ($p=0.041$), ethnicity ($p=0.046$), and being part of a disadvantaged group ($p = 0.072$) were seen to be the most significant unique predictors of choosing a medical residency over a surgical residency. Specifically, 17% of medical residents were Black,

Native Hawaiian, or Mixed Race as compared to 10% of surgical residents. Female gender (46% v 61%), 0.014) and being the sole source of income (17% v 26%, p=0.018) were predictive of not pursuing a top 10 earning specialty. On the other hand, higher parent/guardian level of education was predictive of choosing a top 10 paying residency (p=0.05).

Conclusion: Understanding the socioeconomic influences on specialty choice provides insight into how we can work to alleviate barriers that dissuade qualified and diverse applicants from pursuing surgical careers. Loan repayment concerns, the length of training, and the need to support one's family financially are all reasons that dissuade students from pursuing surgery, alongside persistent gender and racial barriers. It is imperative that we actively help alleviate these financial burdens and create a culture supportive of diversity in order to attract the most diverse and highly qualified candidates.

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Text Analysis and Other Hedonometrics: Understanding the Social Media Conversation About Plastic Surgery

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Purpose: Social media platforms continue to host the majority of public Internet discourse regarding plastic surgery. We sought to establish methods to systematically capture and study social media posts across all relevant platforms and explore a variety of methods to hedonometrically evaluate available data.

Methods: The Twitter Academic Research API was queried for all available tweets relating to "facelift surgery" since the founding of Twitter in March 2006 until March 2022. CrowdTangle software was used to query for all publicly available Facebook and Instagram posts relating to "facelift surgery" between September 2008/July 2012 respectively and

March 2022. Generalizable regular expression-based methods were developed to control for intentional search optimization by users and identify truly relevant posts. A normalized user-response-based sentiment value was derived for Facebook posts. Quantitative sentiment analysis was performed using the Quantitative Discourse Analysis Package (QDAP). Bigram correlations were performed to identify relationships between words and provide context for tokenized sentiment analysis.

Results: A total of 88,027 tweets, 55,269 Facebook posts, and 37,319 Instagram posts relating to "facelift surgery" were identified. While the majority of posts were initially made to Twitter until late 2019, the majority of posts are now on Facebook and Instagram. QDAP-based quantitative sentiment analysis demonstrated no statistically significant change in sentiment over time for any platform despite bigram augmentation, though Facebook and Instagram posts were assessed to be more positive than Twitter posts overall ($p < 0.01$). Normalized user-response-based sentiment of Facebook posts has continuously increased since the introduction of the user response feature.

Conclusion: The emergence of large-scale data acquisition tools and robust text analysis packages enables the plastic surgery community to deeply analyze the public conversation about procedures offered by plastic surgeons and other cosmetic medical providers. Dictionary-based sentiment analysis reveals the differing underlying purposes these social media platforms server for their users. Analysis using foundation models may provide deeper contextual understanding and improve sentiment analysis about plastic surgery and its outcomes.

State-of-the-art Skin Substitute Designs and Formulations for Burns, Wounds, and Soft Tissue Reconstructions

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Purpose: Recent advancements have allowed for the development of a broad range of treatment options for wound healing and repair. Skin substitutes, whether synthetic, biosynthetic, or biologic have been used to cover open wounds with variable similarity to human skin. Tissue scaffolds have been engineered in recent decades to resemble the three-dimension structure of the extracellular matrix, ideally allowing the adhesion, growth, and differentiation of human skin cells. Autografts and allografts remain in use, although xenografts and hydrogels have increased both in popularity and availability. Unfortunately, no product has demonstrated clear evidence of superiority, leaving clinicians and surgeons

wondering. Thus, with this paper we provide an up-to-date review of the randomized controlled and clinical trials pertaining to dermal treatment options for burns, wounds, ulcers, and superficial soft tissue reconstructions.

Methods and Materials: A review of clinical and randomized trials published between between January 2017 and March 2022 was performed. This search yielded 1777 results. One author then screened the search results using PRISMA guidelines, for relevance based on clinical use for ulcers, wounds, burns, flap donor sites, and soft tissue reconstruction closures. The remaining articles were recorded, and duplicates were deleted. Covidence was used to assess risk of bias.

Results: Our search ultimately yielded a total of 87 applicable studies. Randomized controlled trials composed 77.0% of our results (67 out of 87) while the remainder were clinical trials. The most frequently used adjunct for each group is as follows: ulcers (aceullar dermal matrices), burns (omega-3-rich fish), wounds (platelet and fibrin containing hydrogels), soft tissue reconstructions (acellular dermal matrices). Regarding burn treatments, porcine transgenic acellular material reduced hospitalization time by an average of 8 days when compared to standard of care in one trial. Fish skin also displayed efficacy in burn treatment when compared to silver sulfadiazine cream, leading to faster re-epithelialization ($p<0.001$), less dressings ($p<0.001$), and a reduction in treatment related costs per patient by 42.1%. Additionally, in a study of acute biopsy wounds, omega-3-rich fish skin decreased healing time when compared to dehydrated human amnion/chorion allographs. In the treatment of diabetic foot ulcers (DFU), human umbilical cord allografts (EpiCord□) increased healing rates at 12 weeks to 96% compared to the 65% of alginate-treated ulcers ($p<0.0001$) in one study, and a novel, open-structure human reticular acellular dermal matrix decreased mean time to heal by 37 days in another. Another study reveled that omega-3-rich fish skin grafts also dramatically accelerated DFU closure compared to standard of care in ($p= 0.0152$, $n=49$). In breast reconstruction, one study revealed Alloderm RTU□, a sterile regenerative tissue matrix caused three times as many infections requiring antibiotics than its competitor dermACELL□, although the Alloderm□ group had a statistically significant improvement in outcome satisfaction when the two were compared in another study.

Conclusions: This review summarizes the findings of clinical trials for the many dermal therapies for wound healing. Of note, omega-3-rich fish skin appears promising due to its versatility in all categories assessed.

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Human Mesenchymal Stem Cells Regenerates Cranial Bone Defects in Animal Models

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Background: Although the first evidence of skull reconstruction dates back to 3.000 BC by the Incas, it was only since the second part of the last century that modern cranioplasty began to find its way into practice. (1) Calvarial bone defects continue to represent a major reconstructive issue for plastic and neurosurgeons. Cranioplasty continues to be a complicated procedure that has not seen significant modifications from centuries ago. Our objective sought to evaluate the outcomes following the application of human adipose-derived stem cells (hADSCs) alone or loaded in scaffolds for regeneration of critical-size calvarial bone defects in animal models.

Methods: A systematic review was performed by querying PubMed, Ovid MEDLINE, EMBASE, and CINAHL databases. The MeSH terms were "adipose-derived stem cells," "cranial bone defect," "stromal vascular factor," "fat grafting," as well as synonyms in combinations determined by our search strategy. We included observational descriptive studies with animal models that utilized hADSCs as primary therapy for a calvarial bone defect. We excluded studies in languages other than English.

Results: A total of 194 studies were identified after the removal of duplicates. A total of 14 articles fulfilled our inclusion and exclusion criteria. From the 14 studies selected, one study used hADSCs alone, and the 13 remaining used scaffolds loaded with hADSCs. Among selected articles, the most common animal model was the mice, with eight out of fourteen studies, followed by six studies on rats. One of the articles used hypothyroid rats due to their slow bone healing process, however, these rats demonstrated positive and similar results in an 8-week follow-up compared with the other studies. All the studies took samples from

human lipoaspirate. Follow-up between studies varied between 1 to 12 weeks. All the studies exhibited increased bone formation in the groups that used hADSCs, either seeded in the scaffold or alone, in a period of 8 weeks on average.

Conclusions: Based on the studies included and evaluated, this systematic review indicates that in the time range of 1 to 12 weeks, the treatment involving either hADSCs alone or seeded in scaffolds was superior to the control groups in all the articles previously reported.

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CleftGAN: Leveraging A Style-Based Generative Adversarial Network to Create New and Unique Cleft Lip Images

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Purpose: We have been developing applications of machine learning facial analysis to facilitate surgical planning and measurement of clinical outcomes [1,2]. Because machine learning models require large training data sets, a critical rate-limiting factor is the availability of high-quality, ethics board-approved experimental images for research purposes. In response, we introduce here a deep learning-based cleft lip image generator built to produce high fidelity, artificial facial images exhibiting variations of cleft lip deformity. Leveraging the seminal StyleGAN2 model [3] that fabricates normal human images from a dataset of 70,000 faces, we have applied transfer learning tools to extra-train that model with a small dataset depicting cleft lip deformity. Here dubbed CleftGAN, this novel tool is now made available for the generation of an unlimited number of high-fidelity cleft lip images that can be used for a wide variety of research purposes.

Methods: The StyleGAN2-ADA (generative adversarial network artificial facial generator with adaptive augmentation) [4] was employed as the base model for our transfer learning protocol. This modification of the algorithm facilitates the construction of a generative model using a small number of training samples. For our protocol, we used only 295 cleft facial images. The majority of the image subjects were children. We configured the StyleGAN2-ADA to generate different augmentation types such as horizontal flipping, rotation, scaling,

and color transformations. This amplified the small number of training samples and prevented the network from over-fitting the training samples.

Results: Our computer model demonstrates the ability to automatically generate vast numbers of unique faces depicting a wide range of cleft lip deformity, ethnic/racial background, and lighting/angle/pose. It is noted that subjectively the resolution and texture of the images, and the characteristics of the associated nasal deformity, are not entirely realistic in this preliminary trial using a small dataset of 295 base images.

Conclusion: The described novel computer model demonstrates the introduction of anomalous samples (i.e., images depicting cleft facial deformity) into a deep learning generative adversarial network. This represents a machine learning method of "crossbreeding" a small number of anomalous features into a much larger "gene pool" of an established feature dataset. While the output achieved to date is impressive, going forward the addition of larger numbers of raw images portraying a diversity of attributes will likely enhance the resolution of the output and the fidelity of fabricated lip and nasal deformities.

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Regeneration of Calvarial Bone Defects Mediated by Transduced Human Bone Marrow Stem Cells with Bone Morphogenic Protein in Animal Models

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Background: Cranioplasty is a surgical procedure that aims to restore or repair skull discontinuity defects following an injury or other surgical procedures such as craniectomy or craniotomy. The rate of complications associated with cranioplasties such as non-healing and delayed healing fractures is high in the United States, (1) creating the need for alternatives. Bone marrow stem cells have shown to be the most osteogenic among other mesenchymal stem cells sources. (2) The family of bone morphogenic proteins (BMP) are essential for osteogenesis. Clinical and preclinical studies have demonstrated the osteoinductive capacity of BMP-2 therapy in several intervention scenarios such as bone defects, non-union fractures, spinal fusion, root canal surgery, and osteoporosis. (3) This review aims to analyze the status of the use of human bone marrow stem cells (hBMSCs) transduced with bone morphogenic proteins (BMPs) to regenerate calvarial bone defects.

Methods: Following the PRISMA Guidelines a literature search of 4 electronic databases including PubMed, MEDLINE, Embase, and CINAHL was conducted in January 2021 with the following MeSH terms used: "Skull Defect", "Bone Marrow Mesenchymal Stem Cells" and "Morphogenetic Proteins, Bone". Descriptive studies evaluating the use of hBMSCs transduced with BMPs as the primary therapy to regenerate calvarial bone in animal models were included. Studies in a language other than English, reviews, descriptive articles, conference articles, book chapters, and in vitro studies were excluded. Data on bone percentage by micro-CT-scan, bone mineral density, expression of osteoinductive genes, and micromorphological staining analysis were collected.

Results: Out of 511 studies, 5 fulfilled the inclusion criteria. Two included articles used immunocompetent Sprague-Dawley rats. The three remaining used mice as the animal model, from which two scientific papers used severe combined immunodeficient mice. Three out of five articles use Adenovirus as the transduction vector. BMP-2 was the most used transduced protein among studies. All included studies demonstrated the bone regenerative potential of hBMSCs transduced with BMP seeded in scaffolds compared to their respective controls measured with micro-CT-scan and histomorphology staining, however, a comparison among the articles is limited due to the distinct transduction vectors, type of BMPs used, and type of animal model used. Moreover, no standardized dosage of cells creates a new variable that could affect the outcomes. No side effects were reported.

Conclusions: The use of BMP transduced hBMSCs effectively regenerates new bone in a critical size calvarial defect of mice and rats by promoting cell migration and differentiation into osteoblasts at the injured site.

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Sequential Dual-Drug Delivery Of BMP-2 and Alendronate from Hydroxyapatite-Collagen Scaffolds for Enhanced Bone Regeneration

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Summary: The clinical use of bioactive molecules in bone regeneration has been known to have side effects, which result from uncontrolled and supraphysiological doses. In this study, we demonstrated the synergistic effect of two bioactive molecules, bone morphogenic protein-2 (BMP-2) and alendronate (ALN), by releasing them in a sequential manner. Collagen-hydroxyapatite composite scaffolds functionalized using BMP-2 are loaded with biodegradable microspheres where ALN is encapsulated. The results indicate an initial release of BMP-2 for a few days, followed by the sequential release of ALN after two weeks. The composite scaffolds significantly increase osteogenic activity owing to the synergistic effect of BMP-2 and ALN. Enhanced bone regeneration was identified at eight weeks post-implantation in the rat 8-mm critical-sized defect. Our findings suggest that the sequential delivery of BMP-2 and ALN from the scaffolds results in a synergistic effect on bone regeneration, which is unprecedented. Therefore, such a system exhibits potential for the application of cell-free tissue engineering.

A History of Mechanical Tension Depletes Lgr6+ Epidermal Stem Cells

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Purpose: Recent research found the epidermal Lgr6 stem cell population to be progressively depleted under mechanical tension, with a paralleled increase in the Lgr6 descendant population.1 This study aims to determine if there is a reversal of tension-induced skin growth characteristics, specifically if the Lgr6 stem cell population recovers after tension is removed. Our results will guide future research in therapeutic interventions for optimal skin recovery following tension, such as seen with bariatric surgery and the resulting excess skin from rapid weight loss.

Methods And Materials: Genetic Lgr6-EGFP-Cre-ERT2;tdTomato mice (EGFP=Lgr6, tdT=Lgr6 descendants) underwent controlled expansion (E) of the back skin. A tissue expander was surgically placed under the back skin on day zero, rested for 7 days, expanded over 10 days with a total of 24 mL saline, rested for 14 days, then deflated of saline at post-injection day 14 (PI-14) or deflation day zero (DF-0). Skin over the expander was resected, embedded in paraffin, and sectioned at 4µm. Cell populations were defined using immunofluorescence and quantified by relative expression and cell counting (ImageJ). Control mice underwent expander surgery but did not undergo saline expansion (non-expanded, NE). NE and E mice (n=3 each) were compared for PI-14, DF-14, and DF-56. We used two-tailed t-test with alpha set at 0.05.

Results: Relative expression of EGFP decreased from NE to both DF-14 ($p=0.0474$) and DF-56 ($p=0.0477$), while relative expression of tdT increased from NE to DF-56 ($p=0.0125$). EGFP+ cells decreased from NE to PI-14, DF-14, and DF-56 ($p=0.0114$ for all), while tdT+ cells increased from NE to PI-14, DF-14, and DF-56 ($p=0.0086$, $p=0.0133$, $p=0.00002$). Proliferating cells (Ki67+) increased from NE to PI-14, DF-14, and DF-56 ($p=0.00007$, $p=0.00001$, $p=0.0417$), but decreased from DF-14 to DF-56 ($p=0.0278$). Of the proliferating cell population, the [Ki67+tdT+] population increased from NE to DF-56 ($p=0.0002$). Cytokeratin 5 (K5) relative expression increased from NE to PI-14, DF-14, and DF-56 ($p=0.0109$, $p<0.00001$, $p<0.00001$). The number of epidermal keratinocyte layers increased from NE to PI-14, DF-14, and DF-56 ($p<0.00001$, $p<0.00001$, $p=0.0043$), with a decrease from DF-14 to DF-56 ($p=0.0020$).

Conclusions: The epidermal Lgr6 stem cell population remained severely depleted following discontinuation of mechanical tension. Conversely, both the Lgr6 descendent population and K5 stem cell expression continued to increase while under tension and following release of tension. A prolonged history of discontinued tension revealed that the majority of the proliferating cell population was from Lgr6 progeny. Together, these observations suggest that in skin with a history of tension: (1) the Lgr6 population is permanently depleted, (2) the majority of the epidermis will be from Lgr6 progeny, and (3) Lgr6 progeny and K5 stem cells will be preferentially and progressively activated over Lgr6 stem cells to maintain the epidermis. Overall, these results imply that specific stimuli will prioritize responses from specific stem cell populations, and possibly to the detriment of an existing stem cell population.

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Targeting Persister Hyperbiofilm Forming Bacterial Infection: The GelATA Wound Care Dressing

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Background: Management of chronic wounds resistant to antibiotics is a clinical challenge. Persister bacterial phenotypes such as small colony variants (SCV) are a subpopulation of antibiotic-tolerant bacterial cells that are often hyperbiofilm forming in nature. The key to managing such hostile biofilms of persister bacteria is complete eradication and one approach is to dismantle the structural framework of these biofilms. Extracellular DNA is a major component of the biofilm. DNase treatments can eradicate standard biofilms but not persister biofilms. Our work showed that, fragmented extracellular DNA (eDNA) released from a persister strain of Pseudomonas aeruginosa (PAO1ΔwspF) biofilm was responsible for resistance to disruption by DNase. PAO1ΔwspF biofilm can be disrupted by triammonium aurine tricarboxylic acid (ATA), a chemical inhibitor of covalent binding between eDNA and protein1. In this study, we tested the efficacy of GelATA wound care dressing (ATA incorporated into a polymer-based gel) against polymicrobial persister biofilm infection in a preclinical porcine burn wound model.

Methods: Eight 2"x2" full thickness burn wounds were created on the dorsum of (70-80lb) female domestic white pigs (n=3) using a standardized method2. Polymicrobial biofilm infection was established with clinical isolates of P. aeruginosa (PAO1 ΔwspF) and Staphylococcus aureus (S. aureus rexB). Wounds were treated with either standard of care dressing (SOC) or GelATA once weekly. Progression of wound healing was followed using non-invasive imaging: Digital images and Trans Epidermal Water Loss (TEWL). Histopathological examination and Scanning Electron Microscopy (SEM) of the burn wounds were performed at day 56.

Results: SEM imaging of GelATA treated wounds showed disrupted biofilm formation with less bacterial aggregate compared to SOC treatment. Furthermore, GelATA significantly ($p<0.05$; n=12 wounds in 3 pigs) enhanced wound closure and re-epithelialization of persister biofilm-infected wounds ($p<0.05$; n=12 wounds in 3 pigs). Interestingly, improved wound

healing with inhibition of biofilm formation resulted in functional wound closure which was evident by significant decrease in TEWL ($p<0.05$; n=12 wounds in 3 pigs) and improved skin barrier function in GelATA treated wounds.

Conclusions: This work presents first in vivo evidence for the efficacy of GelATA in disrupting persister biofilm and promoting functional wound closure in a pre-clinical porcine burn wound model.

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Human iPSC-Vascular Smooth Muscle Cell Spheroids Demonstrate Size-dependent Alterations in Cellular Properties and Secretory Function

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Purpose: Human induced pluripotent vascular smooth muscle cells (hiPSC-VSMCs) and their secretome have been reported to promote tissue regeneration in the context of wound healing. [1] Using hiPSC-derived secretome in lieu of cells has allowed researchers to overcome obstacles relating immune reactivity. The use of 3D spheroid culture methods has been shown to increase cellular paracrine secretion and thus, their therapeutic potential. However, the implications of spheroid size and composition have yet to be investigated. Our goal was to develop an inexpensive and reproducible method to make hiPSC-VSMC-derived spheroids of various sizes and examine how size influences cell viability and paracrine secretion.

Methods: We used our previously established method for the production of iPSC-VSMCs. [1] Spheroids were made using agarose-coated microwells which induced the cells to self-aggregate. Spheroids of 5000, 10000, 20000, and 40000 cells were created and then tested for relative viability using various assays e.g., AlamarBlue, LDH, EthD-1, and BrdU. Paracrine secretion was assessed using ELISA for a variety of growth factors including vascular endothelial growth factor (VEGF), basic fibroblast growth factor (bFGF), angiopoietin (Ang)-1, transforming growth factor (TGF)-β, tumor necrosis factor (TNF)-α, interleukin (IL)-10, stromal cell-derive growth factor (SDF)-1α, and matrix metalloproteinase (MMP)-2.

Fibroblasts were treated with conditioned medium from 10000 cell spheroids and functional assays were performed to assess the therapeutic potential of the secretome. Statistical significance was determined using one-way ANOVA and student t-test.

Results: A statistically significant increase in AlamarBlue cell viability was seen between the 5000 spheroids and the 20000 and 40000 spheroids. The 40000 spheroids had the most cytotoxicity while the 5000 spheroids had the least cytotoxicity as per the LDH assay. Increasing size was associated with increased viability, but also increased cytotoxicity. The EthD-1 staining of nuclei showed relative number of dead cells increased with increasing spheroid size with 5000 cell spheroids having the least, and 40000 cell spheroids having the most dead cells. The 40000 spheroids had the lowest percentage of proliferating cells compared to all other sizes as per the BrdU staining. In terms of paracrine secretion, the 5000 cell spheroids had significantly less relative VEGF secretion than the 10000, 20000, and 40000 cell spheroids, but there was no difference in secretion between any of the other sizes. This trend was consistent in all other growth factors tested. When assessing the conditioned media from 10000 spheroids, there was no difference in the relative cytotoxicity between the treatment group and the controls, but cells treated with spheroid CM demonstrated significantly enhanced cell migration.

Conclusions: Our work has demonstrated that spheroid size has an enormous impact on the properties of hiPSC-VSMCs and spheroids formed with 10000 cells strike an ideal balance between overall cell health and maximal paracrine secretion. This research will provide a basis for the continued development and optimization of cellular therapies to improve tissue regeneration and wound healing.

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Value Based-Healthcare in Plastic Surgery: A Systematic Review of the Literature

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Background: Value-based healthcare (VBHC), defined as the ratio of outcomes to cost, has been a hot topic of research across many specialties. For example, in a recent 15-year period there have been 33 VBHC publications in the orthopedic literature just in the subspecialty of hand surgery.1 The purpose of this study is to examine the plastic surgery literature in order to (1) outline the general trends of value-based publications, (2) quantify and categorize value-based articles, and (3) identify gaps in value-based research.

Methods: Utilizing PRISMA methodology, the authors conducted a systematic review of VBHC in plastic surgery using PubMed, Google Scholar, and Cochrane databases from January 1988 - February 2021. The initial search captured all articles with any combination of the terms "outcomes", "cost of care" and "plastic surgery". Four independent reviewers screened the results. To meet the definition of VBHC, articles were included only if they analyzed both the economic cost of an intervention and the associated patient-reported outcomes. Articles were categorized according to their focus: (1) Breast, (2) Cosmetic (3) Hand/Peripheral Nerve (4) Pediatric/Craniofacial (5) Reconstructive, and (6) Other.

Results: The initial search yielded 2770 articles. Through screening of abstracts, 2355 articles were excluded as they did not relate directly to plastic surgery, did not include an economic analysis, or were not scientific studies (i.e., editorials). The remaining 415 articles underwent full-text review, resulting in the exclusion of an additional 344 articles, primarily because these articles reported cost analyses but not patient-reported outcomes. The remaining 71 articles were deemed VBHC articles. The number of VBHC publications increased over time, from just 14 in the period 1988-2012, to 57 from 2013-2021. Breast is the largest category, with 40 publications, followed by Reconstructive with 13, and Pediatric/Craniofacial with 9. There are only 2 VBHC articles in the plastic surgery literature in the category of Hand/Peripheral Nerve and 1 in the category of Cosmetic.

Conclusions: To our knowledge, this is the first systematic review quantifying VBHC research in plastic surgery. Although the plastic surgery literature does contain a large number of economic analyses, most of these studies fail to relate cost to outcomes. The number of actual VBHC articles has been increasing in recent years, but certain subspecialties within plastic surgery, particularly Hand/Peripheral Nerve and Cosmetic, are particularly deficient in VBHC research.

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Identification and Analysis of Novel Variants Identified From a Two-Generation Family Affected by Craniosynostosis

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Introduction: Craniosynostosis (CS) affects 1 in 2000 babies. It can be syndromic (SCS) or nonsyndromic (NCS). The genetic basis of NCS has not been fully elucidated. This study examines a two-generation family with 2 affected members, an affected daughter diagnosed with sagittal NSC (CS-64), her affected father with evidence of CS (CS-65), and her unaffected mother (CS-66). Uncovered candidate variants were then studied in zebrafish as a model organism to understand the role of these genes in cranial development.

Methods: Whole exome sequencing (WES) was performed on samples and sequences were then mapped using Burrows-Wheeler Alignment tool. Sequences were then filtered, and functional analysis of candidate genes was performed to identify pathogenic variants that then underwent Sanger sequencing. CRISPR/Cas9 along with guide RNAs were injected into zebrafish embryos to introduce mutations in two candidate genes. The development of cranial bones in the progeny of mutated fish were observed. Another candidate gene was cloned into a heat shock (HS) expression vector, which was injected into embryos to produce transgenic (Tg) fish. Tg fish were heat shocked and their cranial structures were observed. Histological sections of cranial sutures stained with Hematoxylin and eosin of all fish were examined.

Results: Three inherited mutations were identified in both CS-64 and CS-65, and were heterozygous for these mutations. These were variants in integrin alpha V (ITGAV), solute carrier family 30, member 9 (SLC30A9), and BMP and activin membrane-bound inhibitor (BAMBI). In zebrafish itgav and slc30a9 were targeted with CRISPR/Cas9 and bambia was overexpressed. Homozygous itgav mutated fish compared wildtype had significantly ($p<0.05$) larger frontal and parietal bones, less overlap between the bones and more asymmetry between left and right sides. Histological sections of these fish illustrated abnormal bone development and decreased patency of sagittal and interfrontal sutures. Heterozygous slc30a9 mutated fish compared to wildtype had significantly ($p<0.05$) higher growth rates of parietal bones, and more asymmetry between left and right sides. HS Tg bambia fish displayed no significant difference when compared to control groups.

Conclusion: This study identifies three novel variants in NSC and demonstrates the effect of altering their expression on cranial development in zebrafish.

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The Macroeconomic Impact of Cleft Surgical Complications: A Call to Develop Strategies to Reduce Cleft Surgery Complications

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Introduction: Surgery for cleft lip and palate is cost-effective from a quality-of-life standpoint. However, cleft surgery is associated with complications such as secondary deformities requiring revision, velopharyngeal insufficiency (VPI), and midface hypoplasia (MFH) in up to 40% of cases, resulting in substantial morbidity and mortality. Revision surgeries for these complications can be costly.

Aims: To estimate the economic losses attributed to secondary deformities requiring revision, VPI, and MFH and the economic loss associated with disability owing to these complications.

Methods: The value of lost welfare (VLW) approach (Alkire et al., 2015), which accounts for morbidity, was used to ascribe an economic value to Disability Adjusted Life-Years (DALYs) for secondary deformities requiring revision, VPI, and MFH. DALYs were calculated using disability weights from Global Burden of Disease (GBD) 2010 "disfigurement level 1", "disfigurement level 2", and "speech problems" as proxies for secondary deformities, MFH, and VPI, respectively. Value of statistical life-years were calculated for each country.

Results: 187 countries in the GBD were assessed with an orofacial cleft prevalence estimated at 4.2 million in 2010. Economic losses for lip scarring were estimated to be $4.8 billion USD; for MFH were $4.6 billion USD, and for VPI were $1.6 billion USD. Collectively, secondary deformities, MFH, and VPI were estimated to account for 0.94% of global GDP. There was no statistically significant difference between high-income and low- and middle-income countries ($p=0.377$).

Conclusion: The economic impact of cleft surgical complications can contribute to nearly $10 billion USD and nearly one percent of 2010 global GDP. This is substantial considering that, collectively, five of the most common surgical conditions can result in 17% of global GDP due to disability. Strategies to improve primary results, mitigate complications, and advance protocols should be prioritized on the global cleft care agenda.

Geographic Trends of International Medical Graduate Residents and Faculty in U.S. Plastic Surgery Training Programs

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Background: There is an increasing demand for IMG (International Medical Graduate) physicians with a predicated shortage of 125000 physicians by 2025. At the same time, among IMGs, there is a continued interest in matching at a US residency program.
13.6% of academic plastic surgeons in the US are IMGs. There has been no detailed description of the current participation of IMGs in US plastic surgery residency programs. The objective of this study was to evaluate US plastic surgery training programs and identify the countries in which IMGs obtained their medical degrees and the states in which they matched. In addition, we sought to establish a correlation between IMG faculty and IMG residents in US plastic surgery programs.

Methods: ACGME-approved plastic surgery programs were identified. Public program websites were reviewed for their current residents and faculty. IMG residents and faculty were defined as residents who had completed their medical degree at a medical school outside of the US. The primary outcome of interest was the country in which IMG plastic surgery residents had obtained their medical degrees. Secondary outcomes of interest included program state location, PGY year of each IMG resident, and number of IMG faculty (including program director and chair) per program. Chi-square, t-test, and Pearson correlation tests were used to evaluate categorical trends with statistical significance set at $p<0.05$.

Results: 101 independent and integrated plastic surgery programs were screened for IMG faculty and residents. A total of 39 different states were represented which included 1262 current residents of which 92 (7.3%) were IMGs. IMG residents received their medical degrees from 46 different countries. The most common countries were England (n=6, 6.5%) for IMG residents and Canada (24.5%) for IMG faculty. The most common region represented for residents was South America (n=44, 47.8%). The highest proportions of IMGs per total state plastic surgery

residents were found in West Virginia (33.3%) and Minnesota (25%). This high percentage was also represented within the faculty where13.5% and 15.6% of Program Directors and Program Chairs were IMGs, respectively.
There was a statistically significant difference between the proportion of IMG residents in programs that had an IMG program director versus programs with no IMG program director (p=0.016). No such statistically significant difference was found between the proportion of IMG residents in given programs with IMG chairs (p=0.55). There were significantly more IMG faculty in programs with IMG chairs (p=0.001). The number of IMG faculty was positively correlated to the number of IMG residents in a given program (p=0.0001, r=0.39).

Conclusion: IMG residents constitute a small but appreciable portion of current plastic surgery residents in the US; the majority have earned their degrees from the South America region. IMG faculty have a strong representation in academic plastic surgery, as evidenced by the number of IMG Program Directors and Chairs. Programs with IMG Chairs had a greater number of IMG faculty. IMG plastic surgery residents are more likely to be recruited to programs that have an IMG program director and a higher number of IMG faculty.

The Geographical Impact of Plastic Surgery Fellowship to First Job Placement

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Introduction: The location of a plastic surgery fellowship may impact the fellows first job location. If fellowship locations prove to be an important influence in where someone begins their career, there will be a substantial gravity in fellowship selection.

Methods: Plastic surgery fellowship graduates in the United States (2015-2021) were analyzed retrospectively to determine their first job's proximity to their fellowship institution. Charts and maps were created based on if the locations were within 100 miles, within the same state, within the same geographic region, within the United States, or outside of the United States. A Chi-Squared analysis was completed to determine if the proximity was due to chance.

Results: 106 plastic surgery fellowship graduates from 59 programs were included in the sample (n=106). 17 fellows graduated in 2015, 24 in 2016, 27 in 2017, 20 in 2018, 13 in 2019, and 6 in 2020. 25.47% (n=27) stayed within a 100-mile radius of their residency, 44.34% (n=47) stayed

within the same geographic region, and 2.83% (n=3) of the graduates went internationally. These findings were statistically significant (p = 0.001).

Conclusion: The results show that if a graduate completed their plastic surgery fellowship in a certain geographic location, they are more likely to stay in that area for their first job. This can be attributed to factors such as an established network in the area, positive opportunities to practice their specialization, and a shift in focus on family life.

Location Matters: The Geographical Impact of Plastic Surgery Residency to First Job Placement

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Introduction: Residency location may indicate where a resident begins their practice, the type of practice, or attending fellowship. Identifying the impact location has on a resident's future will be a confounding factor in the integrated plastic surgery match.

Methods: Graduates' first job location after integrated plastic surgery residency programs in the United States (2015-2021) were retrospectively collected. This data was categorized based on whether the proximity of the graduate's first job location to residency was within 100 miles, within the same state, within the same geographic region, within the United States, or international. To calculate if the relative geographic location of the first job was due to chance, a Chi-squared analysis was conducted.

Results: The sample size consisted of 279 residency graduates from 41 programs, of which 48 graduated in 2015, 56 in 2016, 54 in 2017, 48 in 2018, 45 in 2019, 26 in 2020, and 6 in 2021. 36.92% (n=103) stayed within a 100-mile radius of their residency, 68.46% (n=191) stayed within the same geographic region, and 1.08% (n=3) went internationally. These findings were statistically significant (p = 0.001).

Conclusion: The results show that if a graduate completed their integrated plastic surgery residency in a certain geographic location, they are more likely to stay in that area for their first job. The implications of this can be attributed to their established network in the area after years of residency, a shift to focus on family life, and increased opportunities to join the private practice industry.

A Multimetric Health Literacy Analysis of Online Gender Affirmation Surgery Materials: From Facial to Bottom Surgery

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Purpose: The transgender, gender non-conforming, and non-binary (TGNB) patient population and gender affirming surgery (GAS) volume is rising. Many TGNB patients search online for treatment options, but there is a paucity of accurate, comprehensive, and easily navigable GAS resources. Previous studies also demonstrate that such materials are above the 6th grade reading levels recommended by the National Institute of Health and American Medical Association. ^1-2 However, whether difficulty differs between masculinizing and feminizing procedures is unknown. The authors aim to evaluate the readability of online GAS resources by specific procedures to highlight potential inequities in information access between TGNB sub-populations.

Methods: We searched Google for GAS keywords, including "facial feminization", "facial masculinization", "MTF breast augmentation", "FTM chest masculinization", "MTF vaginoplasty", "metoidioplasty", and "FTM phalloplasty". Per keyword, the first 75 text-containing results were included, allowing for overlap between keywords. After removing images, captions, and links, the remaining text was analyzed. Reading difficulty was assessed with the Flesch-Kincaid Reading Ease (FKRE) test, with lower scores indicating higher difficulty materials. Grade-level was assessed with the Flesch-Kincaid Grade Level (FKGL), Gunning Fog Score (GFS), Simple Measure of Gobbledygook (SMOG), and Coleman-Liau Index (CLI), with higher scores indicating higher grade-levels. Scores were compared with independent t-and ANOVA tests ($\alpha = 0.05$).

Results: Overall, materials had mean readability scores (FKRE 37.44) and grade-levels (FKGL 12.87, GFS 15.61, SMOG 11.91, CLI 15.00) correlating with advanced high school to college-level difficulty. Ninety webpages were published by academic and 234 by private practices. Masculinizing surgical materials (mean FKRE 35.61, FKGL 13.24, GFS 15.91, SMOG 12.12) were more difficult to read than feminizing ones (mean FKRE 39.87, FKGL 12.37, GFS 15.21, SMOG 11.63, $p \leq 0.023$) except when measured by CLI. Top surgery materials (mean FKRE 44.75, FKGL 11.64, GFS 14.72, SMOG 11.15, CLI 14.40) were easier to read than facial (mean

FKRE 34.38, FKGL 13.54, GFS 15.92, SMOG 12.21, CLI 15.46) and bottom surgery materials (mean FKRE 34.60, FKGL 13.23, GFS 16.00, SMOG 12.22, CLI 15.09, $p \leq 0.001$). Chest masculinization resources (mean FKRE 42.14, FKGL 12.13, GFS 15.06, SMOG 11.55) were more difficult to read than those for breast augmentation (mean FKRE 47.35, FKGL 11.15, GFS 14.39, SMOG 10.75, $p \leq 0.006$) except when measured by CLI. No differences in difficulty or grade-level between facial feminization and masculinization surgery resources, nor between vaginoplasty, metoidioplasty, and phalloplasty, results existed.

Conclusion: The difficulty of GAS online materials is well above the recommended 6th grade reading-level. Masculinizing procedures like FTM top surgery have resources that are significantly more challenging to understand, disproportionately affecting transgender men, which may perpetuate health inequities. Improving readability by using simpler words and shorter sentences can help overcome barriers to care for the TGNB population.

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Outcomes of Closed versus Open Rhinoplasty: A Systematic Review

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Purpose: Open and closed rhinoplasty are two main approaches to perform nasal modifications. According to current literature, there is no current consensus among plastic surgeons and otolaryngologists on which technique is preferred in terms of aesthetic result, complications, and patient satisfaction. This study uses published research to determine whether open or closed rhinoplasty leads to superior patient outcomes.

Methods: PRISMA-P guidelines for systematic reviews were followed and a literature search was conducted in four databases based on our search strategy. Articles were then imported into COVIDENCE where they underwent primary screening and full text review.

Results: Twenty articles were selected in this study after 243 articles were screened. There were four case series, twelve retrospective cohort studies, one prospective cohort study, one case-control, and two outcomes research. There were three cosmetic studies, eight functional studies, and nine studies that included both cosmetic and functional components. Sixteen studies utilized both open and closed rhinoplasty and four utilized open rhinoplasties. Both techniques demonstrated high patient and provider satisfaction and no advantage was found between techniques.

Conclusion: Based on available studies, we conclude there is no preference between open or closed rhinoplasty in terms of which technique leads to better patient outcomes. Several studies determined that both open rhinoplasty and closed rhinoplasty leads to comparative patient satisfaction. Few studies, however, suggested either open or closed rhinoplasty was superior. In order to make outcome reporting more reliable and uniform among studies, authors should look to utilize the nasal obstruction and septoplasty effectiveness scale and the rhinoplasty outcome evaluation.

Preservation Rhinoplasty: A Systematic Review

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Purpose: Preservation rhinoplasty is a technique that maintains the integrity of the nasal keystone area, involving minimal destruction of nasal ligaments. The technique leads to high patient and provider satisfaction. The aim of this study is to evaluate and synthesize published literature to make recommendations on when preservation rhinoplasty should be utilized.

Methods: PRISMA-P guidelines for systematic reviews were followed and a literature search was conducted in four databases based on our search strategy. Articles were then imported into COVIDENCE where they underwent primary screening and full text review.

Results: Nine articles were selected in this study after fifty-two articles were screened. There were seven case series studies, one retrospective cohort study, and one prospective cohort study. Three studies were purely cosmetic with the remaining six relying on both cosmetic and functional components. Preservation rhinoplasty demonstrated high patient and provider satisfaction. In addition, there were minimal short-term and long-term complications along with a small reoperation rate.

Conclusion: Based on available studies, we conclude that preservation rhinoplasty leads to optimal patient and provider outcomes. Several studies determined that preservation rhinoplasty leads to a good aesthetic outcome alongside improvements in the functionality of the nose. We cannot conclude if preservation rhinoplasty is a superior technique in comparison to open or closed rhinoplasty due to limitations in published literature. Furthermore, in order to make outcome reporting more reliable and uniform among studies, authors should look into objective measurement scales for outcome evaluation.

Evaluating the quality and reliability of gender affirming surgery videos on YouTube and TikTok

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Background: Social media platforms have changed the way medical information is disseminated. Prospective transgender patients, especially those with limited access to healthcare, may utilize social media to learn about gender affirming surgeries (GAS). Although videos on social media are readily accessible, their content is not verified or peer reviewed. Previous literature has examined the quality of gender affirming chest surgery, but not of gender affirming genital surgery. (1) Therefore, this study aims to evaluate the quality and reliability of YouTube and TikTok videos related to gender affirming chest and genital surgery.

Methods: YouTube and TikTok were queried for masculinizing top surgery, metoidioplasty, phalloplasty, breast augmentation, and vaginoplasty. Quality of video content was analyzed by the DISCERN scale. Quality scores were compared amongst the type of GAS, account user, and content category.

Results: There were 275 YouTube videos and 55 TikTok videos, with the majority focused on masculinizing top surgery ($p<0.001$). The majority of YouTube videos were produced by patients (67.6%). Healthcare professionals and centers produced 23.6% of YouTube videos. Plastic surgeons created 71.9% of all YouTube videos produced by MDs .

Overall, YouTube videos had higher quality and reliability than TikTok videos ($p=0.003$). Overall, videos on masculinizing GAS had higher quality and reliability than videos on feminizing GAS ($p<0.001$).

Chest surgery videos were of higher quality than those on genital surgery ($p \leq 0.001$). Videos on masculinizing top surgery had the highest quality while vaginoplasty had the lowest quality and reliability ($p<0.001$).

Videos produced by healthcare professionals and academic institutions had the greatest quality and reliability, respectively ($p<0.0001$), whereas videos produced by patients were the least reliable ($p<0.0001$).

Conclusion: Healthcare professionals, especially plastic surgeons, should create high quality and reliable videos on social media. These videos will educate transgender patients with unique health needs, especially for patients interested in breast augmentation and genital surgery. When done correctly, content on social media can improve patient knowledge, promote evidence-based medicine, and ease patient anxiety in real time.

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Quantifying Facial Movement in Facial Palsy Patients using IPhone TrueDepth Technology

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Purpose: We developed a mobile application that uses iPhone/iPad TrueDepth Cameras to three-dimensionally (3D) measure smile movement. This technology was created by Apple (Cupertino, CA) for device security and recreational purposes. The goal of this study was to determine whether the TrueDepth camera could be used to quantify smile movement clinically.

Methods: The TrueDepth camera uses infrared technology to gather 3D location data from 300,000 points on the face, generating a virtual facial mesh. Our application uses the generated virtual facial mesh as a reference to calculate lip corner displacement (LCD) during smile. We recruited 15 facial palsy (FP) patients in different stages of treatment and 4 healthy volunteers. Participants were instructed to perform their maximum smile 4 consecutive times. Differences in LCD between the normal and paralyzed sides were calculated. Results were reported in millimeters as mean and standard deviation. In addition, we graded participants' smiles according to the Sunny Brook (SB) facial grading system.

Results: The mean age for the FP group was 56.33 ± 15.55 years. Most patients had paralysis due to tumor resection (12/15) followed by facial reanimation surgery (12/15) and were at various points of recovery at the time of data collection. For the control group (SB score 5, complete movement), the mean difference between left and right LCD was 0.49 ± 0.18 mm; (stronger side 17.80 ± 0.13 mm and weaker side 17.33 ± 0.20 mm). Nine patients with an SB score of 1 (unable to initiate movement) had a LCD difference of 15.52 ± 3.34 mm (Normal side +11.57 ± 2.75 mm; paralyzed side -3.95 ± 1.85 mm, where negative values indicate that the lip corner was pulled to the contralateral side). Three patients with SB score 3 (initiate movement with mild excursion) had a mean LCD difference of 6.46 ± 2.20 (Normal side +14.04 ± 0.55 mm; paralyzed side +7.58 ± 2.04 mm). Three patients with SB score 4 or 5 (movement almost complete or complete) had a mean LCD difference of 0.92 mm ± 0.58 (Normal side +12.31 ± 2.37 mm; paralyzed side +11.56 ± 3.19 mm). In one patient, data were collected before and after the patient underwent left parotid tumor resection. Before surgery, her smile was normal bilaterally (SB score 5), and the mean LCD difference was 0.35 ± 0.13 mm (right side 9.22 ± 3.09mm; left side 9.36 ± 2.71 mm). Following surgery, the patient developed complete left facial paralysis (SB 1), at which point the LCD difference increased to 11.61 ± 1.97 mm (right/normal side +8.57 ± 1.51 mm and left/paralyzed side -3.03 ± 0.58 mm).

Conclusion: We demonstrated the feasibility of using a mobile application that collects 3D data from iPhone/iPad's TrueDepth cameras to quantify smile of facial palsy patients. Further studies on a larger patient cohort are warranted, but our findings demonstrate the promise of using this tool in the care of facial palsy patients.

Comparative Evaluation of ERAS Versus PSCA Applications to a Single Institution in the 2022 Plastic Surgery Match

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Background: The Plastic Surgery Common Application (PSCA) has emerged as a low-cost alternative application portal to the Electronic Residency Application Service (ERAS) for integrated plastic surgery applicants. During the 2021-2022 application cycle, our plastic surgery residency program accepted both the PSCA and ERAS applications to help recruit candidates otherwise deterred by prohibitively high application costs. We sought to determine how the PSCA compared to the ERAS application in a standardized review of applications scores.

Methods: The PSCA and ERAS applications from 28 candidates who received interviews from the U.S.C. Plastic Surgery Residency Program were analyzed. These 56 applications were randomly assigned across 22 independent reviewers. Each reviewer scored applications on a scale of 1 to 5 for six pre-assigned variables, including communication skills, leadership, intellectual curiosity, compatibility with the program, service, and perseverance. Statistical analysis was performed using two-tailed z-tests, with statistical significance set at $p \leq 0.05$.

Results: The 56 residency applications had a combined average score of 4.21 (95% CI, 4.13 - 4.29). The average score of PSCA applications (4.19; 95% CI, 4.08 - 4.31) did not significantly differ from the average score of ERAS applications (4.24; 95% CI, 4.12 - 4.35; p=0.57). PSCA and ERAS applications did not have a significant difference in the average scores for review categories: communication skills, leadership, intellectual curiosity, compatibility with the program, service, and perseverance.

Conclusion: At our institution, the overall total score and scores of each individual application category are comparable between the PSCA and ERAS applications. This suggests that the PSCA application may be a reasonable alternative to ERAS for medical students applying to plastic surgery residency.

Promoting Publications Through Plastic Surgery Journal Instagram Accounts: Is It Worth It?

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Purpose: In the past five years, plastic surgery journals have grown their social media presence to increase engagement with readers, employing several methods to improve article visibility such as through use of hashtags, account tagging, and multimedia content. However, no research to date has explored the performance of articles promoted on Instagram. We aim to determine the impact of Instagram promotion on article engagement and citations and identify social media tools that effectively enhance such metrics.

Methods: Instagram accounts for Plastic and Reconstructive Surgery, Annals of Plastic Surgery, Aesthetic Surgery Journal, and Aesthetic Plastic Surgery were reviewed for posts promoting articles published by February 8, 2022. Promoted articles from the corresponding Open Access journal were excluded. Per post, the caption word count, whether the post included a video, link to the article or research introduction by the authors, and the number of likes, accounts tagged, and hashtags were recorded. Then, all articles from issues of the four journals published between the date of the first and last post promoting articles were reviewed, excluding commentaries/replies, discussions, erratum, obituaries, and book reviews. Altmetric data for each article was recorded as a measure of engagement and citation numbers were extracted using the National Institute of Health iCite tool. Differences between engagement data and citations of articles with and without social media promotion were assessed by Mann Whitney U-Tests. Univariate and multivariable regressions were used to calculate factors associated with having greater engagement (Altmetric score ≥ 5) and citations (≥ 6) ($p<0.05$).

Results: Overall, 5037 articles met inclusion criteria, of which 675 (13.4%) were promoted on Instagram. Of posts featuring articles, 274 (40.6%) included a video, 469 (69.5%) an article link, and 123 (18.2%) an author introduction. On these posts, the median word count was 52, number of likes 94, number of accounts tagged 6, and number of hashtags used 7. Articles promoted on Instagram had significantly higher median Altmetric Scores, percentiles compared to other articles from the same journal and of similar publication age, number of Mendeley readers, and citations ($p<0.001$). On multivariable analysis, for Instagram-promoted articles, using more hashtags significantly predicted articles having higher Altmetric scores (OR=2.05, $p<0.001$) and more citations (OR=2.40, $p<0.001$). Tagging more accounts (OR=1.56, $p=0.034$), accruing more likes (OR=2.85, $p<0.001$), and including the article's link (OR=2.46, $p<0.001$) significantly predicted having higher Altmetric scores. Including author introductions negatively predicted having higher Altmetric score (OR=0.41, $p<0.001$) and citations (OR=0.57, $p=0.014$). Word count had no significant impact on Altmetric score or citation count of promoted articles.

Conclusion: Instagram promotion increases engagement and citations of articles published in plastic surgery journals. Journals should also utilize more hashtags, tag more accounts, and include manuscript links to increase article metrics. Having authors introduce their work may lessen article performance. We thus recommend that authors use opportunities to promote on journal social media to maximize article reach, engagement, and citations, which positively impacts research productivity with minimal additional effort in designing Instagram content.

Fusion Rate and Myofascial Flap Use in Spinal Fusion for Scoliosis and Spinal Tumor Patients: A Retrospective Study

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Purpose: Spinal fusion is performed in patients requiring stabilization following tumor resection and scoliosis. Multiple interventions, in particular, plastic surgery collaboration with use of muscle flaps, have been used to optimize spinal surgery outcomes. Little is known about the relationship between muscle flap use and bony fusion.

Methods: A retrospective review was conducted to study fusion rate and postoperative complications following spinal stabilization for scoliosis correction or extirpation of spinal tumors at Weill Cornell Medical Center from January 2013 to March 2021. Patient demographics, surgical course, and postoperative complications were collected. Radiographic evidence of fusion was collected by an attending neuroradiologist at three distinct postoperative timepoints (6 weeks to 6 months; 6 months to 1 year; longer than 1 year) and evaluated on a 0–2-point scale (0 = no fusion; 1 = partial fusion; 2 = complete fusion). A second attending neuroradiologist independently assessed fusion in 33 images to assess for inter-read reliability. Both neuroradiologists were blinded to patient and operation groups.

Results: 65 patients undergoing 71 operations (51 spinal tumor, 20 scoliosis) for spinal fusion met inclusion criteria. Patients with spinal tumors had a significantly lower fusion score compared to scoliosis patients across all three timepoints ($p < 0.01$; $p < 0.001$; $p = 0.02$). For both scoliosis and tumor cohorts, a multivariable regression showed that myofascial flap use was not associated with postoperative complications or fusion rate. However, tumor patients who received flaps demonstrated a larger increase in fusion score between the latter two timepoints compared to those without flaps.

Conclusions: To our knowledge, this retrospective study is the first to characterize the relationship between myofascial flap use and postoperative radiographic evidence of spinal fusion in scoliosis and tumor patients. As hypothesized, tumor patients had significantly lower fusion scores than scoliosis patients and may warrant additional bone grafting and/or

stabilization in the future. However, given the extensive neoadjuvant and adjuvant therapies tumor patients undergo and their metabolically catabolic state, the presence of not only fusion but progressive fusion across the first year is extremely encouraging. Moreover, the trend towards greater significance in fusion score across the three timepoints suggest that muscle flaps may help facilitate fusion in tumor patients.

3D-Printed Prosthetic Finger With "Buddy" Mechanism for Device Stabilization and Powering

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Purpose: To provide a low-cost functional prosthetic finger that restores length, improves prehension, pinch, grip, and activities of daily living of patients with finger amputations.

Materials and Methods: The prosthetic finger was 3D-printed on a selective laser sintering printer with nylon. The device was custom-fitted to a 39-year-old right-handed male patient with a partial amputation of the right ring finger at the proximal interphalangeal (PIP) joint. A "buddy" system was designed to stabilize and improve the function of the prosthetic finger using the patient's middle finger as a point of support. A rubber band was integrated into the device, creating a resting adducted position of the device but allowing for abduction of the ring finger away from the middle finger. The device was provided to the patient for a pilot trial of 4 months. A follow-up questionnaire was then conducted to assess patient satisfaction and device performance.

Results: After 4 months, the patient reported using the device an average of 3 to 4 hours per day. He reported that the largest benefit of the prosthetic was "increased grip strength", allowing him to "grip and grab objects like hammers". He also noted that the prosthetic helped him to hold a pen or pencil more comfortably without cramping, improving his handwriting. On a 5-point Likert scale, the patient rated his improvement in grip strength, improvement in ability to grab and pick up objects, and improvement in stamina when holding a pen or pencil as 5, 5, and 5 respectively. He rated both of the statements: "I would recommend the prosthetic to another patient" and "The prosthetic improves the function of my hand", as 5. Of note, prosthetic replacement of the patient's ring finger was not particularly helpful in completing fine motor tasks such as shaving, typing on a computer, or buttoning shirts. The patient rated the prosthetic's ability to help him complete each of these tasks as 2 out of 5.

Conclusions: In this case of a patient with PIP amputation of the ring finger on the dominant hand, our prosthetic device provided improved gross hand function. Using a "buddy" system to stabilize the prosthetic with a rubber band to allow for abduction and adduction, our intuitive design seeks to mimic the movements of a native finger. Benefits of finger prostheses are highly dependent on the amputated finger. Replacement of the ring finger, as in this patient, improves grip strength, the ability to grab and lift objects, and the ability to comfortably hold a writing utensil. Prosthetic replacement of other fingers will have distinct benefits, including likely improvements in fine motor control, which will be the subject of future investigation by our team.

Platelet Rich Fibrin (Prf) Enhances Scar Resolution of High-Tension Wounds in Rats

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Background: Mechanical tension is a central determinant of the size, strength, and physiology of scars formed after cutaneous injury. (1) During post-traumatic proliferation and remodeling, supraphysiologic tension modulates cell signaling and differentiation as well as angiogenic and inflammatory mediators. (2,3) Platelet-rich fibrin (PRF) is an autologous, patient-derived biologic scaffold generated from the blood that maintains a locally high concentration of growth factors, previously demonstrated to enhance angiogenesis and mitigate inflammation. (4,5) Here, we sought to evaluate the possible therapeutic relationship between PRF and cutaneous wounds in a model of variable-tension murine injury.

Methods: 60 Wistar Hannover rats were stratified to receive either high, medium, or low tension injuries via controlled dorsal skin incision/excision. Each cohort received a) isotonic solution injection (sham) or b) PRF emplacement. Wounds were followed for 28 days and tracked visually utilizing the Vancouver Scar Scale (VSS). On the 28th-day scar, the width was measured by caliper, and skin samples were collected for mechanical testing and/or histologic evaluation via H&E and Type I collagen immunochemistry.

Results: Wound healing was appropriately delayed under high tension conditions with the formation of more proliferative scars as assessed by the VSS. Scar width increased in direct correlation to the magnitude of tension applied. Under conditions of PRF treatment, scar/wound scores were improved vs. controls at all levels of tensions assessed. Scar width was noticeably and statistically thinner vs. control in all groups. High-tension scars retained tensile

characteristics consistent with lower-tension injuries in the presence of PRF but not control treatment. PRF-treated wounds additionally demonstrated more robust Type I Collagen expression in PRF-treated high-tension wounds.

Conclusion: PRF-treatment improved scar and wound healing characteristics vs. control. This effect was amplified in the high-tension wound environment.

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Circulating Donor-Derived Cell-Free DNA: A Novel Non-Invasive Biomarker for Allograft Rejection in Vascularized Composite Allotransplantation

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Background: Current diagnosis of rejection in vascularized composite allotransplantation (VCA) relies on correlation of clinical examination with skin histopathology. However, these methods remain both subjective and semi-quantitative, and frequent biopsies carry the risk of

infection, scarring, and/or inciting rejection through immune activation. There remains a need for novel, noninvasive methods of diagnosing rejection in VCA. Cell-free DNA (cfDNA) refers to circulating fragments of DNA in the blood originating from cells undergoing cell injury and death. Currently, cfDNA is an established biomarker in both prenatal testing and oncologic screening/prognostics. Based on promising results in solid organ transplantation, here we evaluated whether circulating donor-derived cfDNA (dd-cfDNA) could be used as a noninvasive biomarker to detect rejection in VCA recipients.

Methods: One combined face/upper extremity transplant recipient was followed longitudinally, and plasma samples were collected prospectively in combination with clinical photography and allograft biopsies at all routine follow-up appointments as well as for any suspected rejection episodes. Peripheral blood samples were collected and plasma levels of dd-cfDNA measured via targeted amplification and sequencing of a validated panel of single-nucleotide polymorphisms (SNPs). The percentage of dd-cfDNA to total-cfDNA (dd-cfDNA%) was calculated for each sample and correlated with rejection status, which was independently determined for each timepoint based on a combination of clinical exam and histopathology ('Non-rejecting' vs. 'Active Rejection'); Samples obtained within 2 weeks following steroid treatment for rejection were classified as 'post-steroid treatment.' Data were compared between groups using the Mann Whitney test.

Results: The recipient demonstrated undetectable levels of dd-cfDNA pre-transplantation followed by a peak of 1.1% on postoperative day (POD) 26 with a subsequent decline to low levels (<1%), all in the absence of rejection. Beginning on POD-280, he experienced a 6-month period of multiple episodes of ongoing clinical rejection confirmed by histopathology and with corresponding elevations in dd-cfDNA levels (1.1-4.9%), which partially responded to pulse steroids but ultimately required lymphocyte depleting therapy. Following treatment, rejection resolved both clinically and histologically with corresponding return to baseline low levels of dd-cfDNA (0.17-0.88%). A total of 21 'non-rejecting' samples (median 0.39%), 20 'Active Rejection' samples (median 2.15%), and 6 'Post-steroid Treatment' samples (median 0.84%) were collected, with significant differences observed between all groups ($p<0.02$ for all).

Conclusion: These results suggest that elevated levels of dd-cfDNA, representing allograft injury, appear to correlate with acute rejection, and have the potential both to help detect rejection through non-invasive means and to monitor resolution following treatment. While further research and a larger sample size is needed to confirm its validity, this safe, simple, and noninvasive test may prove useful for rejection surveillance, enabling more frequent and quantitative assessment while complementing traditional clinical and histopathological data for decision-making.

Establishment of Protocol to Enable On-Site Cryopreservation of Fat for Repeat Procedures

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Introductions: Autologous fat transfer is an effective treatment for soft tissue reconstruction. The main challenge is that, on average, 56% of the graft volume takes, this necessitates repeat procedures. (1) Therefore, preserving harvested tissue on-site for future injections is a clinical need. (2) This study investigates different cryopreservation methods and applies the best results for a clinically usable device.

Methods: Different cryoprotectant combinations, freezing temperatures, and conditions were tested, and the outcome of the cryopreservation was assessed by measuring cell viability using trypan blue and Calcin-Am staining two days post freezing. In vitro validation of optimized conditions was tested for up to 3 months. For in-vivo testing, Nu/Nu athymic mice were used, and human fat cryopreserved for seven days, 21 days, three months, or 11 months was compared to fresh fat for graft weight and volume retention, histology, vacuole formation, and inflammation at nine weeks post grafting. At +4 degrees celsius for three months, stored combination compared to fresh.

Results: A combination of 10% DMSO and 2% human serum albumin at -80 degrees celsius provided optimum cryopreservation. We observed no significant differences in cell viability of cryopreserved fat for up to 3 months compared to the fresh fat. Cryopreserved fat grafts showed weight and volume retention and histological morphology, vacuole formation, and inflammation comparable to fresh fat grafts. The cryopreservation solution was stable during storage.

Conclusion: The result of this study will enable the development of devices with clinically compatible appendages and a defined protocol for clinical use for long cryopreservation of fat tissue at -80 degrees celsius within a closed system.

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Allogeneic Adipose Tissue-Derived Matrix Mitigate Radiation-Induced Fibrosis (Rif)

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Introduction: Radiation-induced fibrosis (RIF) is a complex tissue response characterized by massive deposition of extracellular matrix (ECM) and excessive fibroblast proliferation resulting in loss of tissue function and quality of life. (1) In this study, we tested the efficacy of allograft adipose tissue-derived matrix (AATM) to mitigate RIF.

Methods: We used 40 Gy hind limb irradiated C57BL/6 mice as a skin fibrosis model and injected 200 µl AATM on the 14th post-irradiation day to investigate the inhibition of fibrosis on day 40. PBS and adipose stem cell (ASC) injection were negative and positive controls, respectively. The degree of limb excursion, skin epithelium thickness, and collagen deposition was measured as a marker of fibrosis. Molecular changes in treated and control skins were measured at gene and protein levels using real-time PCR and Luminex assay respectively. As a possible contributor to mitigation, the presence of hepatocyte growth factor (HGF) was measured in AATM using HGF- ELISA assay. In vitro, trans-well studies were performed to analyze the effect of direct co-culture of irradiated cells with AATM on pro-fibrotic gene expressions.

Results: Our results demonstrate that a single dose of 200 µl of AATM mitigates fibrosis. The mitigation efficiency of AATM was comparable to autologous ASCs. At day 40, epithelial thickness, collagen depositions, and limb excursion were similar to ASC treatment and were significantly better than PBS treated cohort. Real-time PCR analysis reveals the downregulation in the expression of pro-fibrotic genes TGF-β, CTGF, Col1, Col2, and TNF-alpha in AATM treated mice. Similarly, direct co-culture studies revealed downregulation of pro-fibrotic genes in irradiated fibroblast upon co-culture with AATM. ELISA results showed the presence of HGF. The noncontact trans-well co-culture of HGF knockout ASCs above a monolayer of irradiated mouse bone marrow stromal cells failed to downregulate fibrosis-related gene TGF-β expression.

Conclusion: Our findings suggest that allogeneic adipose tissue-derived matrix (AATM) is an effective therapeutic option to mitigate fibrosis. Further studies to optimize the time and dose of the therapy will be a significant step forward towards clinical adaptation as a RIF mitigator.

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Orthotic Helmet Therapy Outcomes and Compliance: Stratifying Outcomes by Insurance

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Purpose: Deformational Plagiocephaly (DP) is a condition in which an infant's skull is misshapen due to uneven external pressure. This study investigates the impact of insurance status on patient compliance and outcomes after orthotic helmet therapy for DP correction.

Methods: Demographic variables were collected on patients who presented to Cranial Technologies for orthotic helmeting from 2014 to 2020 across 21 states. Forward stepwise multivariate regression was conducted to identify the relationship between insurance status and poor outcomes of patients treated with orthotic helmeting for DP.

Results: There were a total of 211,417 patients, of whom 141,513 received treatment at a Cranial Technologies facility. Patients with Medicaid and Tricare were more likely to exit treatment with ultrabrachycephaly when compared to patients with private insurance (OR: 1.578, CI: 1.506-1.654, $p < 0.0001$; OR: 1.658, CI: 1.324-2.076, $p < 0.0001$). Compared to patients with private insurance, patients with Medicaid and Tricare were less likely to show treatment compliance (OR: 0.398, CI: 0.380-0.418, $p < 0.0001$; OR: 0.774, CI: 0.599-1.001, $p = 0.0506$, respectively). Patients with Medicaid were more likely to rate their outcomes as poor on a self-reported survey (OR: 3.254, $p < 0.0001$). By state, the likelihoods of treatment non-compliance and exiting treatment with ultrabrachycephaly were significantly correlated ($R = 0.4118$) for patients with Medicaid compared to commercial insurance

Conclusions: Our study investigating socioeconomic factors in helmet therapy across 21 states found that patients with Medicaid had worse craniometric and patient-rated outcomes compared to those with commercial insurance. Additionally, we found that insurance through Medicaid was associated with lower levels of compliance with therapy. This may explain the disparities in outcomes and provide an opportunity for strategies to promote effective helmet treatment among patients at greater risk of treatment failure.

Automated Facial Symmetry Score: A Novel Approach to Monitoring Facial Nerve Function

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Background: The ideal functional outcome measurement for facial nerve injury continues to remain controversial. Ideally, a subjective, minimally invasive, and easily implemented tool would be available. While some automated systems have already been developed and validated, they are largely 2-D renderings, subjective in nature, and capture only static images thus failing to incorporate the dynamism of facial movements. The goal of this project is to evaluate the Automated Facial Symmetry Index (AFSI) tool to assess facial symmetry that can be used to monitor the recovery of facial movements.

Methods: Analysis using optical flow was implemented to measure apparent motion of objects between two consecutive frames caused by the camera motion or object motion. Firstly, the AFSI tool has been developed on the Cohn-Kanade dataset involving a controlled young population of 123 subjects with no facial pathology. Secondly, participants were recruited to receive Dysport® (abobotulinumtoxinA) injections in the glabella, and forehead rhytids, in accordance with FDA approved indications and local ethical approval. Subjects were evaluated over three months to evaluate recovery of nerve function.

Results: The preliminary results demonstrated highly reproducible results for overall and regional symmetry of the face both at rest and during animation (98.9%, SD 2.3). When assessing forehead movement recovery following Dysport® injection, the mean change in movement was 7.7 mm (SD 1.8) and at 3 months, no significant difference between baseline movement was demonstrated and there was a significant change in movement of time ($p < 0.05$, t test, ANOVA).

Conclusions: We developed a novel technique to automatically quantify facial asymmetry in videos for patient treatment and rehabilitation. A state-of-the-art landmark detection technique is effective for style invariant landmark detection. Preliminary data suggests this method may provide a subjective and accurate analysis of facial nerve recovery.

Trends in Fellowship Training Across the United States in Plastic and Reconstructive Surgery Academic Faculty

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Purpose: As more integrated Plastic and Reconstructive Surgery (PRS) programs are founded, fewer surgeons enter the field via a traditional training route of a general surgery residency prior to a PRS residency. A faculty position in PRS is more coveted each year, therefore the aim of this study was to determine the requirement of fellowship training prior to PRS academic appointments.

Methods: PRS faculty at academic institutions in the United States associated with the American Society of Plastic Surgeons were identified. Data collection was obtained from program websites, Doximity, LinkedIn, and PubMed. Only those who completed traditional PRS training or integrated PRS residencies were included. Variables included integrated vs. traditional training, fellowships, gender, academic title, years on faculty, and publications prior to current hire. Associations between variables were analyzed using chi-squared and Mann-Whitney U test for categorical and continuous variables, respectively.

Results: Of 1,052 PRS academic faculty identified, 652 were included across 29 states and the District of Columbia with an average of 16 faculty per state. 73.9% (n=485) identified as male, with only 26.1% (n=170) identifying as female. Prior to hire at their current institution, 66.1% and 8.3% of faculty members completed one or more than one fellowship, respectively. Regardless of training route, academic faculty were significantly more likely to have completed a fellowship prior to hire ($p<0.0001$). An integrated route of training was associated with higher odds of having completed a fellowship prior to academic appointment ($p<0.001$, OR=2.19, 95% CI: 1.49–3.22). The odds of fellowship completion was significantly greater among graduates within the last 5-10 years ($p=0.001$, OR=2.55, 95% CI: 1.48–4.41) and within the last 5 years ($p=0.009$, OR=1.93, 95% CI: 1.18–3.17). No significant difference was found between graduates within the last 16-20 years or greater than 20 years. Current professors were less likely to have completed fellowship training prior to academic appointment compared to assistant professors ($p=0.003$, OR=0.51, 95% CI: 0.33–0.80), with associate professorship being non-significant. Attaining a program leadership position was associated with lower odds of fellowship training prior to initial faculty appointment ($p<0.001$, OR=0.58, 95% CI: 0.39–0.87). Further, no significant difference was found between fellowship- and non-fellowship-trained attendings in regards to gender, number of prior publications, or completion of another degree.

Conclusion: Our results show an increase in fellowship training prior to academic faculty appointment over the last 10 years, suggesting that current PRS trainees may need to consider a fellowship if they wish to pursue an academic career. Undergoing additional training considerably impacts social and financial decision-making early in surgical training. Although an increase in prevalence of highly specialized surgeons at academic institutions is seen, fellowship training is not correlated with attainment of leadership positions among clinical faculty. Future studies are warranted to evaluate the impact of specialized training on surgical outcomes and personal financial burden.

Assessment of Patient-Reported Urologic Function Outcomes Post Vaginoplasty

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Purpose: As transgender medicine and access to care continues to expand, the number of patients undergoing gender affirming surgery (GAS) continues to rise.1,2 Accompanying this increase has been an emphasis on better understanding the surgical implications/complications of this procedure, which may include abnormal voiding, overactive bladder symptoms, incontinence, and more.3 Previous studies assessing bladder function after GAS utilized institution-specific questionnaires or relied on retrospective provider documented chart information.4,5 The primary objective of the present study was to determine the optimal time post vaginoplasty surgery to administer the AFFIRM survey in order to achieve the most reliable information on postoperative outcomes and complications.

Methods: An AFFIRM-validated survey,3 a multi-institutional patient questionnaire was used to capture the genitourinary (GU) complications following vaginoplasty surgery, and was distributed to patients preoperatively, and then postoperatively at two weeks(n= 111 patients), 6 months(n=61), and 12 months(n=47). Survey questions aimed to assess postoperative changes to urinary frequency, urgency, nature of the urinary stream, urinary leakage (across a variety of contexts), occurrence of urinary tract infection (UTIs), and if/how these changes have impacted quality of life. Responses to the survey were collected for each patient and linear mixed-effect models were performed to assess whether responses significantly differed ($p<0.05$) at various time points.

Results: A total of 309 unique patients were included in the study. Most patients identified as white (74%) and non-Hispanic (69%). Survey responses demonstrated a significant decrease in urologic function before and after vaginoplasty for 7 out of 12 questions. When the 2-week survey response was set as the reference group, 4 out of 14 questions demonstrated significant difference in responses at different postoperative time points. Responses at later time points showed that patients had significantly more normal urine stream rates and less frequency of hematuria and UTIs than at the 2-week post op time point. Only 1 out of 14 questions had significantly different responses at 6 months vs 12 months.

Conclusion: As expected, the survey responses demonstrate a significant difference in preoperative and postoperative bladder function. This finding is consistent with current literature.4,5 However, our study also reveals robust evidence that the AFFIRM survey distributed at the 6-month time point provides a reliable basis for assessing postoperative urologic function.

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Three-Dimensional Surface Analysis for Pre-Operative Prediction of Breast Volume: A Validation Study

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Purpose: Three-dimensional (3D) surface imaging, which can analyze breast surface anatomy, has become popular in preoperative patient education. To date, however, few studies have examined whether preoperative 3D surface scanning and soft tissue analysis can accurately predict breast volume. Reliably predicting breast volume preoperatively can assist with breast reconstruction planning, patient education and peri-operative risk stratification.

Methods: A retrospective review of patients undergoing mastectomy in 2020-2021 was performed and included all patients that had preoperative 3D imaging using Canfield Vectra XT. Volumetric analysis was performed using both Vectra Analysis Mode (VAM) and Vectra Body Sculptor (VBS) by a single individual using standard anatomic breast borders. Breast weight was obtained intraoperatively following mastectomy. Predictive accuracy was defined as VAM weight within 10% of mastectomy weight or within 100g of mastectomy weight. Fischer's exact test and logistic regression were used to identify factors associated with prediction success.

Results: 179 patients (266 breasts) were included in this study. There was no significant difference ($p=0.21$) between the average mastectomy weight of 620.8g (SD=360.3g) and the mean VAM volume of 609.5g (SD=361.9g). The mean VBS weight was 498.9g (SD=337.6), which differed significantly from mastectomy weight ($p<0.001$). When using the 100g metric of predictive accuracy, VAM's accuracy rate was 58.7%, and VBS's accuracy rate was 44.4%. BMI, body surface area, and ptosis grading impacted 3D-imaging breast volume predictions.

Conclusions: 3D surface imaging using Vectra gives a rough estimate of mastectomy weight, though lacks precision. VAM is more accurate than VBS, likely due to its analysis of overall surface topography rather than discrete surface anatomical landmarks and best fit measurements. Discrepancies from mastectomy weight are likely due to differences between surgical mastectomy borders and breast borders used in volumetric analysis. Surgeons should consider the physical characteristics of patients in their analysis of 3D imaging.

Prediction of Post-Operative Complications in Two-Stage Breast Reconstruction: A Machine Learning Approach

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Background: Two-stage breast reconstruction is a common technique used to restore pre-operative appearance in patients undergoing mastectomy. A portion of patients develop

complications after surgery, such as capsular contracture, cellulitis, skin ischemia and necrosis. This may lead to significant discomfort, implant failure and the need for additional revision surgeries. In the clinical setting, a method of outcomes prediction based on easily accessible pre-operative measures could prove useful for risk-stratification and patient decision making. The objective of this study is to build a machine learning model that can evaluate the risk of complications after two-stage breast reconstruction, based on known cardiometabolic measures, demographics information, and clinical/social history typically collected at pre-operative visits.

Methods: A preliminary dataset of 35 women (61 samples) who had undergone either bilateral or unilateral two-stage breast reconstruction after mastectomy was used in the study. The patients had undergone surgery between June 2014 to April 2019 with one plastic surgeon at a tertiary-care facility. 55 attributes associated with each patient, such as demographics, medical history, breast measurements, past therapies, location of tissue expander placement, incision type, and oncologic regimen were recorded. The three separate endpoints of interest are the development of capsular contracture, post-operative infection, and need for revision surgery. Logistic regression, Gaussian Naïve Bayes, Support Vector Machine, K-nearest neighbors, decision tree, and random forest model performances were evaluated based on a 3:1 train/test split. Subsequently, random forest classifier was chosen, and k-fold cross validation was used to assess model prediction of the three adverse outcomes (k=15, 11, 11, respectively).

Results: Among the subjects, 20/61(32.7%) patients developed capsular contracture. 11/61 (18.0%) experienced post-operative infections. 32/61 (52.6%) underwent some form of revision surgery after breast reconstruction. The random forest classifier achieved an accuracy of 77.0% and mean ROC AUC of 0.84 ±0.29 in predicting capsular contracture development. The classifier achieved an accuracy of 85.2% and mean ROC AUC of 0.89 ±0.20 in predicting post-surgical infection. The classifier achieved an accuracy of 77.0% and mean ROC AUC of 0.85 ±0.25 in predicting the need for future revision surgery.

Conclusion: There is potential for the application of machine learning in outcomes prediction after plastics and reconstructive procedures. In patients who are at high risk of developing morbidities and post-surgical complications from implant-based reconstruction, it may be prudent to consider preventative measures such as prophylactic antibiotics, more regular follow-ups, complete capsulectomy at the time of implant placement, or choosing alternative flap-based procedures for reconstruction.

Top-Down Approach to Improving Workforce Diversity in Academic Plastic Surgery

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Introduction: This study performs a cross-sectional analysis of diversity status among academic plastic surgeons and ascertains effects of gender and racial/ethnic diversity at the leadership level.

Methods: A database of currently active, ACGME-accredited faculty was curated. Gender and racial/ethnic designations were deduced; under-represented in medicine (URiM) encompassed black and LatinX faculty. Leadership positions as well as productivity metrics were tabulated.

Results: 949 faculty were identified as overwhelmingly non-URiM (95%) males (79%). Male gender was significantly predictive of achieving chief/chair status ($p=0.036$) and fellowship directorship ($X2=11.893$, $p=0.036$), without any significant associations to residency program directorship or editorial board membership. Four URiM chief/chairs were identified, rendering the dataset underpowered for statistical analysis. Programs led by female chief/chairs employed significantly more female faculty ($t=-2.651$, $p=0.009$), while URiM chief/chairs trend towards significance in recruiting URiMs ($t=-1.839$, $p=0.069$). Male faculty maintained higher number of publications ($t=5.034$, $p<0.001$), citations ($t=3.304$, $p=0.001$), H-index ($t=5.985$, $p<0.001$) and NIH funding ($t=3.103$, $p=0.002$). No differences in productivity were observed between URiM and non-URiM faculty.

Conclusions: Despite profoundly disparate presence of minority faculty, URiM cohorts are equally prolific, and leadership diversity directly correlates with faculty diversity. With a paucity of female and URiM representation, opportunity creation for these groups is a growth area for plastic surgery. This could lead to career advancement for these individuals and, more profoundly, enhance recruitment and retention efforts toward creating a plastic surgery workforce more reflective of the patient population.

Healthcare Workers' Experience with an Artificial Intelligence Virtual Assistant for Plastic Surgery Patients

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Purpose: Artificial intelligence virtual assistants (AIVA) are interactive voice response systems capable of understanding unconstrained speech using machine learning and natural language processing. Despite their use in the healthcare setting,1-3 the implementational aspects of these AIVAs are seldom studied. We created an AIVA capable of answering ten of the most frequently asked questions (FAQs) by Plastic Surgery patients regarding their procedure.4 We describe the results of an implementation-focused survey conducted on healthcare workers (HCWs) at our institution regarding the acceptability, adoption, and feasibility of the AIVA.

Methods: The HCWs were instructed on the topics the AIVA could answer and were then provided with a phone to call an office number linked to the AIVA. Once the HCWs had used the AIVA, they answered the survey. The survey consisted of 13 questions and was conducted on 17 HCWs from our institution's Division of Plastic Surgery. It was answered using a 5-point Likert scale model ranging from "Completely Agree" to "Completely Disagree." For analytical purposes, the positive items in the scale were merged into "Agree," and the negative items were combined into "Disagree." The remaining item was defined as "Neutral." Descriptive statistics were performed using R version 4.1.2.

Results: All the HCWs were Nurse Practitioners or Physician Assistants. The average age was 40.1±12.07 (Min. 24, Max. 60). There were 15 female (88.24%) and two male (11.76%). Out of 17 surveys, 15 were complete (88.24%). All interviewees agreed that this AIVA would be useful for patients. Individually, more than 75% of HCWs agreed that the AIVA could positively impact their work time (88.23%) and workflow (76.47%), be useful for appointment scheduling (88.24%), and serve to answer pre- (100%) and postoperative questions (94.12%). Furthermore, between 50% and 75% of HCWs thought the AIVA could positively impact their workload (70.58%), allow them to spend better time with patients (70.58%), work more efficiently (64.71%), and spend more time with new patients rather than follow-ups (52.94%). Only 17.65% thought it would bring more revenue to the institution. Lastly, 76.47% of HCWs considered that an AIVA would be necessary within the next ten years, and 81.25% considered this an environmentally friendly technology.

Conclusion: These results suggest that HCWs in direct contact with patients consider that implementing an AIVA to answer FAQs would help improve their work environment and benefit patients pre- and postoperatively.

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Investigating How the Plastic and Reconstructive Surgery Core Surgical Curriculum Supplements Gaps in Current Residency Training

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Background: Surgical skill workshops and cadaver labs have been shown to be valuable adjuncts to surgical residency education. The Plastic and Reconstructive Surgery Core Surgical Curriculum (PRSCSC) was developed and implemented into our plastic surgery residency education curriculum. This study evaluates how the Plastic and Reconstructive Surgery Core Surgical Curriculum (PRSCSC) impacts residents' perceptions of their skill levels, supplements gaps in current PRS residency education, and effectively augments residency training.

Methods: The PRSCSC is a repeating two-year surgical skills lab curriculum that consists of one-hour instructional didactics followed by 3 hours of hands-on skill-building of non-invasive aesthetic procedures, microsurgery, and cadaver dissections. Residents are provided pre-session resources and didactics before each session. Plastic surgery residents are grouped in small groups of 2 to 6. Junior residents include PGY 1-4. Senior residents include PGY 5-7.

This is a mixed-methods survey study. PRS residents were surveyed before and after five PRSCSC sessions from August 2021 to December 2021 regarding their confidence in performing specific procedures and perceptions of the PRSCSC.

Results: 71% of residents completed all anonymous PRSCSC session surveys stratified by PGY level. Before the session, all residents had more confidence in performing reconstructive surgery than non-invasive aesthetic procedures ($p<0.001$). On average, junior residents felt less confident on all procedures compared to senior residents before each session. Junior residents felt the least confident in microsurgery ($p<0.00001$), whereas senior residents felt the most confident in microsurgery ($p=0.049$).

All residents increased their confidence by the end of aesthetic and reconstructive sessions ($p=<0.01$). When responses are analyzed by junior and senior resident levels, all sessions showed significant increases in confidence scores ($p<0.01$), except for the microsurgery session for senior residents ($p=0.6$).

When asked what the residents enjoyed about each session, they specifically noted the hands-on practice, faculty guidance, and pre-session preparation materials ($p=0.04$). Most residents (90%) learned a large or extreme amount from each session. All residents believed the PRSCSC sessions are important to their education and should continue. All agreed that the sessions had exceeded their expectations.

Conclusion: PRSCSC sessions are effective in increasing residents' confidence in performing surgical tasks and supplementing gaps in residency training by increasing exposure to complex and less common procedures earlier in residency. Given that aesthetic procedures are often less commonly encountered in most PRS residencies, this curriculum allows trainees to improve their non-invasive aesthetic skills in a low stake, supervised environment. Similarly, junior residents are provided earlier opportunities to practice complex operations. When asked for session feedback, junior residents requested for more junior-resident level tasks, prompting us to consider designing future labs at appropriate skill level that address resident needs by PGY level. The PRSCSC is a valuable adjunct that not only supplements gaps in residency education, but also enhances surgical training in the future.

Use of A Three-Dimensional Volumetric Analysis to Monitor Acute Rejection in a Face Transplant Patient

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Purpose: Allograft rejection is a common complication in facial transplant (FT) patients. The invasive nature of histopathological evaluation, along with controversy regarding the validity of the Banff criteria in vascularized composite allotransplantation (VCA), has led to a greater emphasis on the development of novel non-invasive monitoring techniques. Facial edema is one of the main clinical manifestations of acute FT rejection, but this finding remains highly

subjective. Hence, the purpose of our study is to analyze 3D facial images to measure edema progression during an episode of acute allograft rejection in a FT patient.

Methods: Our patient is a 23-year-old male who underwent a face and double hand allotransplantation in August 2020. The Vectra H1 (Canfield, Fairfield, NJ) portable scanner was used to capture 3D facial images at eight time points throughout a FT rejection episode. The 3D facial scans were analyzed with the Vectra Canfield Analysis Module Software (Canfield, Fairfield, NJ) using a rejection free 3D image [post-operative day (POD) 539] as the baseline against which all other images were compared. The software quantifies volumetric changes between 3D facial images by superimposing them using artificial intelligence. We analyzed five areas of the face: right and left periocular region, right and left inferior third of the face, and submandibular region.

Results: By comparing each time point against the rejection-free baseline (POD 539), we were able to quantify a trend in facial edema that agreed with the clinical evaluation that leads to decisions related to patient hospitalization and treatment (Figures 1 and 2). A positive trend in facial soft tissue volume was noted before a formal diagnosis of acute rejection was made, reaching maximum total edema of +156.94cc. The patient was hospitalized and treated with sessions of plasmapheresis with IVIG and thymoglobulin infusions. A 3D facial image taken two weeks after treatment completion demonstrated an expressive total edema reduction of 128.74cc (from +156.94cc to +28.2cc). The following 3D facial image, taken two weeks later, demonstrated an abrupt increase in edema. He was hospitalized once again and treated with Solumedrol for three days. The latest 3D facial image, taken about 11 weeks thereafter, demonstrated an additional total edema reduction of 58.12cc.

Conclusion: This study demonstrates the feasibility of analyzing 3D facial images to quantify volumetric changes of the facial allograft over time. The 3D volumetric analysis detected volumetric changes consistent with acute FT rejection followed by clinical improvement after treatment. This technology shows promise in providing a longitudinal baseline of facial volume in FT patients and, therefore, may serve as a useful tool for VCA rejection monitoring.

Characterizing the Landscape of Childcare Benefits in PRS Integrated Residency Programs

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Background: In the realm of resident support, the topic of having and raising children has gained a renewed interest. It has been demonstrated that female surgeons face higher rates of infertility and pregnancy complications than the general public.1 Furthermore, when asked about making the decision to delay childbearing in residency, residents often cite lack of access to childcare as a main contributing factor in their decision.2,3 This finding is exacerbated by the fact that if such barriers were lessened in residency, many residents would change their decisions to delay childbearing.2,3 Given this information, this study seeks to better understand the current landscape in PRS resident support for childcare availability and funding.

Methods: We used the Residency Explorer Tool, an online database, to collect childcare benefits data for all available plastic and reconstructive integrated residency programs in the United States. For those institutions that indicated childcare support on the Residency Explorer Tool, additional data on specific benefit variables were extracted via surveying program websites and administrators individually. Descriptive statistics were run using SPSS Statistical Software.

Results: Across PRS programs, 33% endorsed on-site childcare, and 17% advertised subsidized childcare. 57% of 'on-site' childcare centers were physically inside the hospital, while 14% were on the hospital campus, and 29% were 'near' the hospital campus. All childcare centers were only open Monday through Friday and averaged operating hours between 7AM and 6PM. Average childcare capacity was 153 children, with a range of 106 to 210. One program had 6 on-site child care centers, while several programs had contracts with multiple local childcare centers but no on-site centers. The average accepted age range was 6 weeks to 5 years. Most programs had restricted enrollment periods of spring for the fall semester. All childcares were available to all hospital employees without priority registration for residents.

Average monthly costs ranged from $990 to $2742. Among those programs that offered subsidies, none offered guaranteed fixed benefits. 43% of such programs cited Dependent Care FSAs in a maximum dollar amount of $5,000, while others referenced child care vouchers residents could apply for, although salary requirements typically excluded residents from qualifying.

Conclusions: Enhanced resident support in the realm of childcare is critical to addressing multiple issues related to resident well-being, including burnout, fertility, and overall health and success for women and men. The presence of childcare support is woefully low across programs nationally, and for those that do offer support, often it is of limited availability with long waitlists or of limited hours. It is critical that institutions recognize the need for resident support in the realm of childcare and work towards sustainable and available programs.

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Characteristics and Limitations of Histological Observation Using the Updated Video-Capillaroscopy for Donor- and Recipient-Site Evaluation in Microvascular Reconstructive Surgery

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Purpose: With microsurgery, surgeons can transfer numerous flaps from several donor sites to virtually any anatomical unit requiring tissue restoration. Intraoperatively, indocyanine green (ICG), ultrasonography, and handheld doppler can be used to assess blood flow at the donor- and recipient-site. However, ICG angiography is invasive and requires contrast agent administration, ultrasound is operator-dependent and bone tissue may generate artifacts, and handheld doppler may pick up emitted sounds from surrounding vessels. We have previously successfully captured real-time blood flow in 1-mm superficial layer of flaps using video-capillaroscopy. In this study, we used the advanced version of video-capillaroscopy device to observe different tissue components involved in reconstructive microvascular surgery. Additionally, we report the characteristics of the findings and the conditions limiting the use of video-capillaroscopy.

Methods: Seven patients (4 males and 3 females) between the ages of 54 and 76 years underwent head and neck microvascular oncologic reconstruction from November 2021 to February 2022. Two rectus abdominis muscle flaps and five anterolateral thigh flaps were transferred. The donor- and recipient-site observation points were performed in four evenly divided areas (quartiles), and the central area was observed with video-capillaroscopy.

At the donor-site (flap), the muscle, fascia, skin surface, adipose tissue, and de-epithelialized skin were observed for each patient before pedicle vessels transection. Perforating branches were observed at the junction of blood vessels and fascia at a total of 25 locations for 7 patients (mean: 3.57). In the recipient site, the cervical skin, mandibular periosteum, sternocleidomastoid muscle,

and cervical adipose tissue were observed. Blood flow was defined as clearly observing the movement of red blood cells. A four-point evaluation scale was used to determine blood flow on video-capillaroscopy. Zero points were given if blood flow was not observed. One, two, three, and four points were given if blood flow was observed in <25%, 25-50%, 50-75%, >75% of the observed area, respectively. Papaverine hydrochloride was used to prevent perforator spasm. GOKO-BscanZD was used for video-capillaroscopy.

Results: The mean score at the donor-site was ≤1 points for muscle, fascia, and de-epithelialized skin; and >3 points for other donor-sites. The mean scores at the recipient-site were 0 for muscle, 2.1 for bone periosteum, 2.7 for skin papillary, and 3.6 for adipose tissue. In the skin papillary region, video-capillaroscopy near to skin incisions was not possible. Muscles and fascia were very difficult to observe due to poor LED penetration. De-epithelialized skin was very difficult to evaluate due to damage within 1-mm depth from the surface. Blood flow could be observed over the periosteum in areas where no surface injury was evident.

Conclusion: Video-capillaroscopy is a portable, non-invasive imaging modality that can be used to observe tissues at a depth of 1-mm and can be easily used intraoperatively. In this study, we found that video-capillaroscopy was difficult to observe blood flow in muscles and injured areas within 1-mm depth. However, the observation of blood vessels in adipose tissue showed good results, and video-capillaroscopy may be useful as an option to evaluate blood flow in donor- and recipient-sites during surgery.

Development of a Scalp Radiation Dermatitis Model in Mice

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Purpose: Radiation dermatitis (RD) affects up to 85% of patients after radiotherapy for central nervous system or skin neoplasms.1 RD is characterized by erythema, desquamation, necrosis, fibrosis, ulcers, and bleeding.2 The chronicity of the lesions, particularly ulcers, negatively impacts the patient's quality of life and requires complex surgical management.3,4 Existing

models do not assess scalp RD.5 We aimed to characterize a reproducible model of scalp RD in mice.

Methods: Twenty C57BL/6 mice received an x-ray dose of 60 Gy using a 5-mm collimator to a scalp area between the coronal and lambdoid sutures. Mice were followed for 44 days after irradiation and photographed on ten endpoints, with two mice euthanized per endpoint. Scalp tissue was collected immediately after euthanasia. The photographs were analyzed for erythema, desquamation, and ulceration using ImageJ (National Institutes of Health, United States). Slides were stained with H&E, Masson's trichrome, and immunohistochemistry for CD31 to analyze epidermal thickness, dermal thickness, total skin thickness (TST), fibrosis, and vascularity using ImageScope (Leica Biosystems, Germany) and ImageJ. Welch's t-tests were performed to compare the variables' means per endpoint using R version 4.1.2.

Results: Erythema appeared on day one and peaked on day 15 (0.17 vs. 0.23 cm2, $p<0.05$) to progressively disappear by day 37, lasting approximately one month. Desquamation appeared on day 11 and peaked on day 19 (0.081 vs. 0.121 cm2, $p>0.05$) to progressively disappear by day 37, lasting approximately three weeks. Most ulcers appeared on day 15 and peaked on day 19 (0.024 vs. 0.025 cm2, $p>0.05$) to disappear by day 23, lasting approximately ten days. The dermal thickness peaked on day 21 (121 vs. 240 μm, $p<0.01$), while the epidermal thickness (13.11 vs. 170.31 μm, $p<0.01$) and TST (133 vs. 373.2 μm, $p<0.01$) peaked on day 23. By day 44, none of the layers had reached their basal thicknesses (epidermis: 13.11 vs. 48.72 μm, $p<0.01$; dermis: 121.29 vs. 136.49 μm, $p<0.05$; TST 133.11 vs. 175.73 μm, $p<0.01$). Dermal fibrosis peaked on day 19 (11% vs. 50%), decreasing to 4.5% on day 44. The average vessel area and average diameter did not change significantly over time.

Conclusion: Animals developed progressive erythema and desquamation lasting approximately one month after irradiation. The ulcerative area remains stable for approximately ten days. There is a significant thickening of the skin layers, particularly the epidermis. There is a progressive increase in dermal fibrosis that drops below basal measurements after one month, with no changes in vascularity.

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Autonomic Responses Used to Measure Postoperative Pain Intensity: A Systematic Review

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Purpose: Current pain scoring systems are being replaced by sensor-derived physiological parameters that use live, objective quantification of pain intensity.1 However, evidence supporting their use in postoperative patients is scarce.2-5 This review aimed to analyze the correlation between physiological parameters and self-reported pain intensity in the postoperative period.

Methods: PubMed/Medline, Embase, Scopus, and Google Scholar were inquired on August 11th, 2021, following the PRISMA guidelines for studies evaluating physiological parameters responding to autonomic changes in the assessment of postoperative pain in the post-anesthesia care unit (PACU) and measuring the correlation between these and pain intensity. The keywords used were related to heart rate variability, plethysmography, electrodermal activity, pupillary reflexes, postoperative pain, and pain measurement. Data extracted consisted in the number of patients, study groups, age, type of surgery, use of drugs influencing the sympathetic nervous system, anesthesia and analgesia regimens, physiologic variable or index used, device used to measure the variable, pain scoring system, area under the curve for the variable, sensitivity and specificity of the variable, and correlation coefficient between the variable and the pain scoring system.

Results: Out of 3,204 studies, 23 fulfilled the eligibility criteria. Photoplethysmography features and indices had the strongest correlations with pain scoring systems, with correlation coefficients of 0.738 and 0.778 for the ratio of alternating current and direct current, and perfusion index in obese patients, respectively. The highest area under the curve was that of the variant coefficient of pupillary diameter, with a value of 0.92 (95% CI 0.89-0.95). The variant coefficient of pupillary diameter and the analgesia nociception index had the highest sensitivity (92% with a cut-off point of 6.42 for the first, 92% with a cut-off point of 48 for the second), while the pupillary light reflex amplitude had the highest specificity (87% with a cut-off point of 37%).

Conclusion: Photoplethysmography and pupillary features are promising candidates for the objective assessment of postoperative pain. Studying these variables and the addition of machine

learning algorithms for feature extraction will provide supporting data for their translation into the clinical setting.

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Poly(D-Glucosamine) Deacetylated Chitin-Based Wound Dressing Modulates the Inflammatory and Immune Response in Skin Injuries

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Background: Wound healing is a complex process comprised of several distinct phases. An imbalance in any of the stages creates a chronic wound with the potential to cause life-threatening complications for patients. Chitosan is a biopolymer that has demonstrated a positive impact on the different healing phases. This systematic review aimed to evaluate the anti-

inflammatory and immunomodulatory properties of chitosan-based wound therapy for the skin healing process after an injury.

Methods: A systematic review was conducted in November 2021 following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The PubMed, Embase, Google Scholar, and Cochrane online databases were queried to capture all publications in the last ten years that investigated the chitosan effects on inflammation and immune reaction.

Results: A total of 234 studies were screened after removing duplicates, and fourteen articles fulfilled our inclusion and exclusion criteria. In the studies, chitosan was combined with a wide range of products. One clinical trial was found that treated patients with diabetic foot ulcers. All animal models in the studies used a full-thickness skin wound to test the effectiveness of chitosan in the healing process. Decreased pro-inflammatory cytokine levels, a shortened inflammatory phase, and accelerated wound closure were observed in all of the studies.
Conclusions: Chitosan proved to be a feasible, versatile, and multifaceted biomaterial that enhances the biological response to a skin injury. When combined with other products, its potential to boost the healing process through regulation of the inflammatory and cellular activity is increased.

Keywords: deacetylated chitin, biocompatible materials, tissue engineering, wound healing, inflammation, skin regeneration

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Bone Tissue Engineering Strategies for Alveolar Cleft: Review of Preclinical Results and Guidelines for Future Studies

Abstract Presenting Author:
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Purpose: Current standard of care for alveolar bone graft is autogenous bone graft, typically from the iliac crest. Given some of the limitations of alveolar bone graft surgery such as donor site morbidity, graft failure, and need for secondary surgery, there has been growing interest in applying regenerative medicine strategies to alveolar bone graft. Although the field of bone tissue engineering is rapidly advancing, alveolar cleft reconstruction has unique requirements of vascularized bone: support of mastication forces, tooth eruption, orthodontic translation, and implant osteointegration. This study reviews all large animal studies implementing tissue engineering constructs in maxillary or mandibular reconstruction to assess whether current research sufficiently addresses the functional needs specific to alveolar cleft.

Methods: A literature review was performed in PubMed and Google Scholar using iterations of keywords for "bone tissue engineering," "maxillary defect," "mandibular defect," and "bone regeneration" to identify large animal studies using a maxillary or mandibular defect model to assess bone regeneration strategies. All large animal studies which incorporated any combination of scaffold, stem cell, or osteogenic agent as therapeutics were included in this study. Publication characteristics including animal model, defect model, length of observation, scaffold use, stem cell use, osteogenic agent use, methods of analyses, and reported percent bone growth were included in this study.

Results: Thirty-seven studies using rabbit, dog, goat, pig, or non-human primate models were included in our review. The majority of studies used autologous bone marrow stem cells seeded onto a hydroxyapatite scaffold in the mandible of facially mature animals. Alternate stem cell sources used included adipose, dental pulp, periosteal, and umbilical tissue. Alternate scaffolds included collagen, platelet rich plasma, or custom bio ceramic scaffolds. Most studies found increased bone growth in the stem cell treatment group compared to scaffold-only control, but results were mixed compared to autologous bone graft control. Most studies concluded observation at 3-6 months, and most did not report full regeneration of the bony defect. Reported bone growth in treatment groups ranged from 30 – 90%. Six studies incorporated mucosal healing around the defect prior to scaffold implantation. Three studies evaluated long term criteria of strength and elastic modulus of bone. Two studies introduced tooth movement via orthodontics or rapid maxillary expansion.

Conclusion: Although there are promising results of bone regeneration in large animal models of maxillary/mandibular defects, the heterogeneity of study design, limited length of follow up, and lack of positive bone graft controls limit comparison of efficacy across studies. There are few to no studies assessing alveolar reconstruction in facially immature animal models, orthodontic translation of teeth into generated bone, placement of osteointegrated implants, or support of tooth eruption. Future studies should incorporate alveolar cleft specific study design to better test the functional requirements of regenerated alveolar bone.

Patient-Specific, 3D-Printed Models for Craniofacial Trauma: A New Application for Virtual Reality Surgical Planning

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Purpose: Facial fractures, particularly of the mandible and skeletal midface frequently require surgical intervention with an open reduction and internal fixation. Manual contouring of fixation plates and bone grafts can be time consuming and rely heavily on direct visualization and surgeon expertise. 3D-printed models can serve as physical references of the desired reduction and allow for patient- specific contouring of fixation plates and bone grafts in an efficient manner. However, due to the complex nature of many computers aided design software's significant collaboration with remote engineers for the construction of surgical plans and 3D models is required. Virtual reality (VR) surgical planning allows for rapid reduction of fractures, construction of virtual plans, and fabrication of 3D anatomical models by the surgeon. This study explores the application of VR planning for intraoperative customization of plates and autologous bone grafts in the setting of craniofacial trauma.

Methods: Six patients presenting with acute facial trauma, including 1 fracture of the nasoorbitoethmoidal complex, 1 of the zygomaticomaxillary complex, 1 of the maxilla and frontal bone, and 3 mandibular fractures, received preoperative planning with Immersive Touch ® Virtual Reality Software. The preoperative CT dataset was loaded into the VR planning software where the virtual reduction was performed by the surgeon and subsequently 3D printed with a biocompatible resin. The models were sterilized and used perioperatively for either contouring patient-specific titanium fixation plates or autologous bone grafts. When post-operative CT scans were available, the post-operative anatomy was compared to the VR plan using a minimum of 10 landmarks on the fractured segments in Mimics Medical (Materialise Co, Belgium).

Results: On average it took the surgeon 6.5 minutes to segment and reduce the fractures in the VR environment. It took approximately 3 hours to 3D-print the mandible models, and 5 hours to 3D-print each midface model. Plate contouring using the 3D-printed models as guides took on average 12 minutes and shaping of the autologous bone grafts took approximately 8 minutes on average. The average difference between the post op CT and the VR surgical plan at 10

landmarks was 1.25 ± 0.80 mm in the transverse plane, 1.35 ± 1.04 mm in the sagittal plane and 1.71 ± 0.53 mm in the coronal plane.

Conclusion: Contouring fixation plates to anatomical models is a cost and time efficient means of plate customization and execution of virtual reduction plans. VR surgical planning by the surgeon streamlines the production of patient- specific models, allowing for a broader application to time sensitive craniofacial trauma. A tangible and unobstructed model of the residual bony defects following optimal fracture reduction allows for efficacious planning and rapid shaping of bone grafts and are especially successful when the surgeon is the one creating the models. We anticipate the minimal pre-operative lead time for preparation of the models will decrease with continued optimization of this workflow.

Surgical Pearls Abstracts

Adult Sternotomy Closure with Anterior, Absorbable Polydioxanone Sutures (PDS)

Abstract Presenting Author:
John Gatti MD

Summary: Sternal dehiscence remains an infrequent though consistent complication of cardiac surgery. Reconstruction requires hardware removal, debridement and often a difficult dissection beneath the sternum to re-apply wires for closure. PDS are appropriate for sternal closure in children, but surgeons have not reported success in adults. An experience of sternotomy closure with superficial absorbable sutures placed across the sternotomy in adults is reported.

Methods: Adult patients who underwent sternal reconstruction subsequent to cardiac surgery dehiscence had their intact bony sternotomy approximated with absorbable PDS. Large caliber, (#1 or #2 PDS) were utilized as multiple, 'horizontal mattress' sutures placed 5 to 8 cm from the sternal edge directly through the anterior ribs superficially along the length of the sternotomy (Figure I). Access beneath the sternum or ribs was not required for suture placement. All patients had the sternal repair covered with bilateral pectoralis muscle flaps and direct skin closure. The pectoralis muscles were left attached to the rectus facsia inferiorly and the units were slid medially and sutured together to cover the sternal repair. The PDS bone approximation was not utilized in situations where significant sternal necrosis and bone loss were present.

Results: Nine patients over a seven-year period underwent sternal repair with PDS sutures as part of their sternal reconstruction after experiencing post-cardiac dehiscence without bone necrosis. All patients maintained a stable sternal repair, healed without complication and bony fusion across the sternotomy occurred. No re-operations were required with these patients.

Discussion: Metal wire re-approximation of the sternum after dehiscence can be difficult and perilous. Adult sternotomy closure utilizing large polydioxanone, superficial sutures is a reliable, simple technique to obtain a stable, secure sternum.

Preservation and Hybrid Rhinoplasty with Push-Up and Extended Push-Up Procedures for Enhanced Aesthetic Outcomes

Abstract Presenting Author:
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Summary: Concept of primary preservation rhinoplasty and its recent advancement in various forms of hybrid rhinoplasty offer improved, more natural aesthetic outcomes with reduced risk of serious complications requiring subsequent skeletal reconstruction with costal cartilage graft. In principle, preservation rhinoplasty composes of dorsal preservation with avoiding an open roof, alar cartilages preservation by their modifications with sutures and minimal excision, and intact skin elevation by subperichondrial-subperiosteal dissection plane. For dorsum reduction, natural dorsum preservation perceived as priority requires in turn extensive maneuvers of the whole surrounding skeletal system, utilized usually as 'push-down' or 'let-down' techniques. In turn, secondary rhinoplasty with costal cartilage graft, the most complex reconstructive nasal procedure, is usually indicated for serious functional or aesthetic complications following primary rhinoplasty. Here, costal cartilage used for dorsal augmentation can result in palpable irregularities requiring further layered facia and chondral camouflaging, with additional morbidity. Therefore, implementation of the selected dorsal preservation techniques from primary rhinoplasty in reverse manner to secondary procedures would conceptually improve predictability of the latter complex cases. However, preservation is seemingly contradictory concept to reconstruction. The aim of the study is to describe a 'push-up' preservation technique for improved aesthetic outcomes of nasal dorsum in secondary rhinoplasty with costal cartilage graft.

Results: 'Push-up' technique begins with meticulous release of the dorsum in subperichondrial-subperiosteal dissection plane to maintain the keystone area in continuity. Component separation detaches transverse limbs of the dorsal septum (T-shaped dorsal portion of the septum) from the medial edges of the upper lateral cartilages. Extended spreader grafts from costal cartilage, placed about 1mm below the 'septal T', restore the internal valve patency and control the nasal length. Strut graft attached to anterior nasal spine and to anterior edge of the extended spreader grafts augments the nasal dorsum in controlled manner as a L-shaped component. Finally, continuity between septal T and upper lateral cartilages is restored with sutures. In many patients requiring secondary rhinoplasty, 'push-up' technique can be utilized with intact keystone area as a prerequisite, even in saddle nose with no previous component hump reduction. The long-term results of the consecutive series of three patients are presented with 1 year of follow-up. In all patients, significantly improved nasal function was obtained together with pleasing aesthetic

outcome of the naturally augmented, smooth dorsum with no palpable irregularities. The overall patient satisfaction rate was very high.

Conclusion: In conclusion, 'push-up' technique can act as a new surgical alternative in secondary rhinoplasty with costal cartilage for improved and highly predictable aesthetic outcomes of nasal dorsum with decreased morbidity.

Preventing Revisional Procedures in Aesthetic Female Genital Surgery

Abstract Presenting Author:
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Abstract Co-Author(s):
Christine Hamori MD

Summary: Over the last decade there has been 600 percent increase in labiaplasty, and clitoral hood procedures performed by plastic surgeons.1 This trend has resulted in an increase in referrals for revisional surgery. Although there is abundant literature available on motivation for labiaplasty, techniques and complications, little information is available regarding the avoidance of revisional surgery including complications.

The senior author (CH) has performed over 600 labiaplasty procedures since 1998. She is a referral source for surgeons regarding complications and patients with postoperative aesthetic concerns. Over this time frame she has developed an effective algorithm to decrease revisional labial surgery.

Preoperative assessment and planning:
• Understanding patient specific concerns and expectations2
• Examination of the entire vulva – educate patient on anatomy and asymmetries3
• Discussion of surgical plan and potential complications

Intraoperative management pearls:
• Double fold
• Submucosa
• Layered closure
• Labial edge
• Tissue resection
• Frenulum
• Clitoral hood
• Anterior labial fold
• Posterior fourchette
• Anal skin tags

Conclusion: Addressing patients' expectations, precise preoperative planning and intraoperative reevaluation may lead to a reduction in labiaplasty revision rate with the end goal of improving overall patient satisfaction.

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Outcomes of Liposuction to Improve Vascular Access in Hemodialysis Patients with Arteriovenous Fistula

Abstract Presenting Author:
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Background: Arteriovenous fistulas (AVF) are indispensable in the care of patients with end-stage renal disease (ESRD) requiring hemodialysis (HD). Obesity is a common comorbidity in HD patients often making AVF cannulation technically challenging. Liposuction may be performed for superficialization of the AVF without the need for an open superficialization procedure. The aim of this study is to evaluate outcomes of liposuction to improve AVF access for hemodialysis.

Methods: A retrospective chart review of patients who underwent liposuction over AVF at our institution between January 2000 to September 2021 was performed. Data was collected on demographics, medical comorbidities, fistula site and depth, diameter and flow, operative details, surgical complications, and follow-up.

Results: There were 19-patients that were referred by the hemodialysis Clinic for liposuction. The mean age was 55.5 and Mean BMI was 39.5. Either liposuction alone or minimal access direct lipectomy was performed to superficialize AVF. All procedures were performed secondarily, after prior creation of the AVF. Of the 19 patients, 18 had upper AVF and one patient had a lower extremity AVF graft. Twelve patients (63%) proceeded to HD after 1 liposuction. Mean time-to-cannulation for these patients was 52.1 days. Two patients required

additional liposuction and 1 required AVF intervention after first liposuction attempt before achieving successful cannulation. Four patients (21%) had unsuccessful cannulation despite additional liposuction or AVF interventions due to AVF stenosis or thrombosis. Overall, 15 (79%) of 19 patients successfully proceeded to dialysis in the same extremity. Access mean depth decreased from 1.75 cm pre-liposuction to 0.93 cm post-liposuction. Mean volume of fat removed was 92.3 cc. Of 16 patients with prior dialysis catheters, 11 were eventually removed post-surgery once the vascular site was accessible. BMI correlated positively with days to first successful cannulation ($r=0.5881$, $p <0.05$). Surgical complications included 2 cases of cellulitis treated with oral antibiotics. Mean follow-up time was 38.3 months.

Conclusion: Liposuction or limited incision lipectomy can be performed safely in obese patients requiring hemodialysis and was successful in improved AVF access in 79% of the 19 patients' studies in our cohort. Larger studies are needed to compare outcomes of this technique with open superficialization.

Micrographic Surgery for The Plastic Surgeon - A Superior Technique for the Treatment of Malignant Tumors

Abstract Presenting Author:
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Summary: Micrographic surgery is a method in which the complete surgical margin is evaluated for the presence of pathological changes as opposed to standard surgical procedures, in which this critical information is extrapolated from representative margins. Review of the literature reveals dramatically (3 to > 20 times) lower local recurrence rates, with the greatest treatment advantage being realized in those tumors which have the least predictable and most aggressive growth patterns including certain malignant melanomas.

Besides a brief overview of the current literature, the authors describe and illustrate in this presentation in detail a novel, practical, and mature surgical technique and the associated tissue management which allows both, staging as well as complete margin evaluation of malignant tumors, while using only readily available local resources. Using this method will allow any skilled surgeon to obtain results and ultra-low recurrence rates previously achieved only by experienced Mohs surgeons.

A Novel and Long-Lasting Technique for Reduction of the Nipple and Areola for Gender-Affirming Mastectomy

Abstract Presenting Author:
Keith Sweitzer

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Jose Christiano MD, FACS

Background: After the 2015 Medicare Appeals Council issued a decision requiring Medicare to pay for gender confirming mastectomy, a great deal of literature has surfaced pertaining to the proper placement of the nipple/areolar complex (NAC) following female to male gender affirming mastectomy. However, very little discussion of surgical techniques for nipple reduction distinct from the areola itself exist, which we believe to be a cosmetically important area to be addressed in gender affirming surgery. We present a step by step and easily reproducible approach to a novel technique for nipple reduction for double incision mastectomy with free nipple grafting.

Surgical Approach: We present in detail our surgical technique including step by step pictures along with video.

Conclusions: We present our technique for nipple reduction in gender affirming mastectomy along with long term follow up results showing excellent cosmetic outcomes up to 2 years following surgery.

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Targeted NAC Reinnervation (TNR) with Nerve Fascicle Split in Implant Based Breast Reconstruction

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Background: Breast neurotization after implant- based reconstruction has been shown to result in similar pre- and postoperative breast and NAC sensation in 67% of patients (1). Apart from sensory recovery, breast reinnervation has great potential to avoid chronic post- mastectomy pain known as "post- mastectomy pain syndrome" (PMPS), which has been shown to occur in 25-60% of women after mastectomy (2). Despite promising pilot study results, widespread adoption of neurotization of immediate implant-based reconstructions has not occurred. For surgeons interested in adopting breast reinnervation techniques, we present ways to overcome initial barriers by decreasing operative time and maximizing chances of sensory recovery utilizing Targeted NAC Reinnervation (TNR) with nerve fascicle split.

Methods: TNR differs from previously described reinnervation techniques in several aspects: 1) the donor axon count is maximized by preserving the 3rd to 5th lateral cutaneous nerves for anastomosis to the NAC 2) the reinnervation approach varies and is based on patient anatomy 3) the distal graft or donor nerve is split into fascicles to increase the reinnervation zone and 4) the split fascicles are coapted to dermal sensory units if free nerve endings are not available.

Results: Our initial sensory recovery results are promising with positive Tinel sign in all neurotized breasts at five months postoperatively. Detailed preoperative and postoperative Semmes Weinstein Filament sensory exam data will be available for PSTM 2022.
Conclusions: Breast reinnervation following mastectomy and implant-based breast reconstruction is a new development with potential to improve sensation of the breast. Initial barriers can be overcome by shortening operative time and providing an individualized reinnervation approach that aims to increase the chance of meaningful sensation.

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Combined Peri-operative Sclerotherapy and Surgical Excision of Upper and Lower Extremity Venous Vascular Malformations: Representative Case Series and Review of the Literature

Abstract Presenting Author:
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Background: Venous vascular malformations (VVMs) are the most common type of congenital vascular malformation. They present at birth and grow proportionally with the child. Treatment options include direct excision, sclerotherapy, and combined approaches. While some patients may prefer a "less invasive" injection over surgical excision, a review of efficacy of the combined approaches may provide further insight into treatment decision making.

Methods: A retrospective review was conducted to assess the outcomes of 18 patients who received peri-operative STS sclerotherapy two hours before direct surgical excision to treat their upper or lower extremity VVM between January 2017 and January 2021. Demographic information and past treatment history were obtained through electronic medical record review. A minimum follows up time of six months was required for inclusion. Data collection also included: size of the VVM, degree of symptom relief post-surgery, recovery time, complications, number of treatments necessary, length of hospital stay, and time to VVM induced symptom recurrence. Furthermore, a review of the peri-operative sclerotherapy literature is conducted.

Results: 18 patients (six male, 12 female) underwent combined peri-operative sclerotherapy and surgical excision between 2017 and 2021. The mean age of the cohort was 15 years (range: 6 months–65 years). Six (33%) patients had upper limb involvement, and 12 (67%) had lower limb involvement. Six of the patients (33%) had VVMs 4cm or larger (mean: 6.0cm), and 12 patients had VVMs smaller than 4cm (mean: 3.0cm). Average length of follow up was 24 months. 14/18 patients left the hospital on the same day while four patients stayed one night for pain monitoring. Two minor complications were seen: one case of dehiscence with a small white necrotic eschar and one case of macerated skin with mild cellulitis. Ten patients experienced

complete symptom resolution after combined surgical therapy. Of the five patients who experienced partial symptom resolution, three received PDL laser touch-ups after combined therapy; complete resolution was obtained in two of these three patients with no additional complications. The complete symptom resolution was shown to be stable at two years post-operation, further cementing the long-term success from reaching a complete asymptomatic status after treatment.

Conclusion: While there is some indication both for the use of sclerotherapy alone and for use of surgery alone, surgical excision with peri-operative sclerotherapy may be more effective than repeated sclerotherapy injections for achieving asymptomatic status in upper and lower extremity VVMs; this combined approach offers a singular treatment event with one recovery period, less required hospital visits and an overall shorter recovery time, while maintaining low complication rates.

Novel Surgical Technique for Thumb Metacarpophalangeal Joint Arthrodesis in a Female Patient with Severe Rheumatoid Arthritis

Abstract Presenting Author:
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Purpose: Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune condition that symmetrically affects small joints of the hand, including the thumb metacarpophalangeal(MCP) joint2. For patients with rheumatoid or osteoarthritis of the thumb MCP joint, arthrodesis can be an effective treatment to address pain and instability. Patients with severe RA, however, generally have poor bone quality, which is associated with greater risk of metacarpal head fracture, suboptimal hardware fixation, and bony nonunion5. We present a simple-to-perform modification of the tension-wire approach using miniplates to load compression across the arthrodesis site. In doing so, the quality of available bone is less important to the success of the final arthrodesis.

Methods: We report a case and provide detail for a novel technique for thumb MCP joint arthrodesis at 2 months of follow-up.

Technique: Under tourniquet control, after accessing the MCP joint capsule through a standard curvilinear incision, the capsule is incised, and collateral ligaments are released in preparation for osteotomies. Osteotomies are made such that the joint will be fused in 25 degrees of flexion. Next, a 10-hole, low-profile, 5 x 2 grid plate was under contoured and secured in place using four screws both proximally and distally. The middle row spanning the arthrodesis is left empty.

To compress the osteotomy site, a 0.045 Kirschner wire is used to drill transversely oriented holes for the passage of a 24-gauge tension wire around the nearest set of screws. These screws act as rigid posts for compression. The wire is then tightened by twisting using a heavy needle driver.

Results: Three-week postoperative radiographs revealed evidence of surgical bony union and no signs of hardware complication. The patient had resolution of her pain and return to normal hand function.

Conclusion: Our approach incorporates the rigidity and stability of plate and screw fixation with the flexibility and joint compression afforded by wire cerclage placement around the innermost four screws. The inclusion of a cerclage structure allows the healing joint to not rely as much on bone quality for successful union.

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Incisional Release and Autologous Fat Grafting for the Management of Perioral Fibrosis in Patients with Scleroderma and Dermatomyositis: A Single Center Experience

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Introduction: Scleroderma, also known as systemic sclerosis (SSc) is a rare autoimmune, connective tissue disorder and dermatomyositis an autoimmune inflammatory myopathy with cutaneous complications. Peri-oral fibrosis is one of the local cutaneous complications of both conditions which has a significant negative impact on functional capabilities as well as aesthetic satisfaction. The use of fat-transfer has been postulated to aid in the management of SSc fibrosis

due to stem cell enrichment. Studies have demonstrated the success of this technique using different sites of graft origin and different targets of injection. We aim to demonstrate our SSc patients' success using abdominal fat and perioral target.

Methods: Electronic medical records from our institution were queried for patients with pre-existing scleroderma who underwent incisional release and fat grafting for perioral fibrosis from 2018-2021. For perioral release, semi-sharp cannula was tunneled under the vermilion border into the vermilion and along the skin. For grafting, cannulas were used to infiltrate the fat with a retrograde filling technique in a radial fanning manner. Their autoimmune diagnosis, anesthetic risk assessment (ASA), systemic complications stemming from their disease, and the degree of their presenting symptoms were reviewed along with their post-operative outcomes, subjectively and objectively.

Results: From 2018-2021, 16 patients diagnosed with scleroderma were treated at our institution with incisional release and fat grafting for the management of facial perioral fibrosis and 2 diagnosed with dermatomyositis and treated in the same manner for facial lipodystrophy. Of the scleroderma patients, 8 presented with limited SSc and 8 presented with diffuse SSc. The mean patient age was 54.31 years. All SSc patients presented with functional symptoms with the most common concern (n=9) being "decreased mouth opening." Some patients (n=11) also presented with cosmetic concerns with "perioral rhytids" being the most common (n=6). The average length-of-condition (LOC) was 17.47 years. The mean number of systemic complications per patient from SSc, at the time of presentation, was 3.06. The mean anesthetic risk assessment (ASA) was 2.44. On average, the amount of fat grafted during the operation was 14.89cc. The average procedure length was 52 minutes. Two patients with SSc required re-grafting. For one patient, this was part of the original treatment plan and for the other due to fat resorption. Compared to the rest of the patients, these patients had no statistically significant difference in age, co-morbidities, LOC, ASA score, or amount of fat grafted. All patients with dermatomyositis saw initial improvement but then had near-complete resorption requiring re-grafting. Patients who followed-up in the clinic or via telemedicine all reported improved functionality and were pleased aesthetically.

Conclusion: Patients with perioral fibrosis due to SSc can benefit from autologous fat-grafting. The immunosuppressive effects of certain stem cells may provide a localized anti-inflammatory response, downregulating the autoimmune condition. Incisional release in-combination with fat-grafting can enhance procedure outcomes. The use of technique provides beneficial functional and aesthetic outcomes. Patients with both diffuse and limited disease are appropriate candidates for this procedure. For patients suffering from dermatomyositis, the benefits of this procedure seem much more temporary.

Ultrasound-Guided Suction-assisted Lipectomy for Arteriovenous Fistula Access and Superficialization

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Background: There are over 530,000 people in the United States with end-stage renal disease on dialysis.1 Autologous arteriovenous fistulas (AVF) are the preferred access in patients who require long-term hemodialysis. The optimal depth of the fistula from the surface of the skin was 6 mm or less, abiding by the National Kidney Foundation's Kidney Disease Outcomes Quality Initiative, "Rule of 6s."2 However, in their most recent guidelines, a depth of 2 mm below the skin is optimal and greater depths have poorer maturation outcomes.3 For this reason, obese patients present a unique challenge for AVF creation, and it is not uncommon for fistula depth to be a limiting factor for successful hemodialysis. Traditionally, this may be remedied by elevating and/or transposing the outflow vein.4 Suction-assisted lipectomy (SAL) is minimally invasive technique that avoids manipulation of the fistula, results in less dissection of surrounding tissue, and involves smaller incisions. When combined with ultrasound, SAL may be a viable and safe option for superficialization of AVF's, but evidence for this technique is limited to small case series.5 The purpose of this study is to review the author's experience on ultrasound-guided SAL for AVF access.

Methods: We performed a retrospective review of patients who underwent ultrasound-guided SAL for superficialization of AVF's at the senior author's institution. Indications for the procedure included patients with mature fistulas that could not be cannulated due to adipose tissue. The same technique was used in all cases, all of which were performed using local tumescent anesthesia and conscious sedation. B-mode ultrasound was used in every case to protect the fistula from inadvertent injury. Following injection of tumescence, hand aspirated liposuction was performed. Data on patient demographics, comorbidities, and details regarding AVF creation were gathered. The primary endpoint was successful cannulation. Secondary endpoints included complications and patency rates.

Results: Five patients underwent ultrasound-guided SAL for superficialization of AVF's. 3 were male and 2 were female. The average age was 65 years old. The average BMI was 36. There were no major complications noted. All AVF's were successfully cannulated within 4 weeks of the superficialization procedure. The average follow up was 5.8 months.

Conclusion: We present the largest case-series in the United States on ultrasound assisted liposuction for AVF superficialization. Our data demonstrates that ultrasound-guided SAL is a safe and effective way to improve fistula access, allow catheter decannulation, prevent more additional unnecessary surgeries.

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Needle-Free Injection of Steroids for Keloids: A Novel Approach to Management

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Purpose: The pathophysiology of keloids is poorly understood, and there are several treatment options available. Intralesional steroid injection is one of the most commonly employed treatments. Precise placement of steroid injections in the pediatric population often requires sedation or general anesthesia. In an effort to develop a less painful strategy for keloid treatment, we developed a novel use for the J-tip sterile jet injector (National Medical Products). The J-tip is an FDA-approved device for pre-procedural intradermal/subcutaneous needle-free administration of xylocaine. This report describes the use of the J-tip, loaded with Kenalog and lidocaine, for intralesional needle-free injection of keloids in pediatric patients.

Methods: A retrospective review was performed to identify pediatric patients that underwent management of keloids with a kenalog-loaded J-tip between January 2020-March 2022 under the care of the senior author (AJB). The J-tip was loaded with .25 mL of a 1:1 mixture of Kenalog 10 mg/ml and Lidocaine 1%. The skin was prepared with an alcohol swab and the J-tip was held firmly against the lesion. Upon deployment of the medication, accuracy was confirmed by the presence of a blood droplet in the center of the lesion. Repeat injections were performed until the lesion exhibited turgor and pallor. Keloid dimensions were recorded and photo documentation was performed. Outcome measurements included number of treatments, post-treatment keloid dimensions, patient satisfaction, post-injection complications, and need for additional treatments.

Results: A total of 6 patients were treated with Kenalog-loaded J-tip injections. Four patients presented with ear keloids, one patient with a 6x2 cm ankle keloid, and one patient with multiple

back keloids. In all patients, the treated keloids demonstrated a reduction in size. All patients reported decreased anxiety secondary to the absence of a needle. Follow-up time ranged from 4-12 months. The injections were well-tolerated by the patients with little to no discomfort reported.

Conclusions: In all patients, the treated keloids diminished in size. No complications were encountered. Some patients required repeat injections. This novel method of intralesional steroid administration delivers the medication into the appropriate tissue planes, reducing the risk of fat atrophy from subcutaneous deposition of Kenalog. Additionally, the risk of needle-stick injury is obviated. Patients reported less pain and anxiety than they would have experienced with traditional needle injection. This unique technique has a low risk profile, is easy to perform, and is cost-effective (each J-tip costs less than $5.00). This technique provides a new option for needle-free management of keloids.

The Validation of a Modified Abdominal Site Closure Technique: An Intraoperative Examination of Scarpa's Fascia

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Purpose: In traditional transverse abdominal closure, Scarpa's (superficial) fascia (SF) is closed along the length of the entire abdominal wall in an effort to add strength to the wound closure and improve the quality the resulting abdominal scar.[1] Our previous work examining the anatomy of SF through the use of radiologic imaging has demonstrated attenuation of SF around the area of the umbilicus.[2] This has led to the development of a modified closure technique that does not attempt to close SF 5 cm left and right of the vertical midline.[3] This study sought to intraoperatively examine SF and validate this closure technique.

Methods: Nine abdominal tissue samples that included the periumbilical region (and were ultimately discarded without pathologic analysis), were dissected from patients undergoing abdominal panniculectomy. Prior to disposal, the layer of adipose tissue that exists below SF was removed from the tissue samples in order to more accurately measure the presence and absence of SF. Using a marking pen, the location of the SF was indicated on each tissue sample. Using the center of the umbilicus as the center point for measurements, the dimensions of SF attenuation was measured in the right, left, caudal, and cranial directions.

Results: The 9 dissected tissue samples each showed an attenuation of SF around the area of the umbilicus. The mean distance of attenuation of SF in the cranial direction was 4.4 cm (SEM = 0.24), in the caudal direction 5.2 cm (SEM = 0.21), to the right of umbilicus 4.8 cm (SEM = 0.13), and to the left of umbilicus 4.8 cm (SEM = 0.13). The mean surface area of SF absence in the dissected specimens was 42.9 cm2 (SEM = 3.67 cm2).

Conclusion: Our previous radiologic imaging study has demonstrated the attenuation of SF in the periumbilical region. No studies, however, have validated this finding intraoperatively. The current study further validates the finding that SF functionally ends approximately 4.5 cm from the umbilicus in all directions. This calls into question the traditional closure technique after transverse abdominal excision in the vicinity of the umbilicus that attempts to approximate SF along the entire length of the wound on the abdominal wall, and instead suggests that surgeons should not attempt SF closure approximately 5 cm to the left and right of the vertical midline in order to avoid increasing the risk of fat necrosis and other closure site complications due to the absence of SF in the periumbilical region.

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Technique and Outcomes in First-Stage Gender-Affirming Free-Flap Phalloplasty

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Purpose: With the rising demand for genital gender-affirming surgery (gGAS), interest in improving technique and outcomes for gender-affirming phalloplasty has grown. As with any reconstruction, achieving good form and function while minimizing morbidity and ensuring technical reliability are key goals. Currently, the most versatile and widely used phalloplasty approaches are free-flap techniques performed in one, two or multiple stages. However, several aspects such as recipient vessel choice and donor site reconstruction options remain controversial. We report outcomes from our series using the deep inferior epigastric artery and veins as the recipient vessels as well as full-thickness infragluteal skin grafts to cover the donor site when performing phalloplasty and free-flap urethroplasty.

Methods and Materials: We performed a retrospective review of all consecutive patients who underwent gender-affirming free-flap phalloplasty, phall urethroplasty, or urethroplasty from June 2017 through October 2021 at our institution. Transgender patients undergoing primary masculinizing genital reconstruction as well as those undergoing complete revision (with a new flap) were included. Patient demographics including age, weight, and comorbidities were recorded along with operative details and outcomes.

Results: 40 patients underwent masculinizing gGAS, including 38 phalloplasties and 2 free flap urethroplasties. Of the phalloplasties, 27 (75%) included a neourethra and 9 (25%) did not. Six patients had prior gGAS elsewhere (2 metoidioplasties, 3 complicated phalloplasties requiring re-do, one with phalloplasty but seeking urethra replacement.) Urethral lengthening (anastomosis of the flap urethra to native urethra) was always performed at a separate stage.

There were 29 radial forearm free flaps (RFFF) and 11 anterolateral thigh (ALT) flaps. RFFF donor sites were reconstructed in all but one case with full thickness skin grafts from either the lower abdomen or the infragluteal creases. In one case, Integra® and delayed split thickness skin grafts were used. Thigh donor sites were covered with split thickness skin grafts, except in one case where full thickness grafts were used. One thigh donor site was excised and closed after tissue expansion.

In every case, the recipient vessels were the deep inferior epigastric artery and deep inferior epigastric venae comitantes, delivered through the external ring of the inguinal canal. The saphenous vein was needed to augment venous outflow in one case. In all but two cases, a clitoral nerve was coapted to at least one flap nerve to provide sensation. In the rest, one of the ilioinguinal nerves was used.

Outcomes: All but one flap survived (97.5%). One flap suffered venous congestion and could not be salvaged. Five patients (12.5%) had some flaps wound dehiscence, three (7.5%) had urethrocutaneous fistulas, one (2.5%) had partial skin necrosis. There were no hernias at the site of vessel transposition detected at follow-up.

Conclusions: Our approach to primary and secondary phalloplasty, urethroplasty and phall urethroplasty involves preferential use of free tissue transfer and the anatomically ideal deep inferior epigastric vessels. Forearm donor sites are addressed with full thickness skin grafts with outcomes superior to use of split-thickness skin grafts. With only one flap failure out of 40, we demonstrate the feasibility and reliability of the described approach.

Multimedia Demonstration of Migraine Surgery Techniques

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Purpose: The purpose of this abstract is to utilize both graphic animation and annotated surgical video clips to highlight techniques in migraine surgery that our team has developed over the past five years.

Preoperative Markings: After general anesthesia is induced, the patient is properly padded and placed onto the operating room table in prone position. The neck is trimmed a few centimeters above the occipital protuberance.

A vertical line is marked in the midline, thereafter a transverse line is marked on the back of the neck at the level of the occipital protuberance. A ruler is used to measure the lateral distance from the midline, and a tick mark is placed at the 5-cm and 7-cm mark. In our experience, the lesser occipital nerve has always been located below this area.

Initial Dissection: A 12-cm transverse incision is made 2 cm below this line at the occipital protuberance. We start by lifting a flap superiorly and inferiorly 2 cm in each direction leaving a 5 mm fat flap on the trapezius fascia. Then a 4x2 cm fat flap is raised on each side, based lateral to medial, which will be used later in the case to cushion the greater occipital nerve. The bilateral third occipital nerves are encountered, and they are usually severely entrapped in the trapezius fascia. The bilateral third occipital nerves are decompressed, transected, and buried into the muscle.

The dissection is directed 0.5 cm laterally from the median raphe. The dissection is continued deeper into the trapezius muscle and fascia until the vertical fibers of the semispinalis capitis muscle are identified.

Decompressing the Occipital Nerves: The trapezius fascia is lifted, and the greater occipital nerves are identified. The semispinalis muscle is dissected around the nerve, and the segment of the muscle medial to the nerve 1 cm in length is separated from the midline raphe and transected. A triangular piece of the trapezius fascia and muscle fiber is removed laterally over the nerve. The nerve is further isolated with a spreading technique using a fine hemostat. The trapezius fascia over the nerve is incised, and the nerve is tracked laterally until it enters the subcutaneous fat. We then track the occipital nerve proximally down to the obliquus capitis muscle fascia. The occipital artery crosses over the greater occipital nerve. This artery is ligated. The lesser occipital nerve is identified. The nerve is tracked proximally until its exit from the posterior border of the sternocleidomastoid muscle. The nerve is transected and implanted into the sternocleidomastoid. This is repeated on the contralateral side.

Flap Cushion for the Greater Occipital Nerve: After hemostasis is achieved, the 4x2 cm fat flap that was raised earlier is now used to cushion the bilateral greater occipital nerves.

Closure: The areas around the nerves are infiltrated with 40 mg kenalog. The deep subcutaneous layer is closed with 2-0 vicryl and 3-0 monocryl.

Reliable Location of Upper Extremity Lymphatic Channels for Use in Immediate Lymphovenous Bypass

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Background: Breast cancer related lymphedema (BCRL) is a limiting sequelae of breast cancer treatment that may negatively impact 30-50% of high risk breast cancer survivors.1 Risk factors for development of BCRL include axillary lymph node dissection(ALND), and recently axillary reverse lymphatic mapping (ARLM) and immediate lymphovenous bypass (iLVB) at time of ALND has been implemented to prevent BCRL.2 Reliable anatomy of neighboring venules has been commented on in the literature, however little information exists about anatomical location of local lymphatic channels amenable for bypass.3 The goal of this project was to identify the consistent location of lymphatic channels in order to aid intraoperative identification at time of iLVB.

Methods: After IRB approval, patients who underwent ALND with ARLM and iLVB at a tertiary cancer center from October 2021 to March 2022 were applicable for this study. The location and number of lymphatic channels utilized for iLVB were identified and measured intraoperatively with the arm abducted to 90 degrees and soft tissue under no tension. Four measurements (2 horizontal and 2 vertical) were taken to localize each lymphatic and were based on relationship with reliable anatomic landmarks including 4th rib, anterior axillary line, and lower border of the pectoralis major muscle. These patients were then followed prospectively in a multidisciplinary lymphedema clinic at three-month intervals. Demographics, oncologic treatments, intraoperative factors, and outcomes were prospectively maintained.

Results: 9 patients met inclusion for this study by March 2022 with a total of 28 lymphatic channels identified. Patients were on average 50 +/-14 years old with a BMI of 28.66 +/- 7.32 and had an average of 3 identifiable lymphatic channels amenable to bypass. None of these patients have developed lymphedema. The average horizontal location was 3.9 +/- 1.1cm lateral to the 4th rib (0.46 distance between 4th rib and anterior axillary line). The average vertical location was 1.5 +/- 0.9 cm from the superior border of the 4th rib (0.56 distance from the perpendicular line drawn from 4th rib to the lower border of the pectoralis major muscle).

Conclusion: This data comment upon intraoperatively identified and consistent location of upper extremity lymphatic channels used for immediate lymph venous bypass. Such insight may aid in easier intraoperative identification of amenable vessels for the unexperienced surgeon, decrease in intraoperative time, and higher success of iLVB. Our research is ongoing, and we continue to add to this growing database.

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Not Just a Linear Closure: Aesthetic Flat Closure After Mastectomy

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Summary: Currently, there is an increasing trend in women seeking aesthetic flat closure after mastectomy for either breast cancer treatment or prophylaxis. However, despite the patient demand for this procedure, there is a paucity of literature on addressing technical aspects of the aesthetic flat closure after mastectomy. To date, there is no plastic surgery literature on specific techniques to achieve an aesthetic flat closure after mastectomy.

As plastic surgeons, we need to continue to innovate and to iterate new surgical techniques in our reconstructive armamentarium in order to address the desires of and to optimize the outcomes for our reconstructive breast surgery patients. Herein, we seek to delineate key considerations and employed techniques for reconstructive plastic surgeons performing aesthetic flat closure after mastectomy. Namely, it is crucial to listen to the patient, and to fully understand the patient's concerns, wishes, and particular aesthetic desired.

From a technical perspective, the key surgical pearls include completely obliterating the inframammary fold, ensuring the same size and flap thickness bilaterally, appropriately de-fatting medially on the chest wall to allow for a smooth contour, obviating any presence of dog ears medially or laterally with precise tissue excision, and confirming that the incisions are

entirely symmetric bilaterally. Intra operatively, it is important to sit these patients up in order to assess soft tissue re-draping.

Moreover, in order to achieve aesthetic closure outcomes, especially in obese patients, the following maneuvers are advised: 1) judicious lateral defatting is necessary in order to mitigate dog ears, specifically, aggressive lateral fat direct excision can be performed while ensuring that the flaps are not too thin; 2) axillary liposuction can be utilized to contour the lateral chest wall in order to provide smooth definition to the final flat chest closure; 3) tailor tacking is key in these patients in order ensure that there is no lateral dog ear, and to obviate the need to extend the lateral chest incisions onto the back, which is aesthetically displeasing to patients. In our experience with this technique, there have been no intra-operative or post-operative complications, and no revision surgeries performed.

Ultimately, with the increasing demand for flat closures after mastectomy, plastic surgeons need to be keen on employing modified surgical techniques to best provide the desired aesthetic flat closure reconstructions for these patients, as these reconstructions are not simply linear closures.

Technical Pearls and Pitfalls in Facial Feminization Surgery

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Background: Facial feminization surgery (FFS), typically sought out by transfeminine individuals or those desiring a more feminine facial appearance, is a growing field that falls under the broader umbrella of gender affirming surgery. Notably, studies have demonstrated that FFS may enhance quality of life from both a physical and psychosocial standpoint. Various approaches exist to feminize the face, yet few published articles describe in detail the techniques of each component procedure. This comprehensive report highlights technical pearls and pitfalls to avoid when performing the component procedures.

Methods: We reviewed the medical records of all patients with gender dysphoria who underwent any combination of scalp advancement, cranioplasty, brow lift, rhinoplasty, upper lip lift, mandibuloplasty, chondrolaryngoplasty, malar augmentation and/or additional cosmetic procedures by the senior author (E.D.R.) from October 2017 to 2021. Medical records were reviewed for FFS procedures undergone, and postoperative complications. Operative notes were examined procedure characteristics were extracted. The alterations to known methods of FFS were then discussed.

Results: Out of 161 patients who underwent FFS, the facial units addressed, in descending order of frequency, were: forehead/brow 150 (93.1%), nose 121 (75.2%), chin 120 (74.5%), cheeks 120 (74.5%), mandible 91 (56.5%), and trachea 59 (36.6%). Nine patients (5.6%) experienced wound related complications, 2 (1.2%) had suboptimal aesthetic results and 2 (1.2%) had systemic complications. We found that avoiding any visible/stigmatizing scars, achieving a feminized profile through softening the lateral most extents of the frontal bandeau, communication, and management of expectations, as well as addressing skeletal tissues at the index operation with minor soft tissue modifications followed by further major manipulation of soft tissues in subsequent procedures resulted in better aesthetic outcomes.

Conclusion: There remains little consensus among plastic surgeons performing FFS regarding best practices and technical considerations. The techniques described herein may be safely performed in appropriately selected patients, yielding consistent surgical outcomes when combined with patient counseling and expectation management. Technical nuance in the execution of FFS can have profound effects on its safety and aesthetic outcomes.

Poster Abstracts

Improving Pre-Clinical Medical Student's Perception of Plastic and Reconstructive Surgery

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Introduction: The medical school curriculum does not provide reasonable exposure to the field of Plastic and Reconstructive Surgery during the early pre-clinical years. Common perceptions of the field have been distorted by popular culture and mainstream media's display of a cosmetically centered, enhancement-heavy and glamorized private practice aspect of the field. This combination has resulted in a distorted view of the field of Plastic and Reconstructive

Surgery for medical students, affecting interest, perceptions of colleagues and referring providers ultimately affecting patient care. This study aimed to provide a concise 6-minute informative video guided by a board-certified plastic surgeon to determine if this minor intervention could impact the preclinical medical students' perception, knowledge and interest in the field of Plastic and Reconstructive Surgery.

Methods: An electronic survey with a brief informative 6-minute module video was provided to medical students across the United States and Canada. The survey included questions regarding exposure to Plastic and Reconstructive Surgery, interest, knowledge, common consultations, and chief complaints that would probe plastic surgery involvement. In addition, global questions regarding their perception of the worldwide need for Plastic and Reconstructive surgery and the percentage of the field that is cosmetic-centered were asked. Survey responses were collected anonymously for analysis.

Results: One hundred and sixty-eight medical students responded to the survey, 90% of which were in their pre-clinical years (1st and 2nd year). With regards to Plastic and Reconstructive Surgery, 91.1% of respondents indicated that they have received little to no formal curricular exposure, with the most common exposure sites being television and online media sources (69.6%), followed by extracurricular activities including interest groups (29.8%) and independent mentorship/shadowing (26.2%). Prior to the informative module, 34.5% rated that there is a significantly large unmet need for plastic and reconstructive surgeons worldwide, compared to 82.2% after the module ($p < 0.01$); 49.4% and 97.0% could identify a correct route in training to become a plastic surgeon before and after respectively ($p <0.01$). Prior to the module students identified on average 2.3 specialties that plastic surgeons collaborate with and 1.7 chief complaints for consult, compared to after the module 3.6 and 3.0 collaborators and chief complaints respectively. An additional 25.0% of students also reported interest in learning more about the field following the module.

Conclusion: A short 6-minute module provides increased awareness about the global unmet need for plastic and reconstructive surgeons, the role of these surgeons in a hospital setting including consultations and collaborations, and increased interest in the field from medical students. Implementing early educational Plastic and Reconstructive Surgery opportunities in medical school curriculums may help garner interest from students, correct misconceptions, and result in more accurate future consults and collaborative efforts from future physicians.

Computational Fluid Dynamic Evaluation of DIEP Flap End-to-Side Anastomosis

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Background: The microvascular anastomosis is a key facet of free-tissue transfers. The technique is commonly utilized, with over 23,000 (16%) of the 137,808 breast reconstruction procedures conducted in the United States in 2020 being deep inferior epigastric artery perforator (DIEP) free-flap transfers.1 The microvascular anastomoses within a DIEP flap can be classified as end-to-end (ETE) or end-to-side (ETS). The ETS technique is of particular importance because, in many cases, ETS may be preferable for its ability to preserve the internal mammary artery for use in future cardiac bypass surgery. Further, many women who need breast reconstruction have history of radiation therapy for their breast cancer, resulting in damage to heart vessels which may lead to these patients being two-times more likely to develop heart disease and become candidates for cardiac bypass surgery.2 At present, no computational fluid dynamic (CFD) studies have been conducted in a DIEP ETS model.
Purpose: This present study will create a CFD model for an ETS DIEP anastomosis to understand what angle(s) of vessel anastomosis can optimize blood flow and vessel wall forces.

Methods: A CFD model of a deep inferior epigastric artery to internal mammary artery anastomosis was constructed with OpenFOAM software.3 The deep inferior epigastric artery was defined as the graft vessel and internal mammary artery as the donor vessel. Both vessels were modeled to have internal diameters of 2.3 mm with 200-micron wall thickness. The lengths of the internal mammary and deep inferior epigastric arteries were defined as 184mm and 103mm, respectively. Blood was modeled as an incompressible Newtonian fluid with viscosity (η) of 3.5x10-3 Pa ·s and density (ρ) of 1060 kg/m. Viscosity and density were assumed to be constant throughout the simulation. Mean arterial pressure was held constant at 100 mmHg. Individual virtual meshes with an average of 1.1 million three-dimensional cells and 4 boundary layers were created for each anastomotic angle (30-, 45-, 60-, 75-, and 90-degrees). All Simulations were run with a convergence tolerance of 10^-4. Fluid flow was visualized with line integral convolution (LIC) and pure fluid velocity (PFV) techniques. Vessel wall shear stress (WSS) was also visualized.

Results: LIC and PFV models revealed blood recirculation and stasis was associated with large anastomotic angles. Minimal to no stasis was seen in the 45- and 30-degree simulations. Any stasis visualized was confined to the toe of the bifurcation. A linear relationship was identified between anastomotic angle and percentage of stagnant fluid (R2=0.973), with stasis increasing as anastomotic angle increased. Wall shear stress increased with anastomotic angle and was concentrated in the heel and toe of the model.

Conclusions: CFD modeling shows increased acuity of anastomotic angles in ETS DIEP flaps is essential to minimize stasis, recirculation, and WSS. Anastomotic angles less than 45-degrees specifically are recommended. Successful implementation of this recommendation may directly reduce the risk of flap failure from thrombosis, intimal hyperplasia, atherogenesis, or other causes of acute and chronic ischemia.4,5

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DRUJ Capsular Release for Forearm Stiffness: Surgical Technique and Case Series

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Hypothesis: Forearm stiffness can be caused by distal radioulnar joint (DRUJ) capsular contractures. In this setting, a DRUJ capsular release may help improve forearm rotation, but the long-term functional outcomes remain unknown. The purpose of this case series is to investigate the long-term improvement in total pronosupination arc range of motion and patient reported outcomes (PROMs) after DRUJ capsular release.

Methods: We performed a retrospective review of patients who underwent DRUJ capsular release. Range of motion prior to surgery and at final follow-up were collected and analyzed with a Wilcoxon signed ranks test. PROMs including QuickDASH, PROMIS UE version 2.0 scores, patient satisfaction and willingness to undergo the procedure again were obtained and described as median with interquartile range.

Results: Six patients met inclusion criteria with a median follow-up of 4,9 (IQR: 3.6-10.3) months. The median pre-operative supination was 30 (IQR: 0-35) degrees and median post-operative supination was 55 (IQR: 40-60) degrees (p=0.03). The median pre-operative pronation was 48 (IQR: 10-60) degrees and median post-operative pronation was 75 (IQR: 60-80) degrees (p=0.04). Five of six patients (83.3%) were satisfied or very satisfied with the results of the surgery. The median DASH score was 15.0 (IQR: 9.1-20.5) and the median PROMIS UE CAT score was 47.1 (IQR:43.8-54.7).

Summary Points:

• DRUJ capsular release can improve pro- and supination in patients with posttraumatic forearm stiffness.
• DRUJ capsular release is associated with high long-term patient satisfaction.

Patients Using Hospital Websites To Find Physicians And How This Impacts Their Ability To Find Craniofacial Surgeons

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Introduction: Over recent years, patients have increasingly depended on online services to choose their physician. The ease with which patients can access digital information disseminated by hospitals plays a key role in their choice of physician. Despite the abundance of information available online, patients may struggle to find a physician suited to their needs. In this study, we evaluated the ability of patients to find a reconstructive craniofacial plastic surgeon among the top ranked United States hospital system websites.

Methods: Using the U.S. News and World Report's Hospital Rankings 2020-2021, the top 20 US medical centers were highlighted. A thorough search was performed for six craniofacial diagnoses on the "Find A Doctor" tool of each of the hospital websites: "cleft lip," "cleft palate," "facial fracture," "craniosynostosis," "sinus fracture," and "cranioplasty". The physician information collected included the academic rank, medical specialty, gender, the location of their medical school and residency program.

Results: Across 689 search results, a total of 576 allopathic trained (M.D) physicians were identified. Almost two thirds (68%) of providers listed were male. A vast majority of the M.D.s completed their medical school and residency training in the U.S., 93% and 100% respectively. Plastic surgeons represented merely a fifth (21%) of the search results. For five of the six craniofacial procedures indexed, plastic surgeons were the minority of search results.
The term "sinus fracture" had the lowest representation rate, with plastic surgeons comprising only 6% of search results. "Cranioplasty" produced the most plastic surgeons (67%). The terms "cleft lip" yielded large numbers of otolaryngologists (34%) and pediatricians (41%). Similarly,

the term "facial fracture" revealed more orthopaedic surgeons (53%) than plastic surgeons (20%). Non-surgeons represented 39% of queries with 269 medicine doctors (internists, pediatricians, otolaryngologists, etc.).

Discussion: When searching for reconstructive craniofacial procedures, plastic surgeons are diluted amongst search results and underrepresented. Our study reveals that non-plastic surgeons, including orthopaedic surgeons and pediatricians, appear more often than plastic surgeons for a majority of searched terms. Moreover, a large number of non-physicians appear in the queries. The inability to quickly find a reconstructive craniofacial plastic surgeon may introduce a delay in care and force patients to seek care with non-plastic surgeons or chose another institution for their surgery. Therefore, it is vital that hospital administrators, plastic surgeons, and information technology professionals work together to refine hospital websites and optimize search engine results. Plastic surgeons must make efforts to preserve the breadth of their practice not only to maintain their specialty but also to provide proper patient care.

Pediatric Hand Trauma: Demographics, Injury Patterns and Operations

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Purpose: The epidemiology, injury patterns, and necessary interventions for pediatric patients who experience hand trauma are not well described in the literature. We hypothesize that older children and high-energy mechanisms of injury will be at the highest risk for requiring surgical management for hand trauma.

Methods: This was a retrospective cohort study of pediatric hand trauma patients presenting to the hand surgery clinic at a tertiary care center from 2010 to 2020. Patients were grouped into operative and non-operative cohorts for comparison. All charts were abstracted for demographic and clinical details. Population estimates and socioeconomic data were obtained from the United States Census Bureau. Summary statistics were computed, and Poisson regression was used to compute relative risks (RR) with 95% confidence intervals (CI) and p-values. Significance was assessed at the alpha=0.05 level.

Results: A total of 1,175 patients sustained hand trauma over the study period, for an incidence of 3 cases per 1000 children over 10 years. The median age was 11.3 years (interquartile range

7.4-13.8). In this sample, 421 patients (36%) were female, and 329 (29%) were non-white. The most common mechanisms of injury were sports-related (n=397, 34%), door slams (n=191, 17%), falls (n=137, 12%), household mishaps (n=125, 11%), and violence-related (n=105, 9%). Of our sample, 179 patients (15%) required operative management, while 996 (85%) injuries were non-operative. Fractures which were rotated, angulated, displaced, or intra-articular usually underwent operative management. The small finger was the most common digit to be injured (n=392, 33.4%), but ring finger injuries were more likely to require operative intervention compared to other injuries (RR 1.34, CI 1.03-1.76, p=0.03). By specific location, phalangeal fractures were the most common overall (n=699, 59%), but metacarpal fractures (n=203, 17%) were significantly more likely to require surgical intervention compared to other injuries (RR 1.36, CI 1.00-1.86, p=0.047). Compared to all other mechanisms, traumas from motorized toys, scooters, or motor vehicles were four times more likely to require operative management (RR 3.99, CI 2.06-7.76, p<0.001). Injury to dominant hand was not associated with increased likelihood of operative intervention for right-handed or left-handed patients (p=0.15, p=0.329 respectively). Male gender, Caucasian race, and age >10 years at the time of injury were all associated with necessity of operative intervention (RR=1.07, CI 1.03-1.12, p=0.001; RR 1.13, CI 1.04-1.24, p=0.04; and RR 1.39, CI 1.20-1.61, p<0.001, respectively).

Summary: This study represents the largest reported cohort in pediatric hand trauma to date. Older Caucasian males and children who play with motorized devices and scooters are at significantly highest risk for operative hand trauma than all other mechanisms noted. Ring finger and metacarpal injuries are the most likely anatomic sites to require operative management. These findings have important preventative implications and can help emergency and primary care providers triage injuries for appropriate referral to hand surgeons.

Flap Coverage of Infected Ventricular Assist Device Impacts Patient Outcomes

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Background: The use of ventricular assist devices (LVADs) for patients with end-stage cardiac failure awaiting heart transplantation has become increasingly common. Ventricular assist devices improve the longevity and the quality of life for these patients. In addition, they serve as a bridge to cardiac allograft transplantation until a donor heart is found. However, ventricular

assist device-related infections remain a major problem complicating their long-term use. As these are life-sustaining devices, simple explanation is often difficult, or directly impossible. Clinical infection and sepsis can critically threaten these patients with ventricular assist devices. Systemic infection can delay immediate transplantation and potentially require the removal of the device for definitive treatment of the problem.

Methods: Patients who underwent insertion of a ventricular assist device and had a subsequent readmission for LVAD infection at the University of Rochester Medical Center from 2021-2022 were identified through accessing the medical records archives of the hospital. Review of patients' medical records was conducted to obtain patient demographics, preoperative diagnosis and disease state, type of ventricular assist device inserted, postoperative day of ventricular assist device infection onset, infectious organism identified at initial washout, infectious organism identified at time of definitive device coverage, timing of coverage procedure after the initial washout for infection, type of flap used for coverage and 90 day complications ifollowing definitive coverage. Comparison analysis with a Chi squared test was used to analyze outcomes.

Results: Of 109 patients admitted with LVAD related infection 36 underwent operative debridement. Of these, 8 underwent primary closure, 5 underwent closure with secondary intention, and 23 were closed with a flap (pectoralis, omental, latissimus, or VRAM). There was a statistically significant higher incidence of complications related to surgical site with primary and secondary closure compared to flap reconstruction ($p=0.008$) 24 patients had a positive culture upon definitive coverage with 5 having a post surgical complication. 12 were closed with negative cultures with 4 having a complication. This was not statistically significant ($p=0.414$) the culture data was further sub-stratified into bacterial cultures ($n=18$) vs fungal cultures ($n=6$) there was no statistically significant difference between these ($p=0.384$)

Conclusion: With placement into typically systemically unwell patients with multiple co-morbidites, infections involving LVADs and their drivelines can become a devastating condition that could delay, or prevent a patient from undergoing cardia transplantation. For patients these can also end up with prolonged hospital stays, and washout with coverage is indicated for serious infections. Coverage of these devices with loco-regional flaps has a decreased incidence of 90-day complications.

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The Impact of Hospital Websites on A Patient's Ability To Find A Plastic Surgeon for Aesthetics Procedures

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Introduction: Patients are increasingly relying on online platforms, such as hospital websites, to decide which physicians to see for their care. Search engines across different hospitals provide varying amounts of information about physicians in their institution. Depending on the specific hospital search engine, patients may have either too many or too few options when they search for a cosmetic surgeon. This study assesses the representation of plastic surgeons across major hospital system websites in the U.S. for aesthetic procedures.

Methods: The search engines of the top 20 US hospitals, as described in U.S. News and World Report's Hospital Rankings 2020-2021, were thoroughly searched for six aesthetic procedures: "face lift," "facial rejuvenation," "neck lift," "rhinoplasty," "blepharoplasty," and "brow lift". The recorded information on the indexed providers included their gender, the location of their medical school and residency program, medical specialty and number of publications.

Results: Our study revealed 1,189 search results highlighting a total of 1,022 allopathic-trained (MD) physicians. Almost three quarters (72%) of the search results were male. Nearly all the MDs completed their medical school and residency program in the US, 95% and 100% respectively. Plastic surgeons represented a just under half (47%) of the search results.
For four of the six search terms, plastic surgeons represented the majority of results. The search term "neck lift" produced the lowest number of plastic surgeons (37%), whereas the term "face lift" produced the highest number of plastic surgeons (71%). Non-surgeons represented 6% of queries which included medicine specialty physicians (dermatologists, ophthalmologists,

internists etc.).

Conclusions: When searching for common aesthetic procedures on the websites of top ranked United States hospital systems, plastic surgeons are underrepresented. In fact, online search engines often provide patients a plethora of non-surgeons to choose from. Patients may be overwhelmed by these choices and find it difficult to quickly find a surgeon for their cosmetic surgery. Our study reveals that surgeons who are not plastic surgeons such as otolaryngologists are performing aesthetic surgery procedures across major United States hospital systems. While non-surgeons, such as physician assistants and nurses, are vital for patient care, their presence among the search results can hinder a patient's ability to promptly seek specialized care. Plastic surgeons must work with hospital administrations to filter search engine recommendations in a more refined, efficient manner. In order improve patients' access to plastic surgeons for cosmetic procedures, it is vital that plastic surgeons engage in advocacy efforts to be better represented in hospital search engine results.

Simulating the Ideal Rhinoplasty: Individual Perspectives from Surgeons Worldwide

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Background: While extensive literature exists describing how to perform various rhinoplasty techniques,1 it has been historically difficult to assess whether there is any consistency in what surgeons aim to achieve. Our group set out to study the potential similarities and differences in ideal nasal aesthetics between rhinoplasty surgeons by comparing individual surgeons' ideal 3D simulation. Factors which may influence a surgeon's overall aesthetic were considered, including level of experience, training program, and geographic location.

Methods: A cohort of plastic surgeons were invited to participate in this study. A set of baseline 3D patient images (n=8) were provided, and all surgeons were asked to create an ideal result. Surgeons were limited to manipulations of five parameters: radix height, alar width, dorsal height, nasal tip projection, and nasal tip rotation. Each simulation was overlaid onto the baseline (preop) image. Distance (mm) of the aforementioned parameters were measured from the baseline.2 Profile views of each surgeon's simulations were combined using a generalized

Procrustes algorithm via tpsSuper.3 The resulting images represented each surgeon's unique ideal nasal profile.

Results: A total of 11 surgeons completed the study to date, from the following locations: NYC, New York (n=5), Beverly Hills, California (n=1), Madrid, Spain (n=1), Athens, Greece (n=1), Miami, Florida (n=1), Durham, North Carolina (n=1), and Dallas, Texas (n=1). Participants were further classified by specialty (plastic surgery, n=7; otolaryngology, n=4) and level of experience (>10 years, n=9; <10 years, n=2). Significant variation was found between the eleven participants; average dorsal height in mm (NYC=-6.25, -2.96, -2.26, -4.17, -2.79; BH=-3.94; M=-4.36; A=-2.61; MIA=-2.08; NC=-4.25; D=-3.67 $p<0.01$) and average alar width in mm (NYC=-0.59, -0.44, -0.66, -0.48, -0.25; BH=-1.12; M=-0.39; A=-0.75; MIA=-0.14; NC=-0.01; D=-1.96 $p<0.01$) using ANOVA analysis. No significance was found for nasolabial angle ($p=0.18$), nasal tip projection ($p=0.8$), and radix height ($p=0.13$). Alar width varied significantly between different geographic regions. Compared to Dallas (-1.96mm): surgeons in Madrid, NYC, and Durham preferred a wider alar base (-0.39mm, $p<0.01$; -0.47mm, $p<0.01$; -0.01mm, $p<0.01$, respectively). Dorsal height differed among plastic surgeons in NYC, (3.2mm, $p<0.01$), suggesting this group preferred a more subtle reduction than the otolaryngologists. Additionally, differences in NYC surgeons with >10 years of practice (mean difference=1.9mm, $p<0.01$) showed the surgeons with longer experience preferred a more conservative approach in dorsal hump reduction by approximately 2mm.

Conclusion: 3D analysis demonstrated variations in ideal nasal aesthetics between rhinoplasty surgeons. Although this is only a preliminary report with limited surgeon numbers, our data suggests differences in ideal dorsum and alar base depending on the region, training, and experience of the surgeon. Post-hoc analysis suggested alar base width varies by geographical region with a preference for a narrower alar base in Dallas compared to other cities. Residency training and experience also appears to influence aesthetic preferences of the dorsum. While aesthetic standards in rhinoplasty exist, 3D technology reveals and quantifies differences in perceived ideal aesthetics between surgeons. The trends and contributing factors to these unique aesthetic preferences in rhinoplasty are a subject of further investigation with greater numbers of surgeons.

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Practice Trends for Management of Asymptomatic Breast Reconstruction Patients with Textured Implants Presenting with Concerns for Risk of Breast Implant Associated - Anaplastic Large Cell Lymphoma (BIA-ALCL)

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Introduction: Since the 2019 recall of Allergan Biocell textured implants, there has been increasing awareness of breast implant associated-anaplastic large cell lymphoma (BIA-ALCL).1 Although management guidelines for symptomatic patients with textured implants have been established, a paucity of evidence-based literature regarding management of the asymptomatic patient with textured implants remains. Furthermore, implant-based breast reconstruction patients present additional surgical challenges including thin soft tissue envelopes, presence of acellular dermal matrix (ADM), and history of radiation therapy. While the risk of developing BIA-ALCL remains low, it can be anxiety provoking, especially in patients with previous breast cancer. The purpose of this study is to survey members of the American Society of Plastic Surgeons (ASPS) to investigate trends in management of asymptomatic breast reconstruction patients with textured implants (ABRTI).

Methods: An electronic survey regarding the management of ABRTI was distributed to all active members of ASPS in April 2021- July 2021. Anonymous responses were collected, and descriptive statistics were performed.

Results: The survey was distributed to 5,189 active members of ASPS, 2,431 members opened the survey and a total of 340 responded (14% response rate). Of the respondents, 271 of 304 (90%) performed implant-based breast reconstruction and 237 of 258 (92%) have managed ABRTI. Despite the overwhelming majority (89%) having used textured devices in the past, only 25% currently use textured devices in their reconstructive practice for the following reasons: patient request (18%), history of recurrent capsular contracture (1.4%), history of radiation (1.4%), surgeon preference (15%) or use textured tissue expanders only (56%). Regarding management, 87% of members recommend non-surgical management while 13% recommend surgical management. Of that 87%, recommendations include: observation for symptoms only (24%), observation for symptoms with clinical screening exams (56%), clinical screening exams only (4%), and clinical screening exams with imaging (16%). When performing surgical management, 35% perform implant exchange alone, 29% perform implant exchange with partial capsulectomy and 35% perform implant exchange with complete capsulectomy. With management of ADM, 66% of respondents recommend leaving the ADM if well incorporated, 10% always remove ADM and 49% leave ADM if there is concern for a thin flap and/or history of prior radiation therapy. Surgical complications encountered were reported as: no complications (54%), surgical site infection (10%), wound healing problems (17%), implant

loss (6%), hematoma (11%) and seroma (24%).

Conclusion: True evidence-based guidelines for ABRTI concerned for risk of BIA-ALCL have yet to be established. Achieving this through prospective study will be challenging, given the relatively low incidence and delayed nature of BIA-ALCL. Understanding current management patterns can provide some guidance and appreciation for the variety of treatment options. Future studies are needed to further standardize management of asymptomatic breast reconstruction patients with textured implants.

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Management of Radiation-Induced Injuries: A Case Series and Literature Review

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PURPOSE: Although radiation therapy remains an integral component in cancer treatment, the sequela of tissue damage can result in long-term morbidity and mortality for patients. This study aimed to perform a comprehensive review of the literature comparing surgical techniques and outcomes of management of various types of radiation-induced injuries. The secondary objective aims to describe the clinical course and management of our own patients presenting with such wounds.

METHODS: A literature review was performed on the major databases (Pubmed, Embase, and Central) using various combinations of terms such as radiation-induced, radiotherapy, irradiated wound, and radiation injury. English articles regarding the management of irradiated wounds were selected, reviewed, and summarized in this paper. References from each article were also reviewed for additional relevant articles and we analyzed and compared treatment strategies and their outcomes. Additionally, we present our own cases of radiation wounds undergoing care at our institution. Patient demographics, medical diagnoses, complications, strategies of management care, and outcomes were reviewed.

RESULTS: Analysis of the current literature reveals that medical management of radiation injury with conventional wound care such as topical interventions and pharmaceutical agents are

generally first-line and minimally invasive but can have limited success and lead to less than satisfactory outcomes. Surgical interventions, such as debridement, primary closure, skin grafts, and use of local or free flaps, may be an effective alternative but can often be compromised by poor surrounding tissues and vasculature. Adjuvant therapies like hyperbaric oxygen therapy and lasers are useful in certain situations. For example, hyperbaric oxygen therapy may optimize the results and prepare patients for better outcomes after reconstruction. The lack of consensus on the optimal treatment regimen supports the notion that a patient-centered approach is necessary.

Three cases of radiation injuries and their management strategies are included here. Case 1 is a 75-year-old male with a history of radiated posterior shoulder and neck cutaneous lymphoma 20 years ago who subsequently developed a Marjolin ulcer. This patient underwent surgical excision with adjuvant hyperbaric oxygen therapy, negative pressure wound therapy, and reconstructive latissimus dorsi free flap. Case 2 is a 91-year-old female with a left lateral leg wound following radiation for squamous cell carcinoma who later developed necrosis of the Achilles tendon. We excised the tendon and she had hyperbaric oxygen therapy in conjunction with a split-thickness skin graft with partial graft failure. She was managed with wound care for a year with great healing improvements. Case 3 is an 80-year-old male who developed excoriations of the scalp secondary to multiple radiation treatments for recurrent squamous cell carcinoma and basal cell carcinoma. He was successfully managed with hydrogel with complete healing.

CONCLUSIONS: Consideration of current techniques and outcomes in the management of radiation-induced wounds demonstrates that impaired wound healing remains a major surgical problem. This case series and review will be helpful to guide plastic surgeons in the selection of treatment options and optimization of outcomes.

Efficacy of Autologous Cranioplasty Using a Dental SafeScraper Device

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Introduction: Conventional methods to reconstruct cortical bone defects introduced by pediatric cranial vault remodeling (CVR) procedures have shortcomings. Use of bone burr shavings as graft material leads to variable ossification, and harvesting split-thickness cortical grafts is time-intensive and often not possible in thin infant calvaria. Since 2013, our team has used the Geistlich dental SafeScraper (Baden-Baden, Germany) to harvest cortical and cancellous bone grafts during CVR. This study evaluates the efficacy of the SafeScraper in reducing cranial defects in fronto-orbital advancement (FOA).

Methods: Medical records of children who underwent FOA from June 2007 to June 2021 at a tertiary center were retrospectively reviewed. Subjects who received head computed tomography (CT) $\leq$ 15 days and $\geq$ 180 days postoperatively were included, and patient cohorts who had SafeScraper (n=25) versus conventional (n=27) graft harvest were compared. During FOA, the conventional cohort underwent cranial reconstruction using split-calvarial grafts and shavings from a Hudson brace and/or electric burr. In the SafeScraper cohort, the device was used to harvest particulate shavings from the endocortical cranial surface of calvarial craniectomy segments, prior to their repositioning and fixation with resorbable plates. Cortical defects in the immediate and later post-operative periods were analyzed using Materialise 3-matic 15.0. Data were analyzed using Student's t tests, Chi-squared tests, Pearson correlations, and binary logistic and linear regression.

Results: Patient age at FOA was similar between SafeScraper and conventional cohorts (3.7 versus 3.1 years, $p = 0.617$). There were no differences in sex, race, or ethnicity between groups (all $p > 0.05$). In the combined cohort, age at surgery correlated positively with total surface area of all defects ($\rho = 0.44$, $p = 0.001$), and number ($\rho = 0.42$, $p = 0.002$) or total surface area ($\rho = 0.44$, $p = 0.001$) of critical-size defects in later postoperative scans. The SafeScraper cohort had a greater and more consistent reduction in total surface area of all defects (-83.1 ± 14.9 versus $-68.9 \pm 29.8\%$, $p = 0.034$). There were trends toward decreased total defect surface area, as well as number and size of critical defects in the SafeScraper cohort; however, these did not reach statistical significance.

Conclusions: The SafeScraper cohort showed a greater and more consistent degree of cranial defect ossification compared to conventional methods of cranioplasty, suggesting potential adaptability of this instrument. As a manual tool, the SafeScraper minimizes thermal injury to the bone graft, enhancing the viability of osteoblasts and osteocytes in comparison to high-speed burrs or drills.1 Moreover, the device enables more consistent harvesting of larger volumes of graft material, which we believe contributes to superior outcomes. The SafeScraper seems to provide a safe and efficient method of harvesting particulate bone graft for pediatric cranioplasty, and improved knowledge of its use may benefit patients with craniosynostosis.

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Cancer Screening and Management in the Transgender Population: A Review of Literature and Special Considerations if Undergoing Gender Affirmation Surgery

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Purpose: According to population-based surveys, the United States is home to approximately 1.4 million adults who identify themselves as transgender (1). Literature is lacking in this population, particularly in relation to cancer screening and management. We performed a systematic search of PUBMED using multiple iterations of search terms as follows: transgender, Gender non-conforming, gender non-binary, cancer screening, cancer management, breast cancer, prostate cancer, ovarian cancer, endometrial cancer, testicular cancer, and cervical cancer. A total of 143 unique publications were included in the study.

Screening: The effects of long-term gender-affirming hormone therapy on cancer risk remain unknown. Given this, current cancer screening recommendations in the transgender population reverted to cis-gender screening protocols (2). The only known screening guidelines made specifically for the transgender population were released in November 2021 by the American College of Radiology for the breast (3).

Management: Prior to Gender Affirmation Surgery, a discussion must be had on organs remaining in situ. Only 8% of patients undergoing gender affirmation surgery have undergone hysterectomy at the time of Gender Affirming Surgery (2). Cancer treatment in this population requires consideration for chemotherapy, radiation, curative surgery +/- reconstruction. Hormonal therapy after should cease, however, this is usually decided by each individual patient.
Breast Cancer: Primarily managed with mastectomy and adjuvant chemotherapy.
Ovarian Cancer: Managed with salpingo-oophorectomy and chemotherapy in select cases
Uterine Cancer: Managed with Total Abdominal Hysterectomy
Prostate Cancer: Managed with Chemotherapy vs Beam radiotherapy vs Prostatectomy.
Cervical Cancer: Managed with Total hysterectomy and radiation
Testicular Cancer: Managed with Radical Orchiectomy.

Conclusion: When considering Gender Affirmation Surgery, a discussion on the future oncologic risk of the organs remaining in situ is essential. Cancer management in this patient population requires a multidisciplinary approach with special considerations to be made depending on the organ at risk. Further literature is needed to translate into better care for this population.

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A Greater Success at Weight Loss Noted After Reduction Mammaplasty

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Introduction: Reduction mammaplasty is the standard of care of symptomatic macromastia and among the benefits of this surgery are an increased ability to exercise and improved quality-of-life outcome (1-2). Patients become more motivated and successful at weight reduction after they are relieved from the back and neck pain resulting from macromastia.

Method: A prospective cohort study was performed to evaluate the success at weight reduction of women before and after reduction mammaplasty. The weight, height and body mass index (BMI) of women at first evaluation was recorded. Again the weight was recorded after 12 months of conservative management (physical therapy, weight loss and analgesics) and at 12 months after breast reduction surgery. Data collection included demographic questions, age, bra size, specimen weight, and if she was exercising. The difference between groups was evaluated using Student's t test or Chi-square test, whichever was appropriate, with a p-value of less than 0.05 being considered significant. The study was approved by the Institutional Review Board.

Results: The study evaluated 206 women with symptomatic macromastia who underwent reduction mammaplasty. The mean patient age at surgery was 31±10 years, the mean bra size was 38-D and the mean specimen weight was 921±124 grams. At 12 months prior to surgery the mean BMI of the group was 31±4 kg/m2, decreasing to 30±3 kg/m2 at the time of surgery and to

27±4 kg/m2 at 12 months after surgery. The decrease in BMI obtained one year after the surgery was found to be statistically significant ($p<0.05$) when compared to the initial BMI. Preoperative weight loss occurred in 40% (82) of the patients, while postoperative weight loss occurred in 75% (155) of the patients. All of the successful patients had incorporated exercise in their daily routines, while only 10% (5) of the non-successful ones were exercising.

Conclusion: Women with symptomatic macromastia were more successful at losing weight and incorporating exercise in their life style after reduction mammaplasty. The physical well-being improvement resulting from this surgery motivated the women to succeed at the needed weight reduction. Often medical insurance coverage is denied to women who are obese prior to breast reduction surgery, when in fact 75% of them will be able to lose weight after the surgery.

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Complications following reconstructive flap procedures: an analysis of racial disparities using ACS-NSQIP

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Purpose: Prior reports have highlighted disparities in healthcare access, environmental conditions, and food insecurity between Black and White populations in the United States. However, limited studies have explored racial disparities in post-operative complications, particularly reconstructive flap surgeries.

Methods: Flap procedures were identified in the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database based on Current Procedural Terminology (CPT) codes and grouped into three time periods: 2005-2009, 2010-2014, and 2015-2019. Univariate frequency and Chi-Square analyses were performed between the Black

and White groups across comorbidities (age, body mass index, hypertension, tobacco use, American Society of Anesthesiologist classification). Logistic regression was used to compare rates of flap failure, sepsis, superficial surgical site infection, deep surgical site infection, wound dehiscence, return to the operating room, and having any complication between White and Black patients within each time period while controlling for comorbidities. Data for flap failure was only available from 2005-2009.

Results: A total of 55,919 patients were included in the study, and 6,276 (11.2%) were Black. Black patients were significantly younger than White patients ($p<0.01$) and had increased rates of hypertension ($p<0.01$), smoking ($p<0.01$), and diabetes ($p<0.01$). Being Black was an independent predictor of developing sepsis, increasing odds by at least 1.36 times across the entire time period. From 2005-2009, Black patients had a significantly higher incidence of flap failure (aOR=2.64, 95% CI 1.45-4.80, $p<0.01$), return to the operating room (aOR=1.48, 95% CI 1.10-2.00, $p=0.01$), and having any complication (aOR=1.51, 95% CI 1.18-1.93, $p<0.01$). From 2010-2014, being Black also increased odds of wound dehiscence (aOR=1.41, 95% CI 1.08-1.83, $p<0.01$). Black patients had decreased incidence of superficial surgical site infection in 2010-2014 (aOR=0.74, 95% CI 0.59-0.93, $p<0.01$) and 2015-2019 (aOR=0.72, 95% CI 0.60-0.85, $p<0.01$).

Conclusions: Results from ACS-NSQIP demonstrate that surgical complication rates following reconstructive flap procedures were higher for Black patients. According to the American Society of Plastic Surgeons (ASPS), 13% of all patients undergoing reconstructive procedures in 2020 were Black, which represents the second highest race group behind White patients.(1) The gold standard to assess flap viability is physical evaluation by an experienced microsurgeon. Flap procedures reflect a unique situation because in addition to the structural and socioeconomic barriers that drive health inequity, studies have shown that board-certified plastic surgeons detected limb ischemia in patients with darker skin at less than half the rate of their lighter-skinned counterparts.(2) Additional research on the drivers of racial disparities is warranted to improve plastic surgery outcomes when treating Black patients.

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At the Interface of Atrocity, Art, and Anatomy: A Review of Eduard Pernkopf's Atlas of Topographical and Applied Human Anatomy in Surgical Anatomy and Medical Ethics

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The use of Eduard Pernkopf's Atlas of Topographical and Applied Human Anatomy in operating rooms is an enduring subject of ethical debate. Disturbing details around the atlas' Nazi origins create enormous moral and ethical tension when juxtaposed with this atlas' surgical utility, widely considered among the most meticulously detailed anatomical resources available. This tension, and resulting ethical debates, calls on issues of moral repulsion against Nazi terror, solidarity with its victims, and surgical duties to provide the best possible outcomes informed by the most accurate resources available.

In this paper, we conduct a comprehensive literature review of 592 articles mentioning Pernkopf's atlas to frame the evolution of discourse surrounding this Nazi-era resource. We contextualize discursive trends around major milestones in the history of this atlas, and approach this analysis from several dimensions which, together, provide insight into the ethical commitments shaping the role of ethically-fraught reference materials in modern ORs.

Publications discussing Pernkopf's atlas as a historical artifact/entity (e.g., the circumstances of its creation, considerations for continued use, etc.) are chronologically traced, allowing for the demonstration of trends in amount and tempo of discourse on this subject. These publications are also coded thematically. Themes identified by this process are analyzed and chronologized, allowing for the clarification of trends in content of discourse on this subject surrounding the milestone publications discussed above.

Publications which cite Pernkopf's atlas as an anatomical reference are quantified and chronologized for analysis of trends in the use and citation of this atlas as an anatomical resource. Publications that cite Pernkopf's atlas are also screened for acknowledgement or disclaimer of the origins of the atlas, in adherence to Vienna Protocol guidelines.1 Such disclaimers are also chronologized and reported.

Finally, reproduction of images from Pernkopf's atlas in publications are reported and chronologized, and the ethical ramifications of such display discussed.

Data resulting from this review suggest early indications that recent years have seen an increase in discussion of Pernkopf's atlas as an ethical/historical entity, and have likewise exhibited a decrease in citations of Pernkopf's atlas as an anatomical resource, suggesting that this atlas is

indeed falling out of use (likely due to a combination of factors including increased awareness and conscientious copyright withholding by former copyright-holder Elsevier).

A perhaps-counterintuitive trend which highlights the complexity of the ethical issues surrounding non-consensual depiction of cadavers shows a greater increase in reproduction of images from Pernkopf's atlas in articles discussing the atlas as a historical/ethical entity, compared with articles citing the atlas as an anatomical reference.

Finally, early analysis-in-progress of trends in the content of articles discussing Pernkopf's atlas appear to suggest trends in themes evoked, as well as in stakeholders identified, which may reflect shifts in the common bioethical consciousness surrounding how biomedical professionals interact with issues including autonomy, treatment of past ethical violations, censorship, and condemnation of harmful biomedical practices.

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The Present Role of Advocacy within Plastic Surgery in the United States

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Introduction: The COVID-19 pandemic, the resurgence of focus on racial disparities, and the ever-evolving national conversation about gender-affirming healthcare have all starkly highlighted the ways in which physician advocacy can be a powerful tool for the best interest of patients if utilized correctly. National and local methods each bring a unique way to advocate for patients, the healthcare system, and for ourselves as plastic surgery providers. The aim of this review is to summarize the range of ways to become involved in advocacy, whether it be through large-scale organizations or individual community involvement.

Legislative Advocacy Committee (LAC): The LAC is the advocacy branch of the American Society of Plastic Surgeons. The goal of the organization is to monitor and advocate for any health policy or issue that directly affects plastic surgery patients or the greater practice of plastic surgery. There are federal, state, and regulatory chairs of the LAC who oversee these specific contexts. The LAC monitors legislation moving through the political system that affects plastic

surgery patients and practice (1). In addition, they work in conjunction with legislators to create laws that align with ASPS interests and priorities. One of the least publicized, yet very important roles of the LAC is the act of preventing legislation that could be harmful to plastic surgeons. The LAC also works with many other prominent groups to advocate powerfully for bills that benefit the entire field of medicine, such as the Resident Shortage Act of 2021 which would increase the number of Medicare-funded residency positions by 14,000 over the next 7 years (2).

PlastyPAC: The PlastyPAC is a bipartisan, 14-member political action committee that plays a key role in how the LAC develops relationships with specific members of Congress (3). The money donated to PlastyPAC goes directly to congressional campaigns, which generally allows for an audience with the candidate and a chance to build a direct relationship with them. This is an important component of health policy advocacy, as time spent educating legislators can increase their willingness to represent a particular issue. PlastyPAC is very consciously bipartisan, and in this season, $167,844 went to Republican legislators, while $102,000 was given to Democrats (4).

Local Advocacy: Critical connections can also be made at a local level. Local educational networks can be great avenues for advocacy, through grand rounds presentations or interdisciplinary education sessions. Pushing for beneficial changes through local committees can also be a form of advocacy. One example through the COVID-19 pandemic has been the creation of peri-operative committees which have been making recommendations for the scheduling of elective cases. Plastic surgeons have proven they have a necessary perspective on advising on the urgency, or lack thereof, of certain procedures over others.

Conclusion: Regardless of attending, fellow, resident, or medical student status, there is a role to play in advocating for plastic surgery patients. Be it through national or local advocacy routes, there have been, and should always be, plastic surgeons willing to utilize their expertise in the political and legal spheres.

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Functional Outcomes of Rhinoplasty as Measured by Acoustic Rhinometry and Rhinomanometry

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Background: Rhinoplasty is the most common facial cosmetic procedure performed in the United States and can be done for both aesthetic and functional reasons.[1] While the aesthetic improvements of rhinoplasty can be assessed easily, the preferred method of functional evaluation of nasal breathing remains challenged in literature.[2] Acoustic rhinometry (AR) gives valuable information about the anatomical cross-sectional area and volume of the nasal airway, and rhinomanometry (RMM) indicates functional airway resistance during inspiration.[2,3]

Purpose: The aim of this literature review is to assess the functional outcomes of rhinoplasty as measured by AR and RMM, and to assess the utility of these objective measures.

Methods: A systematic review was conducted using PubMed/MEDLINE databases. Data extracted and analyzed included patient demographics, indications for rhinoplasty, and acoustic rhinometry or rhinomanometry results. Selection criteria included randomized clinical trials, prospective or retrospective control clinical trials, and cohort clinical studies.

Results: Our initial search resulted in 120 articles, and only 29 of which included acoustic rhinometry or rhinomanometry results and ultimately included in our analysis. AR was highly responsive to rhinoplasty, and showed significant improvement postoperatively. However, RMM was less sensitive and did not show significant postoperatively.

Conclusions: AR and RMM are the two primary tools to objectively assess nasal obstruction. AR was seen to improve after rhinoplasty but is not always in agreement with subjective measures. When assessing functional outcomes of rhinoplasty, it may be important for the physician to not only consider subjective patient feedback, but also consider changes to AR measures.

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Surgical pearls for immediate lymphatic reconstruction in breast cancer patients

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Immediate Lymphatic Reconstruction was proposed by Dr Boccardo in 2011, as LYMPHA technique. 1 Systematic review and meta-analysis and cost-effectiveness of this technique have been published. 2,3

We have been using this technique in breast cancer patients who undergo axillary dissection because of nodal metastasis of breast cancer. We have operated on 32 patients up to present day with a median follow up of 12 months (range 1-26 months). No LYMPHA-related complications have been presented. Long term follow up of around 4 years is required to assure the effectiveness of this technique, we are performing this technique as part of a prospective study.

In the meanwhile, based on our observation, we can propose some surgical pearls to promote a better outcome with this technique.

Communication between resective and reconstructive team, for full preservation of lateral thoracic vessels. We opted for lateral thoracic vein to preserve thoracodorsal vein in case of a future lat dorsi flap.

Localization of cut lymphatic channels through patent blue dye injection in the inner aspect of the arm, once nodal dissection is indicated if sentinel node biopsy is positive. We wait until sentinel node biopsy is done, to avoid interference of the blue dye with visualization of sentinel node.

Fresh cut of lymphatic channels to resect the end injured by energy cut like electrocautery or ligasure system.

Dissection of lateral thoracic vein up to 10cm in length, to anastomose lymphatic channels with octopus technique, without tension, specially avoid tension under abduction of arm, which will be essential to radiotherapy application to axilary site.4

Take the arm to full abduction under direct visualization of lymphaticovenular bypass to assure a lack of tension with this movement.

Surround the anastomosis with adipose tissue, for protection of bypass, to avoid injury with suction drain.

Sharing this experience we hope to promote more randomized comparative studies for evaluation of immediate lymphatic reconstruction effectiveness.

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Eradication of Bacterial Growth with Topical Antibiotic Treatment in Human Collagen Hydrogel Carrier

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Purpose: Chronic wounds can be devastating to healthcare systems globally; approximately 6.5 million individuals within the US alone are affected by chronic wounds. (1) The susceptibility of chronic wounds to bacteria makes them prone to long-term infections, yielding complex wound environments that are difficult to treat. Current treatment for infected chronic wounds consists of high-dose oral and intravenous antibiotics; however, this treatment is ineffective in eradicating bacterial biofilms, leads to antibiotic resistance, and can impair physiologic wound repair mechanisms. Our lab has developed a novel human collagen hydrogel (cHG) embedded with antibiotic (cHG-abx) for topical treatment of infected chronic wounds that is able to mitigate the risks of current treatment while providing physiologic ECM proteins needed for wound repair. We hypothesize that topical administration of our novel cHG-abx will effectively inhibit growth of multiple clinically important and common bacteria while maintaining mammalian cell viability.

Methods: C. perfringens and MRSA were treated with 100X minimum inhibitory concentration

(MIC) of clindamycin (100 μg/ml) and gentamycin (500 μg/ml), respectively. Human collagen hydrogel preparation: 2.5% cHG was fabricated from a previously established protocol. Prepared cHG was mixed with antibiotic and incubated to induce gelation. Modified Kirby-Bauer: cHG-abx was gelled onto polycarbonate films and allowed to elute in PBS for various timepoints before being placed onto inoculated agar. After 12 hours of treatment, the zone of inhibition was measured. Crystal violet assay: Various eluted cHG-abx were added to bacterial suspensions, incubated, then stained with crystal violet solution. Absorbance was measured at 595 nm and compared to a non-treated well. Mammalian cell cytotoxicity: Wells seeded with human and mouse fibroblasts and ADSCs were treated with cHG-abx for 24, 48, and 72 hours before quantifying viability.

Results: No significant mammalian cell death was seen at any time point. Both Kirby-Bauer and crystal violet assays demonstrated significant bacterial inhibition for 48 hours compared to no treatment for C. Perfringens and MRSA. Furthermore, significant differences in bacterial elimination over elution time points indicate sustained release of antibiotics.

Conclusion: Human collagen hydrogel embedded with antibiotics is capable of sustained low-dose antibiotic release to successfully inhibit growth of various clinically relevant bacterial strains in vitro. Furthermore, the gel shows promise for in vivo application, as no significant mammalian cell death was found.

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A Single-Institution, Retrospective Chart Review of Outcomes and Complications Following Infant Ear Molding with the EarWell System

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Background: Approximately one-third of infants are born with ear anomalies, more than two-thirds of which do not self-correct.1 Ear molding is the mainstay of nonsurgical correction and is commonly initiated as soon as possible after birth while cartilage remains malleable due to high

concentrations of circulating maternal estrogens in the infant bloodstream.1 The purpose of this study was to examine the outcomes and complications associated with infant ear molding using the EarWell system at a single institution.

Materials and Methods: We conducted a retrospective chart review of all infants who underwent ear molding with pediatric plastic surgery from October 2010 to March 2021. Ear anomalies were classified as deformations, malformations, or multiple anomalies. Age at initiation, duration of treatment, temporal gaps in treatment, comorbidities, and details regarding any complications were also extracted for included patients. The primary outcomes assessed were degree of ear anomaly correction, incidence of skin complications, and unanticipated cessation of treatment. Parents of included patients were also sent a questionnaire regarding their children's experiences with the ear molding process in which four outcomes regarding ear appearance (overall appearance, "natural" look, symmetry, prominence) were rated on a 4-point Likert scale and cumulatively scored out of 16.

Results: A total of 184 ears of 113 patients were treated during the 11-year study period. Mean age at treatment initiation was 21 days, and average duration of treatment was 40 days. Helical rim deformities (N=50 ears) and lop ear (N=40 ears) were the most common anomalies present. Nine ears possessed characteristics consistent with two different anomalies. A total of 181 ears (98.4%) achieved either a complete (N=125 ears, 67.9%) or partial correction (N= 56 ears, 30.4%) upon treatment completion. There was no statistically significant association between age at initiation ($p = 0.314$), duration of application ($p = 0.198$), or type of anomaly ($p = 0.192$) and partial vs. complete correction. The most common complications were eczematous flares (N=27 occurrences among 25 ears, 13.6%) and pressure ulcers (N=23 occurrences among 21 ears, 12.5%). Incidence of complications was not significantly associated with age at application ($p = 0.269$), duration of application ($p = 0.238$), or type of anomaly ($p = 0.106$). Infants who experienced a complication were 3.36 times more likely to achieve partial correction ($p < 0.001$; 95% CI 1.66-6.81) relative to complete correction. Questionnaire responses were received for 24 out of 113 patients (21.2%) and were categorized into "Successful" (N=21, 87.5%) and "Unsuccessful" groups (N=3, 12.5%) depending on whether respondents denoted the ear molding process as successful or unsuccessful, respectively. The average cumulative appearance score for the "Unsuccessful" and "Successful" groups was 11 ± 2.6 and 15.4 ± 1.6, respectively, with a statistically significant difference between groups ($p = 0.002$).

Conclusions: The EarWell system is an effective treatment strategy for infant ear anomalies, with most patients achieving complete correction. Addressing complications early may help providers optimize outcomes.

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The Keystone Flap: Review of Utility and Versatile Clinical Applications

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Introduction: The Keystone Perforator Island Flap (KPIF) was developed almost a decade ago; however, the approach has only recently been recognized for its advantages in various clinical applications in plastic and reconstructive surgery.1–3 A better understanding of the versatility and modified approaches to KPIFs can help to promote the widespread adoption of this technique for complex wound closures in various anatomical regions, particularly for defects that have failed previous attempts of primary closures.

Methods: A retrospective chart review was conducted of patients undergoing KPIFs from 2020 to 2022 at the authors' home institution. The indications, surgical approaches, patient characteristics, and outcomes were extracted for review and analysis.

Results: A total of 11 patients ranging from 15 to 87 years of age underwent Type IIa (flaps with deep fascia divided at edges) and Type III (two opposing flaps used for larger defects) KPIF closure. Of these, three were performed on the upper back for cancerous skin lesions, two were performed for foot wounds complicated by chronic osteomyelitis, and six were performed in the natal cleft area for recurrent pilonidal disease or lumbosacral trauma. The mean defect size was 14 x 11 x 2.5 cm for the upper back lesions, 3.5 x 2 x 1cm for the foot wounds, and 13.5 x 5 x 5cm for the intergluteal cleft defects. In 64% of the cases, the defects had failed at least one attempt at primary closure prior to the KPIF. The average follow-up time was approximately four months. Three of the 11 cases had post-operative complications: one of the upper trunk KPIFs and one of the metatarsal KPIFs were complicated by superficial dehiscence requiring delayed primary closure and another upper back KPIF had a hypertrophic scar requiring intervention. All of the intergluteal cleft defects had failed previous attempts at primary closure or with paraspinal muscle flaps. However, there were no minor (not requiring medical or surgical intervention) or major complications following closure with KPIFs for the management of intergluteal cleft defects based on the superior gluteal artery perforators.

Conclusion: KPIFs are a simple, safe, and suitable option for reconstructive closure of defects in many anatomical areas, including wounds complicated by previous failed closure attempts, with low complication risk profile.

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A Novel Pressure Distribution Device for Prevention of Pressure Injury: Design Thinking in Plastic Surgery

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Background: Despite recent advances in medical technology, pressure ulcers remain a significant problem affecting millions of patients each year. In the United States alone, over 2.5 million patients develop new pressure ulcers each year with quadriplegics, chronically hospitalized patients, and the immobilized elderly comprising the most vulnerable populations.1–3 State-of-the-art air fluidized beds are the current gold standard for prevention and treatment.4 However, these mattresses can be extremely costly in the tens of thousands of dollars, rendering them inaccessible to patients in low resource settings and prohibiting reconstructive efforts given the high likelihood of recurrence. As such, the objective of this study was to design a cost-effective technology which could prevent formation of new pressure ulcers and protect existing wounds and flaps from additional pressure injury.

Methods: A multidisciplinary team of plastic surgery residents, medical students, and engineers was assembled to brainstorm potential designs for a novel pressure-offloading device. The sacrum and ischium were chosen as target regions given the relatively high incidence of ulcers around these bony prominences. Must-have features of the device were then outlined, including the need for the device to have the capability to physically lift bony prominences and wounds from the underlying surface, for components to be easily replaceable for hygienic reasons, for the device itself to not inflict further pressure injury, and for the device to be more affordable than

current low-cost pressure mats on the market.

Results: A prototype was developed and tested that met all identified criteria and constraints. It possesses three inflatable cylindrical air cells approximately arranged in a triangle. The device may be placed under the gluteal region, and the air cells inflate and deflate on different time scales in a manner that maintains the hips in perpetual motion. In turn, the sacrum does not experience the full pressure it would normally sustain in the absence of the device. Moreover, the ischia are either exposed to more or less pressure than typically sustained in a manner consistent with Kosiak's principle. The air cells, constructed from heat-sealable plastic, may be easily replaced and contain a pressure-sensing system that ensures that they do not deflate under pressure. The device can be controlled with a mobile application connected via bluetooth technology. The total cost of construction for this device was less than 20 dollars.

Conclusions: We have designed a prototype that has the potential to be a safe, effective, and affordable medical device that can offload pressure from the sacrum and ischium. This device could serve as a cost effective tool for the prevention of pressure ulcers and protection of flaps, particularly in low resource settings where high-tech pressure distribution beds are not readily available. Future aims now include quantification of pressure-offloading using a pressure distribution sensor and clinical testing in an in-patient setting. This project serves as a proof-of-concept of how students and residents may use their medical experience to identify existing problems, brainstorm potential solutions, and assemble a prototype in collaboration with engineers.

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The Anatomic Relationship of the Distal Oblique Bundle to the Sensory Branch of the Anterior Interosseous Nerve, A Cadaveric Study

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Purpose: The sensory branch of the anterior interosseous nerve (AIN) is a common cause of volar sided wrist pain, making it a common target for denervation procedures of the wrist. This nerve courses down the forearm past several structures that need to be avoided in denervation procedures, one of which is the distal oblique bundle (DOB) (1). The DOB is a thickening of the interosseous membrane that has been shown to impart a significant amount of isometric stabilization to the distal radioulnar joint (2,3). In this study we hope to describe the path of the AIN in relation to the DOB of the interosseous membrane. Through describing this anatomy, we hope to avoid instability of the distal radioulnar joint during denervation procedures commonly used in wrist fracture/arthritis surgeries by providing guidance for safely performing such without violation of the DOB.

Methods: This study was performed on 5 frozen forearms.

The locations of the AIN relative to the ulna and radius distal and proximal to the DOB were recorded using digital calipers as were all measurements. The distance from the ulnar styloid process to the origin and the distance from the radial styloid process to the insertion were measured; both were also measured from the distal radius dorsal ulnar corner. The length and width of the DOB were measured.

We calculated the mean distances of the AIN relative to the radius and ulna proximal and distal to the DOB. We described the anatomy of the DOB recording the mean location of the DOB origin, insertion, as well as its length, thickness, and width.

Results: Proximal to the DOB, the sensory branch of the AIN is located closer to the radius ($p=0.028$). The average distance proximal to the DOB to the sensory branch of the AIN is 7.14 ± 0.77mm from the ulna and 5.28 ± 0.62mm from the radius. Distal to the DOB, the sensory branch of the AIN is not located closer to either the ulna or the radius ($p=0.64$); it is located 5.63 ± 1.9mm from the ulna and 5.13 ± 1.56mm from the radius.

The DOB runs from the ulna proximally to the radius distally ($p=0.002$). From the dorsal ulnar corner of the radius, the distance to the DOB origin on the ulna is 43.40 ± 4.64mm and the distance to the DOB insertion on the radius is 27.74 ± 8.93mm. From the ulnar styloid process, the origin of the DOB was located 45.16 ± 5.24mm proximally. From the radial styloid process, the insertion of the DOB was located 41.32 ± 5.62mm proximally.
The DOB was measured to be 17.36 ± 2.8mm long from origin to insertion and 11.22 ± 3.06mm wide in its most central portion.

Conclusion: The sensory branch of the AIN was found to travel radially proximal to the DOB, it

then courses towards the center of the interosseous membrane distal to the DOB.

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Nitric Oxide Releasing Gel Increases Expression of Fibronectin, TGF-β1, and Accelerates Wound Healing in Diabetic Mice

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Purpose: According to the American Diabetes Association (ADA), over 9-12 million patients suffer from chronic ulceration each year which costs the healthcare system over 25 billion annually. There is a significant unmet need for new and efficacious therapies to accelerate closure of nonhealing wounds. Nitric Oxide (NO) plays an important role as a messenger molecule during wound repair. NO levels typically increase rapidly after skin injury in the inflammatory phase and gradually diminish as wound healing progresses. The molecular mechanisms of how increased NO concentration affects wound healing and leads to re-epithelialization and wound closure remains incompletely understood. In this study, we sought to investigate the effect of local administration of an NO-releasing gel on excisional wound healing in diabetic mice.

Methods: We utilized 15-week-old C57BL/6 mice with leptin receptor deficiency in a splinted

excisional wounding model to mimic human wound healing through deposition of new granulation tissue and re-epithelialization rather than contracture. Excisional wounds of each mouse received either NO-gel or control phosphate buffered saline (PBS)-gel treatment twice daily until full wound closure (N=5 mice per group). The wound areas were quantified and expressed as a percentage of the original wound area. To assess angiogenic signaling and vasculature in the healed wounds, sections were stained for fibronectin and TGF-β1.

Results: Topical administration of NO releasing gel significantly accelerated the rate of wound healing as compared with PBS treated mice. The mean time for complete wound healing was 14.0 ± 0.75 days in the NO gel treated group compared to 16.0 ± 0.75 days in the PBS-treated group (*$p < 0.05$). At day two and day seven of healing, as well as after wound closure, we found that immunofluorescent staining for fibronectin and TGF-β1 was significantly increased in the NO treatment group compared to the control group.

Conclusions: We have shown that application of NO releasing gel rapidly upregulates fibronectin and TGF-β1 to accelerate closure, facilitate improved ECM reconstruction, and promote tissue regeneration in chronic impaired wounds. The results of this work may have important clinical implications for the management of patients with nonhealing wounds.

One Stage Periareolar Mastopexy Augmentation with Light Weight Implants: Shifting the Paradigm

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Purpose: Single stage mastopexy augmentation using the periareolar (donut) technique is sometimes criticized due to the widening of the areola, poor scar formation and inadequate lift effect achieved. It has been suggested that the stretch and weight produced by the implant contributes to the areolar widening and poor scar formation.1
Light weight implants (B-lite, G&G Biotechnology Ltd., Haifa, Israel) are up to 30% lighter and have been shown to place less strain on the breast parenchyma.2 The purpose of this study was thus to evaluate the impact of using these light weight implants on areolar widening, scar formation, degree of lift achieved and patient satisfaction in patients undergoing a one stage periareolar mastopexy augmentation.

Method: Consecutive patients with ptosis of 2cm (or less) requiring a primary periareolar mastopexy augmentation and who were happy to receive the light weight implant were included in the study. Data collected include patient age, implant size, length of follow up, preoperative and postoperative measurements of the sternal notch to nipple distance, areolar diameter, patient satisfaction with the scar as well as patient satisfaction with the result as measured by a Likert scale of between 0 to 10, with 0 representing the lowest degree of satisfaction and 10 the highest degree of satisfaction.

Experience: 32 patients were included in the study with 2 lost to follow up. The mean age was 37 years (range 24 years to 46 years). The follow up duration was 6 months (range 4.5 months to 13 months). The implants sizes ranged from 230cc to 545cc with a mean of 325cc. All implants were round medium profile light weight implants.

Summary of results: The mean nipple elevation achieved was 1.85cm (range 1.62cm to 2.45cm). The mean increase between the pre and postoperative areolar diameter over the follow up period was 15% with a range of 5% to 25%. Patient satisfaction with the scar was rated at 7 (range 5 to 8.5) while patient satisfaction with the result was rated as 8.6 (range 6 to 9). Two complications were recorded; the first involving a palpable suture know and the second involving an area of delayed healing.

Conclusions: the use of light weight implants in single stage periareolar mastopexy augmentation is not associated with any unexpected complications and appears to counter some of the traditional short comings of this procedure frequently seen with standard heavier implants. Longer term follow up is desirable to establish the longevity of these results.

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The Anatomic Relationship Between the Wrist Flexion Creases and the Volar Radiocarpal Joint, A Cadaveric Study

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Purpose: Previous research has characterized the general relationship between the distal wrist creases with the neurovascular structures of the volar radiocarpal joint, allowing for surgeons to better navigate around these structures when making incisions (1). The relationship between the distal and proximal wrist flexion creases and the location of the volar radiocarpal joint, however, has not been objectively measured and quantified. There have been studies that have characterized the relationship subjectively. One radiographic study placed the distal wrist flexion crease distal of the volar radiocarpal joint (2). The proximal wrist flexion crease has also been found to be located at the proximal end of the volar surface of the radius (3). In this study, we will describe the anatomic relationships of the distal and proximal wrist flexion crease with the

volar radiocarpal joint.

Methods: This study was performed on 5 frozen cadaveric forearms. All distances were recorded relative to the interfossal ridge of the radius using calipers.
We identified the locations of the distal and proximal wrist flexion creases in relation to the interfossal ridge of the radius using wires under fluoroscopy. This was done by identifying the interfossal ridge of the radius via fluoroscopy and marking it with a K-wire. The distance from the K-wire to the wrist creases were measured.

The relative location of the radiocarpal joint compared to the superficial wrist creases were then measured using a hypodermic needle filled with an indigo dye; the dye was injected at the location of the wrist creases. The sample was then dissected down to the volar radiocarpal joint, and the distance between the dye and the interfossal ridge of the radius was measured using calipers.

We then calculated the mean distances from the distal and proximal wrist creases to the interfossal ridge of the radius measured via fluoroscopy and grossly. Student's T-test was then performed to see if there was a statistical difference between the distances from the wrist flexion creases to the interfossal ridge using fluoroscopy versus using the dye.

Results: Using fluoroscopy to identify the inferfossal ridge of the radius, the interfossal ridge was located 5.44±1.27 mm proximally to the proximal wrist crease and 14.16±1.71 mm proximally to the distal wrist crease. Using dye injected at the proximal and distal wrist creases, the interfossal ridge of the radius was located 6.00±0.92 mm proximally and 14.08±0.71 mm proximally, respectively.

There was found to be no statistical difference between the distance from the proximal wrist flexion crease to the interfossal ridge measured via fluoroscopy or dye ($p=0.318$). There was also no statistical difference between the distance from the distal wrist flexion crease to the interfossal ridge measured via fluoroscopy or dye ($p=0.914$).

Discussion and Conclusion: The superficial anatomy determined radiographically correlates well with the underlying deep anatomy; the volar radiocarpal joint is located proximally to both the proximal and distal wrist flexion creases.

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Preservation of Extracellular Matrix in Decellularized Human Auricular Cartilage for Recellularization

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Background: Bioengineering advances have been made in the field of auricular reconstruction, but many challenges still exist due to the lack of compatible biomaterials, the unique characteristics of cartilage, and its avascular nature. Decellularized tissue has gained popularity as a biomaterial scaffold for repopulating human cells.1 While decellularizing human auricular cartilage has been performed and proven in many bioengineering material studies, our protocol was developed with the goal of maintaining the optimal cell structure and integrity for recellularization. Many current protocols focus on complete decellularization, but not preservation of the components and structure of the cartilage itself, including the maintenance of glycosaminoglycans (GAGS).2-5 Other studies, however, have shown very time-intensive or expensive methods to ensure structural integrity of the cartilage. Therefore, we hypothesize that the optimization of auricular cartilage decellularization will be beneficial in the clinical setting as human decellularized tissue will become more commonly used in reconstructive procedures, such as the treatment of microtia.

Methods and Materials: Human adult auricular cadaver cartilage was obtained. The skin and perichondrium were removed to create a uniform structure. After an initial dry 12-hour freeze, the specimen was thawed at room temperature. The sample was then placed in phosphate-buffered solution (PBS) at -20°C and subsequently washed in deionized water. For the decellularization, the cartilage was agitated with 4% sodium deoxycholate at room temperature and washed with PBS. Next, the sample was placed in 2% deoxyribonuclease followed by 0.25% trypsin at room temperature. This process was repeated for 14 cycles in total. Trypsin was only utilized for the initial 4 cycles.

The tissue was analyzed histologically to show complete decellularization and preservation of the cartilaginous structure. The overall structure and cellular content were assessed by hematoxylin and eosin (HE) staining. Alcian blue staining was performed to assess the presence of GAGs, Masson's Trichrome for collagen fibers, and Verhoeff Van Geison's stain for elastic

fibers.

Results: Our histological data showed complete decellularization when analyzed with HE staining with preservation of the cartilaginous structure when analyzed with Masson's Trichrome. There were preserved extracellular matrix (ECM) components with well-defined structures that were comparable to those seen prior to decellularization.

Conclusion: Decellularization was successful with the new protocol. These new changes are significant in that our protocol utilizes inexpensive resources to process a human auricular ear with optimal preservation of structural integrity. Compared to current protocols, trypsin was optimized to ensure proper decellularization without interrupting surrounding ECM and removal of GAGs. The updated protocol will allow us to utilize a structure closer to the native scaffold. The next step is to recellularize the decellularized scaffold to create a structure for clinical use.

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Maxillary and Mandibular Healing After Facial Allotransplantation

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Introduction: Facial transplantation has emerged as a viable option in treating devastating facial injuries. Despite the high healing rate of Le Fort I-II-III and bilateral sagittal split osteotomies (BSSO) in non-transplant patients (with reported non-union rates of 1.6% and 2.6%, respectively),[1,2] previous studies have reported nonunion between the allograft and the recipient's bone at the area of maxillary and mandibular osteotomies. [3,4] This suboptimal bone healing remains unexplained and is still yet to be investigated. In this study, we present three patients that received facial transplantation at our institution with a focus on the healing of the mandibular and maxillary osteotomies after osteocutaneous face transplantation.

Methods: A retrospective chart review was conducted of facial allotransplantation patients at the Cleveland Clinic from December 2008 to inception. Demographics such as age, date of birth, and sex were recorded. Additional variables included procedures, revisions, reoperations, medications, and bone stability and healing. Computed tomography (CT) images assessed alignment of skeletal components, bony union quality, and stability of fixation.

Results: Three patients receiving facial allotransplantation at our institution were included in our study: two had Le Fort III segment transplantation, and one had transplantation of both a Le Fort III segment and mandibular BSSO. The Le Fort III segment in all three patients exhibited mobility and fibrous union at the Le Fort III osteotomy on CT. In contrast, the BSSO healed uneventfully after transplantation and revision surgery, with bony union confirmed by both CT and histology of the fixation area between the donor and recipient mandible bilaterally. No patients with midfacial fibrous union required revision of the nonunion as they were clinically asymptomatic.

Conclusion: Le Fort osteotomies demonstrated inferior healing in patients undergoing facial transplantation compared to Le Fort osteotomies in patients treated for malocclusion. Interestingly, the mandible healed uneventfully after facial transplantation, likely due to the amount of rich cancellous bone in the mandible. This similarly reflects bone healing rates in patients undergoing mandibular surgery for correction of malocclusion or hand transplantation at the level of the humerus, radius, and ulna. Nonunion of the midface does not require revision unless the patient is clinically symptomatic.

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Gender Disparities in the Peer-reviewed Hand Surgery Research over the Last Decade

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Purpose: The discrepancy in the proportion of the female and male trainees and physicians has been a hot topic in recent years. Predictably, both the orthopedic and plastic surgery specialties, which perform hand surgery, were noted to have female underrepresentation.1,2 AMA and the Association of American Medical Colleges have reported that orthopedic surgery is the most heavily (84.6%) male-dominated surgical field.3 The gender imbalance was also observed in plastic surgery, with only 16.6% of the practicing plastic surgeons and 13% of the program directors being female.4 This paper aimed to identify if this gender imbalance is also reflected in research in the field of hand surgery.

Methods: The past issues of 3 journals (The Journal of Hand Surgery, Plastic and Reconstructive Surgery, Annals of Plastic Surgery) published between 2010 and 2021 were screened for original articles with a minimum of 2 authors focusing on hand surgery research. Systematic, literature, and book reviews, CME articles, correspondences and letters to the editor articles were excluded. All the data was extracted to Microsoft Excel, and full names of the first and senior authors were determined using Gender API. If the gender probability was <75%, the authors searched for these names manually. If full names could not be determined, or manual search failed to return the gender of the author, the articles were excluded from the final analysis.

Results: Both names and genders were found for 2468 articles published in the Journal of the Hand Surgery. While 26.8% of first authors were female, only 14.6% of the senior authors consisted of female authors. Unsurprisingly, in the majority (69.3%) of the articles, both first and senior authors were male. The reverse was observed only in a fraction (3.6%) of the total publications.

In the 314 articles with female senior authorship, 71% of the first authors were male, which was similar to the rates (79.5%) of the male first authorship of the papers with male senior authorship. When the first author was male, there was a significantly higher likelihood of having a male senior author. (OR, 1.55 [1.19-2.03])

We could identify the names and genders of the authors of 396 Plastic and Reconstructive Surgery "Hand/Peripheral Nerve" articles. 67.4% of the first and 87.9% of the senior authors of these articles were males. Nonetheless, having a male first author did not correlate with having male senior author (OR, 1.16 [0.61-2.18]). The same trend was replicated in the articles published in the Annals of Plastic Surgery in the last decade (OR, 0.98 [0.27-3.56]). This journal had the highest rate of male first (85.5%) and senior authorship (89.9%).

Summary: Disparities exist when considering gender as it relates to publication authorship. Possible explanations include selection bias as to career choice, research interest, as well as the absolute number of men and women in the male-dominated fields of orthopedics and plastic surgery. However, as the number of female surgeons enter into these fields, sponsorship and mentorship of both learners and faculty from both senior male and female authors are needed.

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Surgeon-generated Reconstructed 3D Computed Tomography Images of Soft Tissue Lesions Improve Surgical Results on Deep Lesions

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Introduction: As 3D reconstruction technology has developed, plastic surgeons have begun to use reconstructed 3D computed tomography (CT) images, primarily for facial bone surgery and vascular evaluation. On the other hand, the use of 3D imaging on soft tissue lesions was limited due to the difficulty of automatically segmenting the region of interest (ROI), given that the soft

tissue images were expressed within the narrow Hounsfield unit (HU) scale.
However, because ROIs are distinguishable by humans, surgeons can manually segment an ROI and reconstruct it in 3D images for use in preoperative planning, such as determining precise incision lines and avoiding vital structures during surgery.
This study elucidated surgeon-generated reconstructed 3D imaging of soft tissue pathology and its application in clinical practice using an open-source program without expert help. It also evaluated the usefulness of such imaging in clinical applications.

Methods: We defined lesions that could be manually segmented as those that were negative or near zero on the HU scale (fat tissue, fluid cysts) or enhancing soft tissue lesions (tumor recurrences, inflamed tissue, or foreign bodies).
We used the Slicer open-source program for segmentation and 3D reconstruction. Five plastic surgeons and four residents were trained to use the program and apply it to clinical practice. Pre- and post-questionnaires were administered to trainees to identify the clinical usefulness of 3D imaging of soft tissue lesions. Four application cases were also presented: resectioning deep soft tissue masses, biopsying suspicious recurrent cancer lesions, draining concealed pus pockets, and planning to remove impacted foreign bodies. A Wilcoxon matched-pairs signed-rank test was used to compare differences pre- and post-training.

Results: A statistically significant result ($p < 0.05$) confirmed that a 3D image can help improve surgical outcomes (shorter incision, less bleeding, complete excision) on deep soft tissue lesions. This method was most helpful for excising deep intramuscular masses, followed by draining concealed pus pockets, removing deeply impacted foreign bodies, and biopsying suspicious enhancing soft tissue lesions.

Conclusions: This study suggests that surgeons can apply 3D imaging to soft tissue lesions and expect improved surgical outcomes. Surgeons can be expected to produce reconstructed 3D images of soft tissue lesions easily and apply them to clinical practice after simple training using an open-source program. These reconstructed 3D images can be useful preoperative planning tools for soft tissue lesions.

Predictors of Post-Operative Complications in Cranioplasty: A Preliminary Analysis

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Introduction: Predictors of post-operative complications in cranioplasty have not been well established. Although single-center studies exist that determine risk of common post-cranioplasty complications1 such as cranioplasty resorption and infection, sparse data exists for other common post-cranioplasty complications such as wound dehiscence, CSF leak, and hydrocephalus. Furthermore, although some predictors have been shown to be significant in predicting post-cranioplasty complications independently, pooled analysis have not shown significance and there is still great debate on optimal time between craniotomy and cranioplasty as well as preferred cranioplasty material.2 Additionally, post-surgical cranioplasty complications are common. While some studies estimate complications rates of <10%, others estimate complication rates of >20%.3,4 Given the high prevalence of post-cranioplasty complications, it is important to identify predictors of a wide array of post cranioplasty complications including infections, allograft failure, stroke, seizure, blood clots, and hydrocephalus, wound dehiscence and CSF leaks.

Aim: To identify predictive risk factors of a wide array of both common and rare post-cranioplasty complications.

Methods: Databases of two craniofacial surgery attendings were procured and were analyzed both qualitatively and quantitatively. Qualitative analyses involved assessing each patient file for preoperative indication, comorbidities, cranioplasty material used and postoperative complications, if any. Quantitative analyses involved measuring the surface area of cranioplasty material, midline shift, size of defect, and total volume of air present intracranially. Both analyses were performed independently by two medical trainees and validated by a third independent radiology attending. Univariate regression analysis was performed on patient comorbidities, preoperative indication, material with relation to presence of post-cranioplasty complications with logistic regression. Those predictors that had a $p < 0.15$ were included in a multivariate logistic regression.

Results: We analyzed 102 patients that underwent cranioplasty at a large NYC health system. Complication rate (any complication) was 34.31% (35/102). The most common complications following cranioplasty were surgical site infections (n=11) and wound dehiscence (n=11). Univariate analysis demonstrated that Black race was associated with significantly fewer post-cranioplasty complications ($p<0.05$). Additionally, presence of diabetes or hemorrhagic stroke significantly increased the probability of post-operative complications ($p<0.05$). Additionally, autologous transplant, presence of hematoma, age, ventilator dependence, malignancy, and bifrontal craniotomy were all associated with increased odds of post-cranioplasty complications, although not significant. Multivariate analysis demonstrated that hemorrhagic stroke and black race were significant predictors of post-operative complications.

Conclusions: Post-operative complications in cranioplasty are a common occurrence. Thus far, predictors of both mild and severe complications have not been thoroughly elucidated. Identification of predictors of post-cranioplasty complications can improve patient morbidity and mortality as well as allow physicians to better risk stratify patients. In this preliminary

multivariate analysis of 102 patients at a single-center, this study identified only hemorrhagic stroke and black race as predictors of post-operative complications. Analysis of the effect of cranioplasty defect size, midline shift, and volume of air present intracranially on post-operative complications and a multi-center study of patients who have undergone cranioplasty is forthcoming.

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Trigger Finger Release in the United States: Trends in Operative Setting and Reimbursement

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PURPOSE: Wide awake, local only, no tourniquet (WALANT) hand surgery performed in the office has seen increasing popularity with equivalent or better outcomes and patient satisfaction.1-5 This study compares office-based and ambulatory trigger finger release in the U.S., including trends in volume, financial burden, physician reimbursement and adverse outcomes over the past ten years. The authors expect that office-based procedures will demonstrate a smaller economic burden with comparable physician reimbursement and adverse events compared to ambulatory procedures.

METHODS: Data from 2010-2020Q3 were analyzed in PearlDiver, a national administrative

claims dataset. All claims for trigger finger release (CPT-26055) were identified. Claims that included concomitant hand surgery, fewer than 30 days of follow-up, younger than 18 years, and anesthesia use in office were excluded.

The cohort was stratified by setting (ambulatory, office), and trends in volume of surgery were analyzed. These groups were then matched 4:1 for age, sex, and Elixhauser Comorbidity Index, and total and physician reimbursement for the day of surgery were determined. The number of filled narcotic prescriptions, emergency department visits, and surgical site infections within 30 days of surgery were also determined. These data were compared using T-tests and chi-squared tests.

RESULTS: A total of 307,837 patients with trigger finger release were identified. After exclusions, cohorts consisted of 243,124 ambulatory surgeries and 16,004 office surgeries. For these patients, from 2010 to 2020, the proportion of office-based trigger finger releases increased from 5.3% to 9.8%.

After matching, the ambulatory cohort included 64,003 patients, and the office cohort included 16,001 patients. Total reimbursement (mean ± stdev) for the day of surgery was significantly greater for ambulatory ($895 ± 1153) than office ($462 ± 523) surgeries($p<0.001$). Within 30 days of surgery, patients with office procedures were less likely to fill a narcotics prescription (30.5% vs 50.9%, $p<0.001$), had fewer emergency department visits (2.2% vs 3.4%, $p<0.001$), and had similar rates of surgical site infection (0.5% vs 0.6%, $p=0.917$).

Overall, physician reimbursement was greater for ambulatory ($601± 497) than office ($420 ± 322) procedures in the ten-year period ($p<0.001$). Yearly analysis showed that, from 2010 to 2020, median physician reimbursement for office surgeries increased by 81% and only 25% for ambulatory, with the two being equivalent in 2020.

CONCLUSIONS: The proportion of office-based trigger finger releases nearly doubled from 2010 to 2020. Office surgeries had smaller overall financial burden (payor disbursement), lower narcotic utilization, and equivalent, if not better, rates of adverse outcomes. Additionally, physician reimbursement increased substantially for office surgeries, equaling reimbursement for ambulatory surgeries in 2020. Given the time and financial efficiency, increasing physician reimbursement, and favorable outcomes for office-based procedures, in addition to the high patient satisfaction documented in the literature, hand surgeons are incentivized to perform operations in their office rather than the ambulatory setting.

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Plastic Surgeon Involvement and Post-operative Complication Risk Factors During Soft Tissue Sarcoma Resection

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PURPOSE: Given the invasiveness of margin negative radical resection for soft tissue sarcoma (STS), some plastic surgeons and orthopaedic oncologists have opted for a multidisciplinary approach to index resection dubbed "orthoplasty" that includes plastics assistance during complex wound closure.[1,2] This study assesses risk factors of STS index resection complications at a single institution to determine the impact that plastic surgeon involvement during such procedures has on patient outcomes.

METHODS: Adult patients that underwent index STS resection between January 2005 and December 2018 were queried from an institutional database using CPT codes. Cases were excluded if the patient underwent head or neck malignancy resection or previous same-site resection at our institution. Primary outcomes analyzed include same-site reoperation, any-cause readmission, and wound healing complications, all assessed within 90-days post-resection. Predictor variables including gender, age, tumor size, operative time, ASA classification, hospital LOS, BMI, smoking, diabetes, radiation, and plastic surgeon involvement. Outcomes were verified with chart review. Univariate logistic regression was used to identify risk factors for complications, with multivariate logistic regression used to assess significant univariate predictors. Patients were then split into two cohorts: those with and without plastic surgeon involvement. Chi-squared and unpaired t-tests were used to compare categorical and continuous variables, respectively.

RESULTS: 234 patients were included in the final analysis. Univariate regression suggested the following risk factors for readmission: operative time ($p<0.001$) and hospital LOS ($p=0.002$); reoperation: operative time ($p=0.009$) and hospital LOS ($p=0.004$); and wound complications: operative time ($p<0.001$) and hospital LOS ($p<0.001$). Multivariate regression demonstrated the following independent predictors for readmission: operative time ($p=0.039$); reoperation: hospital LOS ($p=0.036$); and wound-healing complications: operative time ($p=0.009$) and hospital LOS ($p=0.006$). Upon separation into two cohorts based on plastic surgeon involvement, patients whose resection included a plastic surgeon (104 vs. 130 patients) experienced statistically similar rates of all primary outcomes despite patients with plastics involvement having expectedly longer operative times (219 vs. 107 minutes, $p<0.001$) and hospital LOS (3.96 vs. 1.33 days, $p <0.001$)–both independent predictors of complications.

CONCLUSION: Operative time and hospital LOS emerged via multivariate logistic regression as independent predictors of short term readmission (operative time), reoperation (hospital LOS), and wound healing complications (both). In our analysis of plastic surgeon involvement in STS index resection cases, patients whose cases included a plastic surgeon achieved statistically similar complication rates in all categories relative to patients without plastics involvement. Similar complication rates for plastic surgery patients were achieved despite significantly longer operative time and hospital LOS, both identified as independent risk factors for complications. As the partnership between plastic surgeons and orthopaedic oncologists evolves, risk factor analysis and patient selection will become increasingly central to limiting complications and promoting healthy outcomes.

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Effects of a Catechol-Functionalized Hyaluronic Acid Patch Combined with Human Adipose-Derived Stem Cells in Diabetic Wound Healing

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Chronic inflammation and impaired neovascularization play critical roles in delayed wound healing in diabetic patients. To overcome the limitations of current diabetic wound (DBW) management interventions, we investigated the effects of a catechol-functionalized hyaluronic acid (HA-CA) patch combined with adipose-derived mesenchymal stem cells (ADSCs) in DBW mouse models. Methods: Diabetes in mice (C57BL/6, male) was induced by streptozotocin (50 mg/kg, >250 mg/dL). Mice were divided into four groups: control (DBW) group, ADSCs group, HA-CA group, and HA-CA + ADSCs group (n = 10 per group). Fluorescently labeled ADSCs (5 x 10^5 cells/100 uL) were transplanted into healthy tissues at the wound boundary or deposited at the HA-CA patch at the wound site. The wound area was visually examined. Collagen content, granulation tissue thickness and vascularity, cell apoptosis, and re-epithelialization were assessed. Angiogenesis was evaluated by immunohistochemistry, quantitative real-time polymerase chain reaction, and Western blot.

Results: DBW size was significantly smaller in the HA-CA + ADSCs group (8% ± 2%) compared with the control (16% ± 5%, $p < 0.01$) and ADSCs (24% ± 17%, $p < 0.05$) groups. In mice treated with HA-CA + ADSCs, the epidermis was regenerated, and skin thickness was restored. CD31 and von Willebrand factor-positive vessels were detected in mice treated with HA-CA + ADSCs. The mRNA and protein levels of VEGF, IGF-1, FGF-2, ANG-1, PIK, and AKT in the HA-CA + ADSCs group were the highest among all groups, although the Spred1 and ERK expression levels remained unchanged.

Conclusions: The combination of HA-CA and ADSCs provided synergistic wound healing effects by maximizing paracrine signaling and angiogenesis via the PI3K/AKT pathway. Therefore, ADSC-loaded HA-CA might represent a novel strategy for the treatment of DBW.

An Overview of Gender-Affirming Surgical Fellowships in the United States

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Introduction: In recent years, there has been a significant increase in the awareness and demand of gender transition surgery. Surgical transition often occurs in specialized centers due to the involvement of a multidisciplinary team. Thus, residents may have limited clinical experience in gender transition and seek out fellowships. This study aims to assess the formation and characteristics of gender-affirming surgical fellowships in the United States.

Methods: A cross-sectional study was performed on all institutions with an accredited plastic surgery residency program in the United States. The official website for each program was reviewed for the presence of a gender transition fellowship. The authors then contacted program coordinators through email or telephone interview to collect data on the characteristics of the fellowship.

Results: The authors included 102 academic institutions in this study, less than half (n=48, 47%) were known as "Leader in LGBT Healthcare" centers. Seven transgender fellowships were identified; however, data was only available for 6 fellowships. All fellowships (n=6) had a 12 month duration and the average stipend was $81,225. All offered training in masculinizing and feminizing chest reconstruction. Five provided training in both masculinizing and feminizing genital reconstruction (83%), whereas one fellowship provided training in neither. Strikingly, significantly more fellowships offered facial feminization training than facial masculinization (83% vs 33%, $p<0.001$).

Conclusion: The creation of transgender surgery fellowships in plastic surgery reflects the growing demand for gender-affirming surgical training and provision. Although there is universal fellowship training in chest reconstruction, there are fewer learning opportunities for genital reconstruction and facial masculinization surgery.

Biomechanical Characterization of Human Normal Auricular and Microtia Cartilage

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Purpose/Background: Advances in microtia reconstruction, including ear scaffolding and prosthesis, have a high failure rate due to the avascular nature of cartilage, loss of structure, and immunogenic reaction to foreign material.1 Improvements in bioengineered materials and scaffolding have started to tackle these issues, but there is a noticeable gap in the microtia and auricular cartilage literature. Little testing has been performed on the biomechanical characteristics of microtia cartilage and how it compares to phenotypically normal auricular cartilage.2-4 Thus, we characterized the biomechanical properties of distinct sections of microtia cartilage relative to anatomical regions of normal adult auricular cartilage. We hypothesized that the biomechanical properties of microtia cartilage would be uniform throughout and not different from the healthy adult auricular cartilage.

Methods: Healthy adult and juvenile microtia ear cartilage, initially stored at -80°C, were thawed at 4°C overnight and dissected at room temperature. For the adult normal cartilage, 3mm punch biopsies were taken from the concha, helix, anti-helix, tragus, anti-tragus, and scapha. For the microtia ears, 4mm punch biopsies were taken from the superior, middle, and inferior regions as topographical regions could be not appreciated.

Creep indentation testing was performed to determine the compressive stiffness of the specimens. Using an automated system, an indenter tip (0.5mm for adult, 1mm for microtia) was applied to samples under various appropriate weights to achieve 10 - 15% strain within the tissue. A semi-analytical, semi-numerical, linear biphasic model and finite element analysis were used to obtain the aggregate modulus and shear modulus from the experimental data. Tensile properties were also measured. After samples were trimmed to forma dog-bone shape, they underwent uniaxial tensile strain at 1% gauge length per second until sample failure. Force data were normalized to sample cross-sectional area to generate a stress-strain curve from which tensile Young's modulus and ultimate tensile strength were obtained. The data was analyzed by using one-way ANOVA.

Results: Our study found that the tensile and compression properties of the superior, middle, inferior regions of microtia tissue were not statistically different from each other ($p > 0.05$ for all measures).

When comparing the tensile Young's modulus (5.26 MPa vs. 5.81 MPa), ultimate tensile strength (3.99 MPa vs. 3.46 MPa), aggregate modulus (154.2 kPa vs. 172.0 kPa), and shear modulus (80.6 kPa vs. 85.5 kPa) of the microtia ear to those of the adult ear, respectively, the upper portion of a healthy adult ear, including the helix and concha, was not significantly different than the microtia tissue. In contrast, the permeability of the microtia tissue (7.8 vs. 36.1 1015*m4/N.s) was significantly different than all regions of a healthy adult ear ($p < 0.05$).

Conclusion: These results have added to our understanding of microtia tissue and elucidated a possible relationship with specific regions of the healthy adult ear. We plan to combine biomechanical data with biochemical and histological data to form a more complete understanding of microtia tissue and normal auricular cartilage.

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Role of Hyperbaric Oxygen Therapy in Cosmetic and Plastic Reconstructive Surgery in Compromised Ischemic Soft Tissue: A Case Series

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PURPOSE: Hyperbaric oxygen therapy (HBOT) is an effective primary and adjunctive treatment for a wide spectrum of conditions, ranging from carbon monoxide poisoning to non-healing wounds.1 Although HBOT has been shown to improve morbidity and mortality when used as adjunctive therapy for compromised skin wounds, HBOT is still underutilized in practice, especially in the field of cosmetic and plastic reconstructive surgery. When approaching therapy, it is crucial to identify any risk factors for skin compromise in aesthetic procedures, such as age, sex, comorbidities, combined procedures, previous surgical scars, and surgical technique issues in flap design and tension in closure.2-4 In our patients, the decision to perform HBOT was based on several factors involving potential vascular occlusion, history of prior abdominal surgery, and ischemia refractory to other therapies. The purpose of this case series is to add to the current existing literature the expanding role of HBOT in treating compromised skin and subcutaneous tissue wounds.

METHODS: Here we present four successful cases of HBOT used to manage complications following facial fillers injectables, abdominoplasty, and compromise cutaneous flap after Mohs

surgery reconstruction. Case 1 is a 53-year-old female who received 1mL of Juvéderm for nasal tip refinement and presented to our clinic with nasal tip skin necrosis. Case 2 is a 30-year-old female who received Juvéderm filler injections into her left chin at an outside clinic and started developing complications of skin remodeling overlying the injection site with possible ischemia and mild smile asymmetry. Case 3 is a 46-year-old female with a history of sleeve gastrectomy with extensive adhesiolysis and open cholecystectomy with Kocher incision who underwent multiple surgeries outside of the United States, including breast lift with implants, gluteal lift, torsoplasty, abdominoplasty, and liposuction. She developed a non-healing post-surgical wound on the lower abdominal wall that was swollen, erythematous, and indurated with scant serosanguineous drainage and tissue necrosis. Case 4 is a 73-year-old female who underwent Mohs surgery for distal nasal dorsum basal cell carcinoma with closure using advancement of rectangular nasal dorsum cutaneous flap. Postoperatively, she developed necrosis of the flap tip. Photos of all patients prior to and after completion of HBOT were taken and used to assess the efficacy of treatment. Their records were retrospectively reviewed for patient demographics, medical history, surgical history, clinical diagnosis, alternative therapies attempted, and number of completed dives.

RESULTS: We found that all patients treated with adjuvant HBOT had improvements in wound healing and decreased remodeling and necrosis of the skin. We attribute this to increased local tissue oxygenation and healing of wounds from reduced hypoxia, ischemic damage, cellular death, inflammation, and acidosis with promotion of angiogenesis and collagen synthesis.5

CONCLUSIONS: The results observed in this case series suggest that HBOT is a beneficial adjunctive therapy for compromised skin wounds. Plastic surgeons should have a low threshold to refer their patients to HBOT in such cases to limit tissue necrosis and improve the outcome.

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Review of Outpatient Aesthetic Surgery Complications

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Background: In recent years, the demand for aesthetic surgery has increased with procedures like gluteal enhancement gaining popularity.[1] Knowledge of adverse effects that may occur following these surgical interventions is critical in evaluating their associated risks and overall safety.[2] Many patients undergo these procedures in outpatient settings and are later admitted on an emergent basis to the hospital with a variety of potentially life-threatening complications. This is often the result of inadequate postoperative monitoring or care.[3] The goal of this study is to review the data on complications related to outpatient aesthetic surgical procedures in order to characterize the scope of the issue and generate recommendations for improved postoperative monitoring and care.

Methods: A retrospective chart review from June 2021 to February 2022 of patients presenting to the emergency department following complications from outpatient aesthetic procedures. Variables collected include procedure type, time elapsed since surgical procedure, hospital length of stay, ICU length of stay, number of ventilator days, number of blood transfusions, number of operative interventions, mortality, diagnosis, complications, and discharge disposition.

Results: A total of 37 patients met inclusion criteria. The age range of the patient population was 23 to 55 (average age 35). All patients were female. The average number of days since surgery was 4.5, (range: 0 to 35 days) and the average hospital length of stay was 4.7 (range: 0 to 9 days). Six patients were admitted to the ICU for an average of 2.17 days and no reported ventilator days. Nineteen patients received blood transfusions, averaging 1.89 units of blood. Three patients underwent operative interventions. Thirty-five patients were discharged home, of which one required home health services and one left against medical advice. Two patients were discharged to a rehabilitation center or acute care hospital. Liposuction and gluteal augmentation "Brazilian Butt Lift" (BBL) had the highest rate of complications, accounting for 37.94% of procedures. This was followed by combined liposuction, abdominoplasty, and BBL (16.22%), liposuction (10.82%), abdominoplasty (8.12%), and combined liposuction, abdominoplasty, and breast augmentation (5.41%). Overall, the most common complication was anemia due to postoperative acute blood loss, occurring in 72.98% of patients as well as in all cosmetic procedures involving gluteal augmentation (BBL). This was followed by acute post-surgical pain (56.75%), syncope/near syncope episodes (35.14%), hypovolemia (35.14%), sepsis (18.92%), wound drainage (18.92%), infection (16.22%), cellulitis (13.51%), and wound dehiscence (10.81%). Less common complications include but are not limited to dyspnea, abnormal liver function, acute respiratory failure, and surgical site hematoma, each occurring in 5.41% of patients. Systemic complications were more common in procedures involving liposuction with

and without combined BBL procedure.

Conclusion: These results bring into focus the potentially life-threatening complications that outpatient aesthetic surgery patients incur, with the highest rates of complications occurring in liposuction and BBL procedures. Examining common complications following these procedures can provide insight for healthcare providers and lead to the reduction of adverse outcomes. These findings also underscore the need for appropriate and necessary post-operative patient monitoring and follow-up care after ambulatory aesthetic surgery.

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The Umbilicus in Plastic Surgery:

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Introduction: The umbilicus is a critical, central, visual element of the abdomen. Umbilical appearance can alter the aesthetics of the entire abdomen and is closely tied to structural anatomy and blood supply. Understanding of these concepts and their interplay is crucial for plastic surgeons performing surgery on and around the umbilicus. Umbilical manipulation, including positioning and re-creation, is a cornerstone of aesthetic and reconstructive abdominal surgery, and an important, often over-looked component of abdominoplasty, autologous breast reconstruction and umbilical hernia repair. We present a review of the published literature on umbilical anatomy, aesthetics and surgical concepts.

Methods: A review of the literature was performed. The PubMed database was searched for

published literature reporting on anatomy, aesthetics, surgical techniques, and surgical complications of the umbilicus.

Results: The ligamentous structure of the umbilicus is formed by the remnants of four obliterated fetal cord components. This structure defines outward appearance and umbilical hernia risk. Blood supply to the umbilicus comes from four deep sources and the subdermal plexus, each of which can be disrupted by surgical manipulation. The natural location of the umbilicus is around the iliac crests and this vertical height does not vary with BMI, but may be lower in men. There is no consensus regarding population distribution of umbilicus shapes, categorized as round, oval, vertical, horizontal and T-shaped, although vertical shape may be more common in men than women. Aesthetic parameters of the umbilicus include shape, depth, dimensions and location on the abdomen. Oval shape and hooding are reported as aesthetically desirable, while protruding umbilici are reported as undesirable. Location at the "golden ratio" location, 1:1.614, between the xiphoid and pubis symphysis is reported as aesthetically preferred. Umbilical surgeries include umbilicoplasty, neoumbilicoplasty and umbilical hernia repair. To create the ideal shape and depth in umbilical reconstruction many surgical techniques have been reported. Varying peri-umbilical and abdominal flap incision shapes are suggested, but patient satisfaction is reported to be greatest with the inverted-U or oval shape abdominal flap incision. Creation of adequate depth in umbilical reconstruction is an important component and can be achieved by suturing the abdominal flap to the rectus sheath, peri-umbilical fat removal and stalk truncation. Innovative umbilical reconstruction techniques include scarless umbilicoplasty and umbilical float, although these come with higher risk of flattening and poor positioning, respectively. Complications of umbilical surgery includes stenosis, necrosis and scarring, and data is limited on prevalence of these outcomes. Strategies to mitigate risk of stenosis and necrosis include a non-circular abdominal flap incision and sparing peri-umbilical flap thinning, respectively.

Conclusions: The anatomy and blood supply of the umbilicus form the foundation of the outward aesthetic appearance. Aesthetic preferences of the umbilicus include oval-shape, moderately deep depression with superior hooding, located 2/3 down the abdomen between the xiphoid process and infraumbilical crease. Umbilical reconstruction outcomes can impact patient satisfaction with abdominal surgery, and optimal outcomes are driven by technique and understanding of anatomy and blood supply.

Case Report: Surgical Management of Tessier No. 4 and Postoperative Outcomes after Three Years

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Introduction: Atypical craniofacial clefts are rare phenomena with an incidence of about 1.43 to 4.85 per 100,000 live births. The Tessier classification system defines facial clefts based on their position relative to the orbit. Tessier No. 4 is an orbito-facial cleft extending within the skeletal and soft tissue between the lower eyelid and the lip [1-3]. This report contributes a case of bilateral Tessier No. 4 clefts with at 3 years of follow-up.

Case Report: An 8-month-old Hispanic male with history presented as an international referral from rural Guatemala with findings consistent with bilateral Tessier No. 4 clefts. In partnership with a local charitable organization, the patient and family were funded to travel to the United States for reconstruction at our Children's Hospital. The patient had an initial delayed presentation, and so developed exposure keratopathy. Soft tissue deficits included bilateral orofacial clefts spanning from the lateral lip to the medial canthus with wide eyelid colobomas. The premaxilla and nasal anatomy was spared, typical of this clefting pattern. Involvement of the lacrimal apparatus contributed to epiphora and severe exposure keratopathy. Goals for reconstruction included: (1) closure of eyelids with restoration of conjunctival lining, (2) medial canthoplasty, (3) correction of enophthalmos, (4) premaxillary downfracture, (5) cleft lip repair and (6) midfacial closure. The conjunctiva was released and advanced to serve as lining for paired vertically-oriented paranasal flaps that were inset to correct the eyelid colobomas. Enophthalmos was addressed with calvarial bone grafts used to reconstruct the orbital floor. The soft tissues of the midface were widely undermined and advanced and a standard Mulliken-type bilateral cleft rip repair was performed. The patient's recovery was uncomplicated, and he was discharged on post-operative day two, returning to his home country in the second post-operative month. No complications were identified at early follow-ups. At three years following his surgery, photographs were obtained, demonstrating acceptable scarring and excellent eyelid position, with satisfactory midfacial growth. In-person follow-up has been limited secondary to financial limitations and travel restrictions put forth by the Covid-19 pandemic.

Discussion: Literature on surgical management and long-term outcomes is limited. We present a rare case of an 8-month old male with bilateral Tessier No. 4 facial clefts. This case highlights the difficulties in caring for children with complex facial clefts in the low-resource setting and the importance of local philanthropic organizations.

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Sickle Cell Trait: Should it be a Contraindication to Breast Reconstruction?

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Purpose: While sickle cell disease has long been considered a contraindication to breast free flap reconstruction, there have been less definitive decisions about the impact of sickle cell trait on these procedures. The pro-coagulation factors of sickle cell disease that can promote vessel thrombosis and ultimately flap failure and loss are still possible in sickle cell trait as has been detailed in a few case reports. We sought to analyze the patients with sickle cell trait who underwent breast free and pedicled reconstruction at a single institution to determine the reconstructive outcomes.

Materials and methods: Patients with sickle cell trait who underwent breast free and pedicled reconstruction from 2007 to present at a single institution by the lead surgeon were analyzed for demographics and surgical outcomes.

Results: 4 patients were identified as having sickle cell trait and having undergone a breast flap reconstruction. Average age was 54 years, median BMI was 25, and past medical history was notable for 1 patient being a current smoker, and 1 patient having hypertension. 2 patients received a unilateral free TRAM flap, 1 received a bilateral free TRAM flap, and 1 received a unilateral LD flap. 3 of the patients received prior hormone therapy, 1 received prior radiation therapy, and 1 received prior chemotherapy. Average follow-up was 9 months postoperatively. There were no instances of flap failure, vessel thrombosis, or pulmonary embolism. 1 patient experienced wound dehiscence.

Conclusions: In this case series we present 4 patients with sickle cell trait who successfully underwent breast flap reconstruction. Despite the procoagulant nature of sickle cell trait during times of stress, such as surgery, these patients did not experience any instances of flap thrombosis, failure, or systemic thromboembolism. More work is needed to determine how to

pre- and post-operatively optimize patients with sickle cell trait for favorable breast flap reconstruction outcomes.

The Effect of Lymphatic Microsurgical Preventing Healing Approach (LYMPHA) on the Development of Upper Extremity Lymphedema Following Axillary Lymph Node Dissection in Breast Cancer Patients

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Background: Lymphedema following axillary lymph node dissection (ALND) is a common complication that can negatively impact quality of life as it reduces the functional capacity of the affected arm. It can also predispose patients to serious infectious complications such as limb cellulitis and development of malignancy. The Lymphatic Microsurgical Preventing Healing Approach (LYMPHA) procedure involves the creation of a lymphatic to venous bypass at the time of axillary lymph node dissection (ALND) as a means of preventing lymphedema. The purpose of our study is to assess the effect of LYMPHA on the development of clinical and subjective post-operative lymphedema.

Methods: This is a prospective longitudinal study in patients with breast cancer who underwent ALND with or without LYMPHA. The incidence of lymphedema was compared between patients who underwent "ALND alone" vs. "ALND with LYMPHA" using descriptive statistics. Limb circumference of both affected and unaffected limbs were measured and used to calculate limb volume by using an equation that converts limb circumference (cm) to volume (cc). Lymphedema was defined as a volume difference of ≥ 10% between the affected and unaffected limb. Patient symptoms were also assessed and compared between the two groups. Patient demographics including age, preoperative body mass index (BMI), smoking history, comorbidities, receipt of neoadjuvant or adjuvant chemotherapy, and receipt of adjuvant radiation were compared between the groups.

Results: In our cohort of 139 patients, 104 underwent "ALND with LYMPHA", while 35 underwent "ALND alone". 52.5% of patients had documented interlimb circumference measurements. The mean age was 52.6 years old, mean BMI was 30.16 kg/m^2, 4 (2.9%)

patients had pre-operative radiation, 102 (73.4 %) had post-operative radiation, 86 patients (61.9 %) had neoadjuvant chemotherapy, and 58 (41.7 %) had adjuvant chemotherapy. With regards to demographics and treatment variables, there were no significant differences between the two study groups except that those who underwent "ALND alone" had a significantly higher incidence of diabetes mellitus (25.7% of "ALND alone" patients vs. 11.5% of "ALND with LYMPHA" patients (p=0.043)). Based on patient reported symptoms and the need to initiate complete decongestive therapy, 57.1% (n=20) of patients who underwent "ALND alone" developed lymphedema compared to 26.9% (n=28 patients) of those who underwent "ALND with LYMPHA" (p=0.0011). With regards to relative limb volume difference, 57.1% (8) of "ALND alone" patients developed lymphedema compared to 20.3% (12) of patients who underwent "ALND with LYMPHA" (p=0.0055).

Conclusion: Our data supports the universal use of LYMPHA at the time of ALND as a means of preventing upper extremity lymphedema. Further studies are needed to evaluate quality of life and functional differences between those who had LYMPHA and those who did not.

Auricular Reconstruction: Modifications to Classification and Surgical Approach

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AIM: One of the primary treatments for microtia is two-stage autogenous auricular reconstruction. The first stage involves a costal cartilage framework inset, and the second stage elevates the framework using fascial flaps, wedge cartilage grafts, and skin grafts. We present modifications to the conceptual classifications and surgical approach to auricular reconstruction with a focus on small concha-type microtia

MODIFICATIONS TO TECHNIQUE: 1) Microtia is classified into four sub-categories: lobule type, conchal type, small concha-type, and anotia. Planning the surgical approach begins with accurately identifying the category. Small concha-type microtia is often overlooked or thought to be a simple indentation in the conchal bowl region. The small concha is often a cavity, instead of an indentation, and located anteriorly to the normal conchal bowl.
2) The proper location of the ear can be determined by constructing an "auricular rectangle," a term coined by the senior author that utilizes multiple topographic references of the unaffected side in unilateral microtia: top of upper helix, caudal end of lobule, Frankfurt Horizontal line, shape of hairline, and face mask. If the face is asymmetrical like in severe hemifacial microsomia, identification of the auricular rectangle is more challenging and perfect symmetry is

less attainable. Identifying the proper location of the ear is crucial to gauge if the vestige is in a surgically-usable location.
3) Surgical technique has evolved from a V- to W-shaped incision along the posterior surface of the auricle to maximize the skin surface area and create the deep concha. The W-shape also creates a superior advancement of the vestige. If the vestige is located at the same height as the unaffected side, the flap is more U-shaped. Additionally, the W-shape can be made asymmetric to create the desired 10-15 degree posterior inclination of the ear framework.
4) The hallmark of small concha-type microtia is that the small concha is not located in the correct anatomic location, so the skin flap elevated off the indent is too anteriorly positioned to be used for the tragus as much of the literature suggests. The small concha skin pocket should instead be excised.
5) After vestigial cartilage is removed and the cartilage framework is inserted around the subcutaneous pedicle of W-flap, the anterior lobule flap and transposed W-flap are closed. Temporary suction is applied to adhere the skin envelope to the framework. The final location and posterior inclination of the ear is determined, which reveals the areas of redundant skin, typically the anterior helix. Although conventional teachings do not include skin trimming, the senior author finds that horizontal wound closure has been successful in providing uninterrupted blood supply while preventing ischemia after years of training under Satoru Nagata and years of independent practice.

CONCLUSION: These modifications advance our understanding of microtia classifications and how the surgical approach can be tailored to best utilize each component of the vestige. The functional outcomes of auricular reconstruction are especially important in light of the coronavirus disease 2019 (COVID-19) pandemic where the ability to wear masks relies on external ear function.

Comparison of Complication Rates Between Different Abdominal Lipectomy Techniques and Identification of Risk Factors

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

938

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Abstract Text:

BACKGROUND:
An evaluation of complication rates in abdominal lipectomy patients compared to type of excision pattern in relationship to BMI and other risk factors.

PURPOSE:
To compare complication rates of horizontal and inverted-T abdominal lipectomy patients with BMI and identify other risk factors to better assist surgical decision making.

MATERIAL AND METHODS:
We identified patients who underwent an abdominal lipectomy at our institution from January 2015-July 2020. Those with concurrent hernia repair were excluded. Patients were classified into three groups: 1. Horizontal lipectomy without umbilical translocation 2. Horizontal lipectomy with translocation 3. Inverted-T lipectomy with translocation. Demographics, operative details, and post-operative complications were collected for 1 year postoperatively. Bivariate analyses were conducted to determine factors associated with type of procedure and complications. Based on the results, and due to sample size constraints, groups 1 and 2 were collapsed. Crude and stratum-specific (based on BMI) odds ratios (ORs) for complications were calculated for the inverted-T as compared to the horizontal group. BMI was classified based on CDC defined cutoffs.

RESULTS:
362 patients (group 1=17, group 2=179, group 3=166) met inclusion criteria. Average age was 46.3, standard deviation (SD) of 12.2. Population was predominantly female (86.7%) and white (73.8%). 40.9% of patients experienced at least one complication. Age, gender, race, BMI, ASA,

prior massive weight loss, prior bariatric surgery, LOS, procedure duration, payment source, and complication rate were associated with procedure. Specifically, wound disruption rates were highest in group 3 (39.8%) compared to group 2 (15.6%) and group 1 (23.5%) ($p<0.0001$). The odds of experiencing a complication were greater in the inverted-T group overall and within each stratum of BMI. However, only the crude OR (2.3 95%CI:1.5-3.6) and class 1 obesity OR (2.7 95%CI: 1.3-5.9) were statistically significant ($p=0.0001$ and 0.0110, respectively).

Other factors associated with complications included BMI, tobacco use, diabetes, ASA, prior massive weight loss, and LOS. The median BMI was higher in the complication group compared to the non-complication group (31.6 vs 29, respectively, $p<0.0001$). When dividing the cohort based on BMI class (normal weight, overweight, class I, class II, and class III obesity), the incidence of wound disruption increased as did BMI (2.6%, 22.2%, 27.2%, 48.2%, and 56.3%, respectively, $p<0.0001$). Hospital re-admission rate was also higher in the class III obesity group (31.3%) compared to all others ($p=0.0238$).

DISCUSSION:
Overall, patients with an inverted-T lipectomy had more than double the odds of experiencing a complication compared to those who had a horizontal lipectomy. When stratifying on BMI class, only class 1 obesity had a statistically significant OR of developing a complication in the inverted-T group compared to the horizontal group. This was likely due to small sample size when stratifying the data to this level.

CONCLUSIONS:
Those who underwent inverted-T lipectomies had higher rates of complications than those who underwent horizontal lipectomies, regardless of BMI class. Higher BMI was also associated with higher complication rates. Further study of technique in relation to BMI with adequate sample sizes will help define best practice in abdominal lipectomy cases.

Virtual and Augmented Reality in Management of Phantom Limb Pain: a Systematic Review

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

932

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Abstract Text:

Background: Upper and lower limb amputations are frequently associated with phantom limb pain (PLP). Recently, virtual reality (VR) and augmented reality (AR) have been reported as a potential therapy of PLP. We have conducted a systematic review of literature to evaluate the efficacy of VR and AR in managing PLP.

Methods: Four databases were searched: PubMed, EMBASE, CINAHL, and Web of Science. We utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) for our organization.

Results: After the initial search and duplicate removal resulted in 164 results, title and abstract screening according to the eligibility criteria was performed. Full-text evaluation of 23 publications occurred which produced nine studies to be included in our final analysis. Seven studies used VR while two studies used AR to treat PLP.
Of the nine studies included, one received a "good" score of 25/28 based on the modified Downs and Black Quality Checklist. Seven studies were "fair"; four scored 17/25, two scored 18/25, and one study scored 16/25. Finally, one study obtained a "poor" quality score of 13/25. The low scores are a consequence of the lack of randomization, blinding, and control, which decreased the internal validity of the studies. Additionally, the small sample size affected both the external and the internal validity of all the included studies. The lowest number of treatment sessions was one, and the highest was 28. Session durations ranged from ten minutes to two hours. The sessions included variable tasks performed with the phantom limb, such as driving a car, touching a virtual target, tracing virtual figures, pedaling a virtual bicycle, and sorting games. According to Cochrane Back Review Group Qualitative Methods, this systematic review reports limited evidence on the effectiveness of VR and AR in reducing PLP as we included only one

good-quality RCT and multiple fair to poor quality before-after (pre-post) studies with no control group.
All the included studies reported improvement of PLP on one or more of the following pain scales: Numeric Rating Scale (NRS), Pain Rating Index (PRI), McGill Pain Questionnaire (MPQ), Short Form of MPQ (SF-MPQ), Visual Analog Scale (VAS), Phantom Limb Pain Questionnaire (PLPQ), Multi-dimensional Pain Inventory (MPI-D), Weighted Pain Distribution Scale, Neuropathic Pain Symptom Inventory, and Brief Pain Inventory (BPI). Furthermore, the patients reported improvement in quality of life assessed by The Trinity Amputation and Prosthetic Experience Scale and he 12-item Short Form Survey. Finally, VR and AR were effective in reducing the dose of medications like gabapentin and pregabalin.

Conclusion: Despite the promising results reported by literature, we cannot recommend using VR or AR for PLP. Most of the studies are of poor design and have limited sample size with high bias levels. Therefore, no substantial evidence can be derived from them. However, we do believe further research with high-quality RCTs should take place to increase the knowledge of the potential advantages.

Predictive Value of Integrated Plastic Surgery Applicant Research Productivity on Resident and Attending Productivity

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

790

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Abstract Text:

Background: A chief component for selection into an integrated plastic surgery residency is research productivity.1 Residency program interest in research stems from many factors including demonstration of initiative, critical thinking, and passion for the chosen field.2 Research productivity can also secure grant funding for institutions while simultaneously advancing the specialty.3 To date, no literature exists which explores whether pre-residency research productivity correlates with resident and attending productivity after completing an integrated plastic surgery residency.
Purpose: This study analyzes research productivity of plastic surgeons pre-, intra-, and post-residency to evaluate whether early-attending research productivity is associated with productivity from earlier years of training.
Methods: A retrospective review of 2006 to 2015 issues of The American Board of Plastic Surgery's Annual Newsletter to Diplomates was performed to identify newly board-certified plastic surgeons.4 Only surgeons from US medical schools matching directly into integrated programs were included. Publication counts were retrieved using the NIH's iCite tool.5 Publications were categorized as pre-residency, intra-residency, and within 6 years post-residency. All statistical analyses were carried out using STATA (13MP) with a significance level of $p<0.05$. Pairwise correlations evaluated relationships between pre-, intra-, and post-residency publications. A Mann Whitney U test determined if the decision to pursue a fellowship correlated with increased total publications. Kruskal-Wallis H and Mann Whitney U tests identified differences between publication counts between fellowship types. Linear regression determined if the length of residency correlated with total and post-residency publication counts. Linear regression also determined if graduation year correlated with total publication count.
Results: A total of 1,838 new American Board of Plastic Surgery diplomates were reviewed across 10 years of newsletters. Six hundred fifty-five (35.6%) integrated plastic surgery graduates were included for analysis. The median number of total publications (pre-, intra-, and post-residency) was 4 (interquartile range, 1 to 9). The median number of publications pre-, intra-, and post-residency were 0 (IQR, 0 to 0), 1 (IQR, 0 to 3), and 2 (IQR, 0 to 5) respectively. Given the positive skew of the data, means were not used for statistical analysis, but were found to be 0.38 ±1.2, 2.4 ±3.7, 4.8 ±8.6, and 7.6 ±10.7 for pre-residency, intra-residency, post-residency, and total publications, respectively. There is negligible correlation between pre- and post-residency publications ($r=0.0023$, $p=0.002$). Total publications and increasing graduation year had a significant correlation of 0.83 ($p<0.001$). Graduates of fellowships had significantly increased median total publications compared to those without fellowships (7 IQR, 3 to 15 vs 3 IQR, 1 to 6.5 respectively, $p<0.001$). Aesthetic surgery fellowships, however, yielded significantly fewer median total publications than other fellowship graduates with only 4.5 (IQR, 1 to 7) ($p=0.002$). Dedicated research years during residency were associated with a significant increase in median total and post-residency publications ($r=3.8$, $p<0.001$ and $r=2.1$, $p<0.001$, respectively) .

Conclusions: Pre-residency research productivity does not appear to be predictive of post-residency research productivity in Integrated Plastic Surgery. Programs looking to maximize research output in their graduates should consider applicant desires to take dedicated research year(s) in residency or pursue a non-aesthetic fellowship.

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Preserving Nipple Sensitivity after Mastectomy: A Systematic Review [and Meta-Analysis]

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

764

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Abstract Text:

Purpose: As breast-conserving procedures become increasingly safe and viable options for surgical management of breast cancer, efforts have focused on assessing and optimizing patient-reported outcome measures (PROMs), such as nipple sensation. This study aims to evaluate the current understanding of nipple areolar complex (NAC) sensation outcomes in breast cancer patients undergoing nipple sparing mastectomies (NSM) or lumpectomies.

Methods: Articles including terms related to "nipple," "mastectomy," "sensation," and "patient-reported outcome" were queried from three databases according to PRISMA guidelines. Study characteristics, patient demographics, and surgical details were recorded. Outcomes of interest included objective nipple sensitivity testing and PROMs. Reported outcomes of sensory testing using Semmes-Weinstein monofilaments (SWM) were combined using a modified classification system for assessing quality of sensation as described by Imai et al.1

Results: Of 888 manuscripts identified, 27 articles met inclusion criteria, encapsulating 2,431 total patients. Eleven studies used various objective measures to evaluate sensitivity, such as monofilament testing (n = 290 patients), and sixteen studies (n = 1,785 patients) assessed PROMs through validated or investigator-generated surveys. Three of the included studies reported NAC sensitivity in patients who received NSM with neurotization (n = 203 patients). Results of investigator surveys showed that of 1,565 patients without neurotization, nipple sensation was maintained in 29.0% (n = 453) of patients, of whom 13.4% (n = 61) reported normal sensation. Of 138 NSM patients without NAC neurotization, SWM testing showed an average loss of protective sensation in the nipple (average SWM score: 4.7) compared to normal or diminished sensation to light touch in non-operated controls (average SWM score: 2.9, n = 195). Seventy-one patients reported an overall loss of protective sensation in the areola (average SWM score: 5.5) compared to normal or diminished average sensation in non-operated controls (average SWM score: 3.1, n = 57). Of patients who underwent NSM with neurotization, one study (n = 78) reported maintenance of NAC sensation in 100% of patients, of which 16% reported normal sensation, while another study (n = 7) reported average diminished protective sensation in the nipple (average SWM score: 3.9) and loss of protective sensation in the areola (average SWM score: 4.8).

Conclusion: Our systematic review has shown that objective and patient-reported results of nipple sensitivity support nipple-sparing techniques as a viable option for preserving NAC sensation, although patients can expect decrease in sensation overall. Neurotization of the NAC during NSM shows promising results of improved postoperative nipple sensitivity, though additional studies are warranted to confirm this finding. Variations between study methodology

highlight the lack of standardization in sensory testing techniques when evaluating NAC sensation. Additionally, future studies are warranted to elucidate whether different operative techniques improve patient satisfaction and to create validated patient surveys to allow for more standardized assessments of NAC outcomes.

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Close

The Safety of Elution of Multiple Antibiotics from Collagen-Rich Hydrogel for Topical Treatment of Chronic Polymicrobial Wounds

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

682

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Abstract Text:

Purpose:
Chronic non-healing wounds significantly strain modern healthcare systems, affecting 1-2% of the population in developed countries with costs ranging between $28.1 and $96.8 billion annually1. Chronic wounds are gradually either colonized or infected with a variety of microbes,

which can warrant treatment with several rounds of systemic, oral, and IV antibiotics. As a result, antibiotic resistance develops, and wounds become more difficult to treat. Comorbidities, such as diabetes, also make treatment more challenging. Ideally chronic wounds would be treated topically with customized antimicrobial combinations.

In vivo, we have previously shown that a topical collagen-rich hydrogel (cHG) can provide controlled elution of single antibiotics leading to inhibition of bacterial growth while avoiding cytotoxicity towards host cells in a stented wound model. Characterizing the polymicrobial nature of the chronic wound is an important step in recognizing that treatment requiring more than one antibiotic is important. We hypothesize that 10 human sampled diabetic wounds will be primarily polymicrobial, and the simultaneous elution of multiple antibiotics from cHG will also be well-tolerated in mammalian cells in vitro.

Methods:

Human wound cultures:

Human wound cultures were collected and sent for lab identification from 10 patients diagnosed with diabetes mellitus suffering from a chronic wound defined as a wound present for more than 6 weeks.

Antibiotic Selection:

We performed a literature search to determine the antibiograms of bacteria isolated from chronic diabetic wounds; the most common microbes were Staphylococcus aureus, Pseudomonas aeruginosa, Enterococcus spp., and beta-hemolytic streptococci. We tested four antibiotic combinations from six antibiotics that provided the most extensive coverage against these microbes.

Collagen hydrogel formation:

2.5% cHG was synthesized according to a previously established protocol. cHG-antibiotic solutions were prepared by determining 100x the minimum inhibitory concentration of each antibiotic and adjusting the final volume to 100 mL per well. The concentrations used were 400 ug/mL vancomycin, 400 ug/mL imipenem, 200 ug/mL ciprofloxacin, 500 ug/mL ceftazidime, 1.0 mg/mL gentamicin, and 100 ug/mL clindamycin.

Mammalian cell cytotoxicity:

Human adipose-derived stem cells (ASCs), mouse ASCs, human fibroblasts (FBs), and mouse FBs were used to study cytotoxicity in differentiated and undifferentiated mammalian cells. A live/dead viability/cytotoxicity assay was performed in triplicate according to the manufacturer's instructions, and images were analyzed using MATLAB.

Results:

Diabetic chronic wounds were primarily polymicrobial, with a variety of different organisms isolated including MRSA, MSSA, Corynebacterium spp., Pseudomonas aeruginosa, and Enterobacter spp. that may require multiple antibiotics for eradication. We observed no significant cell death in mammalian cell lines treated with antibiotic-eluting hydrogel with multiple combinations of antibiotics. All cell lines had >90% survival at all timepoints.

Conclusion:

This study demonstrates that the application of a topical drug-eluting hydrogel with a combination of antibiotics in the hydrogel is safe for use in mammalian cells. This could transform the treatment of chronic diabetic wounds, which are often polymicrobial with unique

resistance patterns requiring multiple antibiotics.
References:
1. Nussbaum SR et al. An Economic Evaluation of the Impact, Cost, and Medicare Policy Implications of Chronic Nonhealing Wounds. Value Heal. Published 2018.

Close

Redefining the Pulley System of the Thumb: Back to the Anatomy Lab

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

618

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Abstract Text:

Background:
The pulley system is a subject of increasing interest in recent literature. Despite centuries of anatomic descriptions, debate persists around these structures. The A0 pulley(often called palmar aponeurosis) is a structure widely accepted in digits 2-5. Wu et al.2 describe the A0 as a primary cause of trigger finger in>30% of cases;Hetzler et al.1 report in a randomized controlled trial the A0 pulley contributes to~55% of trigger fingers;neither of these studies references the thumb. Marek et al.3 describe "any proximal bands of tissue(an A0 pulley)" as a potential contributor in pediatric trigger thumb but do not provide clear anatomic description of this structure. We offer a complete anatomic description of the pulley system of the thumb with specific interest in characterizing if and when there is an "A0 pulley."

Methods:
Twenty-four hands on 12 cadavers were dissected exposing the pulley system of the thumb from distal phalanx to thenar musculature. The known pulleys were cataloged as A1, Av, Aob and A2 pulleys. Any distinct transverse structural consolidation overlying the flexor tendon proximal to the A1 pulley was recorded.

Results:
Consistent with accepted thumb anatomy, all specimens demonstrated A1, Aob, and A2 pulleys and 20/24(83.3%) had Avariable pulleys; one thumb had two oblique pulleys.
A well-defined, proximal, transverse structure clearly delineated from the A1 pulley was observed in 15/24(62.5%) thumbs. Bilateral A0 pulley was observed in 5/12(41.6%) cadavers; unilateral A0 pulley was observed in 5 cadavers(41.6%);2 cadavers(16.7%) had no A0 pulley. The A0 pulleys ranged in size from 2-5mm in width and 0.5-1.2mm in thickness.

Conclusions:
The presence of consolidated transverse fibers termed "A0 pulley" was observed in the majority of specimens(15/24,62.5%). Based on these findings, we feel confident in anatomically describing the A0 pulley as a unique anatomic structure of the thumb pulley system.

Only 50% of cadavers demonstrated bilateral A0 anatomy, introducing a challenge in predicting contralateral pathology in patients without direct investigation. The thumb's A0 pulley could easily be missed in-vivo and not released during trigger thumb surgery leading to persistent symptoms. Given the growing literature suggesting a prominent role of the A0 pulley for digits 2-5 in trigger finger pathology, the observation of a distinct A0 pulley in the thumb should be considered by hand surgeons when treating trigger thumb.

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The Efficacy of Onion Extract and Contractubex on the Prevention or Treatment of Scars: A Systematic Review

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

562

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Abstract Presenting Author:

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Abstract Text:

Objective:
We aimed to review the literature regarding use of Onion Extract (OE) in the prevention and treatment of scars in patients.

Background:
There is currently no consensus regarding the gold standard in treatment and prevention of scars. Non-invasive interventions such as silicone gel or immune modulators are popular adjuvant treatments due to ease of application and nature.1 Several commercial formulations of OE such as Contractubex are available for the prevention of scar formation and promoting scar smoothness.2 OE has been proposed as a scar treatment and prevention modality due to its anti-microbial and anti-inflammatory properties.2 Due to the high demand for scar formation prophylaxis, investigating OE topicals will allow direct clinical application of this therapy. Since the current literature displays mixed OE outcomes, this review aims to analyze the discrepancies and bridge the gap between varying OE conclusions.

Methods:
A systematic search of the literature was done using PubMed, Scopus, and Cochrane for articles

published between January 2000 and December 2021 using the following keywords: Contractubex, OE, Hypertrophic, Keloid, Scar. Inclusion criteria were the following: (a) involved Contractubex or OE treatment; and (b) assessed scar prevention and treatment outcomes. Non-English studies, animal studies, in-vitro studies, case reports, case series, reviews, and letters to the editors were excluded. Objective, subjective, and patient reported scar outcomes after treatments, adverse effects were recorded. A meta-analysis could not be executed due to heterogeneity of data and comparison groups.

Results:
A total of 21 articles were included in the final review. Patient and Observer Subjective Assessment Scale (POSAS) and the Vancouver Scar Scale (VSS) were utilized to determine treatment efficacy of OE. 5 studies found a statistically significant improvement in overall scores and individual VSS components in the OE treatment group compared to the silicone groups. Several studies found combined treatment of OE with other topical treatment modalities such as triamcinolone or silicone gel produced a statistically significant improvement in scar symptoms. In this review, the only adverse effects encountered were minimal pruritus, irritation, and erythema, which were tolerable and study participants continued treatment without significant discomfort.

Conclusion:
This review supports OE's potential utility in scar prevention and treatment. The majority of studies examined reported minimal adverse events with OE application and significant benefits in addressing specific scar characteristics. Further research focused on elucidating effectiveness of OE and adjunctive therapy with silicone as compared to corticosteroids are needed. Additional research is also needed to investigate scar outcomes after treatment with OE with larger sample sizes and a follow up period greater than a year.

References:

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Application of Polysmooth Technique in Craniofacial Stereolithography

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

516

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Abstract Text:

Introduction:
With the growing demand for high fidelity stereolithographic models that accurately reflect patient craniofacial pathology, several studies have reported the use of commercially available 3D printers that allow limited-resource medical centers to reconstruct models comparable to their industry-made counterparts. However, most models are made using only a single filament, which accurately depicts the surface anatomy, but fails to highlight relevant intraosseous anatomy. This becomes a problem when performing pre-operative planning for surgeries requiring osteotomies where knowledge of the precise location of tooth roots and nerves is paramount to avoid injury. While industry-made 3D models are capable of highlighting both surface and intraosseous anatomy, techniques utilizing commercially available printers that produce high-quality, low-cost 3D models that accurately depict intraosseous anatomy are yet to be established.

Methods:
Utilizing previously reported open-source software and a dual extruder 3D printer, we created a protocol using Polymaker Polysmooth filament with isopropyl alcohol to create transparent stereolithographic models that accurately depict both the surface and intraosseous anatomy of a pediatric mandible, a pediatric patient with Crouzon syndrome, and an adult trauma patient. Specifically, the models accurately display the tooth roots and the course of the inferior alveolar nerve within the mandible in the pediatric and adult trauma patient while the optic nerve and maxillary tooth roots are displayed in the Crouzon patient to aid in preoperative planning of osteotomies.

Results:

We report a novel technique for creating transparent 3D models of relevant intraosseous craniofacial anatomy at a cost that mitigates the financial burden of purchasing manufactured 3D models or industrial 3D printers.

Conclusions:
As the use of 3D models that can accurately depict patient-specific craniofacial pathology continues to become more commonplace, the need for techniques that enable the user to develop low-cost 3D models continues to grow. We highlight a low-cost method for limited resource medical centers to produce high fidelity transparent 3D models with applications in preoperative planning for craniofacial surgery.

Close

Long term outcomes of autologous fat grafting to hands and feet for patients with Raynaud's

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

499

Abstract Co-Author(s):

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Abstract Text:

Background: Autologous fat grafting (AFG) has emerged as a promising treatment option for primary and secondary Raynaud's, both with and without digital ulcers. However, prospective and retrospective studies of the procedure are limited by short follow-up, and there is scant data regarding factors that can impact the likelihood of successful long-term outcomes.

Objective: The aims of this study were to (1) characterize the long-term outcomes and patient

satisfaction for AFG used to treat Raynaud's and digital ulcers, and (2) identify factors that affected the longevity and magnitude of symptom relief.

Methods: A retrospective chart review was performed of all patients (n=17) treated with AFG to the hands or feet at our institution for primary or secondary Raynaud's over an 11-year period between 2010 and 2021. Standardized phone interview follow ups were conducted with all patients, with a 65% response rate (n=11 patients). AFG to each extremity was defined as a separate surgery, and results were measured per surgery (n=23). Demographics, medical information, operative notes, and post-operative clinic notes were collected from chart review. A phone survey was used to assess pre- and post-operative symptoms based on the validated Raynaud Condition Score (RCS), initial response to AFG, long-term symptom relief, and satisfaction.

Results: Digital ulcers were present prior to AFG in 65% of surgeries, the average RCS was 5.8 (scored 0-10), and patients experienced an average of 3.5 cold attacks per day that lasted for 19.2 mins with an intensity of 2.0 (scored 0-3). At peak response level 83% of surgeries improved Raynaud's symptoms and 87% of those with ulcers reported healing. Diminished symptom relief following peak response was reported in 70% of surgeries, but in 81% of those cases symptoms at follow-up were still better than before AFG. At follow-up (defined as time of survey or time of presentation for subsequent AFG), the average RCS was 3.5 (delta -2.3, $p<0.01$), frequency of cold attacks was 2.4 per day (delta -1.1, $p<0.01$), duration was 13.7 mins (delta -5.4, $p<0.01$), and intensity was 1.1 (delta of -0.9, $p<0.01$). Younger age and primary Raynaud's correlated with larger improvements in RCS ($p<0.05$). Average follow-up was 2.9 years from AFG; 2.5 for surgeries with eventually diminishing symptom relief and 3.9 for those without. Diminishing symptom relief with symptom recurrence at 0.5, 1, and 2 years was observed in 30%, 52%, and 64% of surgeries. Median duration of maximum symptom relief was 10.5 months post-operatively. Patients with no ulcers prior to AFG (OR 0.43), higher BMI (26.2 vs. 22.6), and non-White race (OR 0.40) were less likely to experience diminishing symptom relief ($p<0.05$). In addition, patients with primary Raynaud's were less likely to experience diminishing symptom relief than those with CREST or systemic scleroderma (33% vs. 50% vs. 91%, $p<0.10$). Average patient satisfaction with AFG was 7.2/10, and 91% would recommend AFG to others.

Conclusions: AFG is an effective, albeit sometimes temporary, treatment for Raynaud's and digital ulcers. Certain subsets of patients may be more likely to experience lasting symptom relief beyond 1 year.

Union complications and Treatment after Diaphyseal Ulnar Shortening Osteotomies: A Systematic Literature Review

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

476

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Abstract Text:

Introduction:
Diaphyseal ulnar shortening osteotomies (USO) provide surgical treatment for a variety of conditions, such as radial fractures and ulnocarpal impaction syndrome. However, nonunion and delayed unions present an arduous decision for the surgeon to treat, especially whether to pursue surgical reoperation or conservative treatment. In this study, we perform a systematic literature review to determine the efficacy of various USO techniques as well as treatment for union complications.

Methods:
A systematic literature review was performed according to PRISMA guidelines using the search terms ("Non-union" or "Nonunion" or "Non union" or "Delayed union") AND "ulnar" AND "osteotomy" on the PubMed, Web of Science, and SCOPUS databases. Patients who underwent treatment with ulnar shortening osteotomies were included in the study. Exclusion criteria consisted of traumatic non-unions, non-ulnar osteotomies, epiphyseal or metaphyseal ulnar union complications, congenital defects, and studies not in English. Data regarding patient demographic, indication for ulnar shortening, surgical details, postoperative treatment, and intervention after union complication were collected.

Results: There were 29 studies with 1268 patients who underwent diaphyseal USO, with 96 (7.6%) union complications. Of these, there were 43 delayed unions and 53 non-unions reported. The mean age of patients with union complications was 42.9 years, with 35 males and 33 females. There were 142 transverse, 296 oblique, and 164 step cut procedures reported. The union complication rate was 7.7% for transverse osteotomies, 10.1% for oblique osteotomies, and 1.2% for step cut osteotomies. Delayed union was observed in 5.4% of oblique osteotomies, while non-union was observed in 4.7%. Non-union was observed in 7.8% of transverse osteotomies and 1.2% of step-cut osteotomies, without any reported delayed unions. Nonsurgical

interventions after union complications included: bone stimulation (13), casts (3), refreshment (2), low intensity pulse ultrasound and teriparatide (2), Ilazarov frame (1), bone morphogenetic protein (1), and conservative treatment (2). Surgical reoperations included iliac bone graft (14), unspecified bone graft (5), osteosynthesis without bone graft (3), vascularized femoral medial epicondyle graft (2), screw exchange (1), revision plating (1), cancellous olecranon autograft (1), DHBM (1), replacement with longer plate fixation (1), and plate removal and splint (1). Surgical reoperation successfully resolved union complication in all but one patient, who was then treated with ultrasound with resulting union after four months.

Conclusion:
The step cut technique had the lowest union complication rate of the three USO techniques, although this was recorded in only one study. Both surgical and nonsurgical interventions had excellent outcomes for union complications, with a 100% success rate for nonsurgical intervention and 96% success for surgical intervention.

Close

Incidence of Fat Necrosis Associated with Compromised Subdermal Plexus of DIEP Flaps for Breast Reconstruction

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

468

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Abstract Text:

Introduction

The deep inferior epigastric perforator flap (DIEP) is a major workhorse in autologous breast reconstruction. However, despite advancements in flap optimization, fat necrosis (FN) remains a problematic complication for both the patient and the surgeon, and rates are estimated to range from 6-17.4% [1]. The pathophysiology of FN implicates compromised vascular supply and drainage of the flap. Anatomic studies of the blood supply to abdominal fat revealed two sources: perforating blood vessels from a deep subcutaneous plexus and the subdermal plexus [2]. In certain types of reconstruction flaps may be almost completely deepithelialized, and thus the subdermal plexus incidentally compromised. The purpose of this study was to evaluate the clinical incidence of FN after de-epithelialization and excision of the subdermal plexus within completely buried flaps used for breast reconstruction.

Methods

We performed a multi-center, multi-surgeon retrospective study of all DIEP flaps used for breast reconstruction. The primary outcome measured was the incidence of fat necrosis within completely buried and deepithelialized flaps relative to flaps that were not completely buried, and thus maintained at least part of their subdermal plexus. Patients were excluded from the study if breast reconstruction was performed with stacked flaps, if there was inadequate follow-up time, or if hybrid breast reconstruction with a flap and implant/expander was performed.

Results

129 patients were included in the completely deepithelialized flap group and 446 patients were included in the non-completely deepithelialized flap group. The incidence of fat necrosis was similar between the two study groups (adjusted relative risk = 1.9 [95% CI 0.82-4.42]; p value = 0.13). The number of perforators included in each flap dissection ranged from 1-3. Follow-up time for patients was at least 3 months.

Conclusion

In conclusion, the subdermal plexus may not play a significant role in contributing to the vascular supply of abdominally-based free flap breast reconstruction, and complete flap de-epithelialization would appear to be a reasonable technique to pursue without fear of adverse consequences.

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Close

Immunomodulatory Effects Of Oxylipin 10-HOME Produced By Biofilm Results In Host-Biofilm Interaction In Breast Implant Illness

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

467

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Abstract Text:

PURPOSE: The spread of biofilms on medical implants represents one of the principal triggers of persistent and chronic infections in clinical settings. Nearly 300,000 women annually have breast implant surgery in the United States, for reasons including post-mastectomy breast reconstruction, revision of prior augmentation/ reconstruction, cosmetic augmentation, and gender affirmation. There has been increased identification of patients experiencing a constellation of symptoms related to their implants termed as breast implant illness (BII). In this work, we report that bacterial biofilm associated with breast implant, metabolize fatty acid oleic acid present in the breast tissue milieu to oxylipins, one such oxylipin identified from this study is (E)-10-hydroxy-8-octadecenoic acid (10-HOME). We hypothesize that immunomodulatory effects of oxylipin 10-HOME produced by biofilm present on the implant could be a possible etiology for BII pathogenesis.

METHODS: Implants, peri-prosthetic tissues and blood was collected from BII subjects (n=46) and two control groups, group I, (non-BII, n=34) patients with breast implants, no BII symptoms. Group II (normal tissue, n = 20), patients without an implant, whose breast tissue was removed due to surgical procedures. A questionnaire developed based on epidemiological studies on BII screened for the commonly reported symptoms associated with BII. Predictive variables included age, diabetes status, co-morbidities, type (smooth/textured) and duration of implant. Scanning electron microscopy (SEM), 16S rRNA (genomic) next generation sequencing (NGS) were used for bacterial biofilm identification. 10-HOME was quantitated through targeted and untargeted lipidomic analyses using LC-MS-MS. RNA-Seq analysis was performed on peri-prosthetic breast tissues. Flow cytometry and mass cytometry (CyToF) were conducted to investigate the role of immune cells.

RESULTS: Bacterial biofilm was detected through SEM and 16SrRNA NGS. Bivariate analysis using cross-tabulation was performed between presence of biofilm and the study groups. Using the two-sample test of proportions with z-tests, Staphylococcus epidermidis colonization was observed to be higher in the BII group (73.33%) compared to non-BII group (16.67%, p=0.018) and the normal group (10%, p=0.036). The BII group was 2.4 times more likely to have S. epidermidis colonization compared to the non-BII group (Odds Ratio=2.4). Similarly, when comparing with normal group, the BII group was 3.4 times more likely to have S. epidermidis. Elevated levels of 10-HOME in BII compared to non-BII samples, ($p<0.0001$) were observed through mass spectrometry. Positive correlation was observed between bacterial abundance and concentration of 10-HOME in BII subjects (R2=0.88). RNA-Seq analysis on peri-prosthetic tissue and flow/ mass cytometry analyses from peripheral blood derived lymphocytes showed increased abundance of CD4+ Th1 cells. Th1 cells have been reported to be activated in auto-immune diseases. No significant difference was observed in the abundance of other Th subtypes (Th2, Th9 and Th22). Oxylipin 10-HOME polarized CD4+ naïve T cells to Th1 subtype in vitro.

CONCLUSIONS: This study investigated the biofilm hypothesis of BII through a biofilm derived immunogenic metabolite. Through a systematic cause-effect based studies, the work shows activation of Th1 cells in presence of 10-HOME. The study provides the first evidence of a possible etiology of BII mediated via bacterial biofilm derived 10-HOME.

Close

Risk Factors Associated with Pressure Ulcer Recurrence after Reconstruction: Analysis of a National Database

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

426

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Abstract Text:

Background: Patients with pressure ulcer reconstruction (PUR) are susceptible to high rates of recurrence with up to 70% of patients having recurrence of their pressure ulcer (PU) despite surgical intervention. There is conflicting evidence of what patient characteristics and comorbidities are associated with increased rate of recurrence of PU's after reconstruction. This study aimed to identify patient characteristics associated with PUR failure.

Methods: PearlDiver, an insurance claims database, was queried using International Classification Diagnosis (ICD) 10 codes and Current Procedure Terminology (CPT) codes for all patients between 2014 and 2020 diagnosed with at least one PU that received at least one PUR. Patient cohorts were divided as follows: 1) Patients without recurrence and received only one surgical reconstruction either PU primary closure/excision or flap closure 2) Patients with recurrence and received multiple primary closures/excisions 3) Patients with recurrence and

received multiple flaps, 4) Patients with recurrence and received a combination of primary closure/excision and flap reconstruction. Patient demographics and comorbidities were compared between the four groups. A multiple logistic regression was performed to evaluate possible preoperative characteristics associated with recurrence of PUR.

Results: Our study identified 2693 patients that underwent PUR. Among these, 68.7% (n=1851) had resolution of their PU after the initial PUR requiring no further reconstruction. Overall,31.3% (n=842) had recurrence of their pressure ulcer after the initial PUR. Patients with an ischial PU had highest rates of recurrence at 57.6% and lowest in the sacral group at 32.2%. Logistic regression demonstrated that PUR was associated with hypoalbuminemia (OR = 1.460, 95% CI: 1.156 – 1.840) and osteomyelitis (OR = 1.329 95% CI: 1.092 – 1.619) Recurrence risk was increased for ischial PU (OR = 1.378, 95% CI: 1.057 – 1.804). Prior PU primary closure/excision increased the recurrence risk (OR = 5.61, 95% CI: 4.222 – 7.466) as did prior PU flap reconstruction (OR = 18.128, 95% CI: 12.324 – 26.665).

Conclusion: PU remains a procedure with a high recurrence rate. High risk patients can be identified based on their risk factors. Patients with hypoalbuminemia, osteomyelitis, and PU in the Ischial regions should be counseled about increased risk of recurrence following PUR.

The Adoption of Oncoplastic Surgery: Is There a Learning Curve?

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

390

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Introduction:
Oncoplastic surgery is a form of breast conservation surgery involving partial mastectomy followed by volume displacement or volume replacement surgery. As the field of oncoplastic surgery continues to grow, a large number of new oncoplastic surgeons will begin their practice in the near future. As such, we sought to determine if there was a learning curve to this surgery.

Methods:
A retrospective chart review was conducted of all patients who underwent oncoplastic surgery over a 6-year period with a single surgeon formally trained in both Plastic Surgery and Breast Oncology. Primary outcomes studied were rates of positive margins and overall complication rate; secondary outcomes were mean operative time, post-operative breast asymmetry, loco-regional recurrence, and overall survival. Outcomes were compared over 3 time intervals (2015-16, 2017-2018, 2019-2021).

Results:
A total of 117 patients were identified. Ninety-three percent of cases involved level 2 volume displacement oncoplastic surgery (using oncoplastic reduction techniques), with the majority undergoing immediate symmetry surgery (91.5%). The mean age of patients was 55.2 years, and mean BMI was 28.4. The mean Charlson Co-morbidity Index was 3.5. Over time, a greater proportion of patients with macromastia were selected ($p=0.001$). The overall positive margin rate was 10.9% and there was no significant difference in positive margin rates over the 6-year period ($p=1$). Overall complication rates, re-operation rates, and time to adjuvant therapy remained the same across the period ($p=0.31$; $p=0.69$; $p=0.38$ respectively). Rates of wound dehiscence decreased across the period (9.7% to 0%; $p=0.017$). Mean operative time also decreased (253 min to 214 min; $p=0.019$). There was no significant difference in loco-regional recurrence or mortality over the period ($p=0.73$; $p=0.34$ respectively). From a reconstructive standpoint, long term follow-up noted no significant difference in breast asymmetry ($p=0.79$).

Conclusions:
As with many complex operations, there does appear to be a learning curve with regards to oncoplastic surgery. Specifically, the operative time and the rates of wound dehiscence decreased over time. Based on our data, it can be noted that new oncoplastic surgeons can achieve an acceptably low positive margin rate and recurrence rate, as well as satisfactory reconstructive outcomes.

Close

Online Patient Reviews of Breast Reconstruction: Realself Analysis

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

382

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Abstract Text:

Background
Online ratings have increasingly become more of a priority in physician selection, insofar that the comments and ratings of patients may sometimes supersede the qualifications of a physician when seeking medical care.1,2 While there are current standards to survey breast reconstruction patients including BREAST-Q and BRECON-31, few studies have analyzed online reviews regarding breast reconstruction despite the significance of social media and online reviews.3,4 Realself.com is an online community that hosts an extensive amount of procedure and physician reviews that many prospective patients use in their decision-making.5 Therefore, we analyzed breast reconstruction reviews from Realself.com to understand factors contributing to a positive or negative patient experience.

Methods
Reviews under the breast reconstruction category from Realself.com were collected through an

automated web crawler-based in Python and Selenium. Reviews were collected from May 2009 to November 2021. These reviews were characterized according to the site's inherent rating of "Worth It," "Not Worth it", or "Not Sure". Additionally, each review was independently evaluated by authors to be determined as a positive or negative review as reviews would not align with the inherent rating system. Key factors underlying the favorable or unfavorable evaluations were identified for each review and quantified. Key factors included: physician demeanor or knowledge, thoroughness, office technology or appearance, aesthetic outcome, price, postoperative care, staff, and postoperative complications.

Results

A total of 3451 reviews from RealSelf.com were collected and evaluated. Approximately 2050 (59.96%) of the reviews listed their experience as "Worth It," 87 (2.54%) listed their experience as "Not Worth It," and 156 (1.8%) listed their experience as "Not Sure." After author review, 3225 (94.33%) were identified as positive reviews and 194 (5.67%) were negative reviews. The most common reasons for a positive review were physician demeanor (n=2600, 31.7%), aesthetic outcome (n=1955, 23.8%), and staff (n=1543, 18.8%), while negative reviews were most often due to aesthetic outcome (n=94, 28.9%), physician demeanor (n=82, 25.2%), and postoperative complications (n=75, 23.1%).

Discussion

Patient satisfaction is a complex, multifactorial outcome that physicians can potentially use to measure the quality of care. This is especially important when plastic surgeons are reviewing patient input for breast reconstruction.

Our study found that there is a strong association between the patient-physician relationship and patient satisfaction. Many negative reviews would exclusively comment on the physician's demeanor without mention of aesthetic outcome or other factors. Interestingly, negative reviews with postoperative complications stated how their physician's response exacerbated the issue, while positive reviews with postoperative complications stated how the response mitigated their concerns and was one of the factors leading to the positive review. Additionally, reviewers who found their physician to be thorough and attentive to their questions were likely to be satisfied despite unexpected aesthetic outcomes. These findings demonstrate how multifactorial the patient experience is and how certain factors may take precedence above some while also compensating for the lack of others.

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Comparing Extended Superomedial and Inferior Pedicle Breast Reduction Outcomes

Presented During:

View Presentation

Fri, 10/28/2022: 9:00 AM - 4:30 PM

Abstract No:

275

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Abstract Text:

Background:
Reduction mammoplasty is the most common breast operation and can be performed through different techniques.1 The superomedial pedicle technique is safe and effective. It has been shown to preserve innervation and vascularity to the Nipple Areola Complex (NAC) and limit bottoming out.2
We present a modification of this technique, the "extended superomedial pedicle with inverted T scar." Preservation of medial breast tissue likely enhances perfusion to the NAC making the

procedure safe for large volume resections and prevents medial hollowing. Use of the inverted T pattern facilitates tissue resection and shaping. The purpose of this study was to critically evaluate our outcomes using this technique.

Methods:
All female patients undergoing bilateral breast reduction surgery (oncoplastic reduction excluded) at the University of Florida by the senior author from 2010-2020 were retrospectively reviewed. Patient demographics, surgical details, and outcomes were recorded. Data analysis included descriptive statistics, Mann-Whitney, Fisher's Exact tests, and logistic regression models.

Results:
A total of 286 patients met study criteria. The majority (264, 92.3%) were performed as extended superomedial pedicles, with the remainder (22, 7.7%) inferior pedicles. There were 2 cases (0.8% of patients) of partial NAC necrosis in the superomedial pedicle group and 1 (4.5%) in the inferior pedicle group. Surgical times were significantly shorter in the superomedial group (113 vs 167 minutes, $p<0.0001$). Univariate analysis showed higher BMI, HTN and larger resection weights were significantly associated with 30-day and 1-year complications. Multivariable analysis showed larger resection weights increased risk of 1-year complications, with the odds ratio increasing 7% for every 100 grams of weight (95% CI=1.00-1.15, $p=.048$).

Discussion:
The extended superomedial pedicle breast reduction is an efficient and safe method, for all breast types, including very large volumes. On univariate analysis, HTN, high BMI and large resection weights were associated with 1-year complications. Multivariable analyses showed larger resection weights increased risk of 1-year complications. No difference in outcomes was found between pedicle designs.

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A Novel Approach for Management of Complex Pressure Ulcers Using Fish Skin Substitutes

Abstract Presenting Author:

Pradeep Sharma Mohan

Introduction: Pressure ulcers are caused by pressure, shear, and friction over bony prominences [1] which can develop into chronic wounds that result in significant economic burden. This is especially true of stage III and stage IV ulcers that can deepen into tendon, muscle, and bone. Patients in stage III and IV pressure ulcers often fail conservative treatment methods requiring surgical reconstructive options such as autologous skin grafts, adjacent tissue transfer and flap procedures. These ulcers remain a challenge as they are colonized with bacteria, heavy exudate, high enzymatic activities, and lack of good vascularized wound bed [2]. Acellular fish skin sourced from the Atlantic cod in Iceland contains rich amount of collagen, lipids, and fatty acids, especially Omega-3, that is anti-inflammatory. The fish skin is porous for cellular ingrowth, supports vascularization with improved granulation tissue formation while reducing scar tissue burden. We hypothesize that fish skin substitutes (FSS) can augment the healing of pressure ulcers due to its anti-inflammatory properties, and ability to not only stabilize but provide a favorable, well-vascularized wound bed to assist in pressure ulcer closure without the need for advanced treatments.

Methods: A pilot study was conducted where 5 patients with stage III and IV pressure ulcers were treated with thorough debridement followed by Omega-3 rich FSS. FSS were covered with a standard nonadherent dressing and underwent negative pressure therapy. Once the fish skin is fully integrated into the wound bed, a new graft was applied until the wound bed was flush with the wound edges or a solid bed of tissue was obtained to facilitate simpler reconstructive techniques. Factors evaluated included frequency of application, granulation tissue coverage, wound size, infection, antibiotic utilization, osteomyelitis, and hospitalization.

Results: All of the five patients achieved early granulation coverage of the wound bed, including those with areas of exposed bone, with a decrease in the wound size. The areas treated with Omega-3 rich FSS had significant wound size reductions with wounds achieving complete or near complete closure without the need for an adjacent tissue rearrangement or flap reconstruction.

Conclusion: This is the first reported evaluation of Fish Skin Substitutes for the management of severe, complex pressure ulcers. Unlike other skin substitutes, fish skin substitutes are unique in facilitating the formation of a viable soft tissue bed after debridement, leading to a significant decrease in the pressure ulcer size potentially avoiding flap reconstruction. Omega-3 rich bioabsorbable skin substitutes allow for covering of vulnerable structures and provide a mechanical barrier to irritation and possible infection. This approach opens a new space for treatment of pressure ulcers that is rapid, cost effective and enhances the patients' quality of life.

References:

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The Utility of Smartphone-Based Thermal Imaging in the Management and Monitoring of Free Flap Procedures: A Systematic Review

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Purpose: Recently, smartphone-based thermal imaging (SBTI) has emerged as a less costly and invasive alternative to standard imaging modalities, ranging from Doppler Ultrasound to CTA, for use in identification of flap perforators and rapid detection of flap failure. The relative lack of training needed to operate SBTI devices and interpret results also makes this technology an attractive means of post-operative monitoring, as quick checks can be performed by nearly all hospital ranks. Our systematic review of the current literatures aims to identify, evaluate, and summarize the potential benefit of smartphone-based thermal imaging compared to currently established imaging standards for the management and monitoring of microvascular free flap procedures during the pre-operative, intraoperative, and post-operative stages.

Methods and Materials: A systematic review of the literature published between January 2009 and June 2021 was performed. Search terms included microsurgery, thermal imaging, thermal camera, free flap, infrared camera, and FLIR. Search results were recorded and duplicates were deleted. Two authors then screened the remaining articles using PRISMA guidelines, for relevance based on the use of smartphone-based thermal imaging and study protocol. Covidence was used to assess risk of bias.

Results: Our search ultimately yielded a total of 17 applicable studies including: 5 descriptive, 3 proof of concept, 2 clinical, 1 pilot, 1 prospective cohort, 1 prospective case series, 1 case report, 1 concordance, 1 feasibility, and 1 letter to the editor. Regarding the experimental studies, 7 were conducted to assess the utility of smartphone-based thermal imaging in flap perfusion monitoring and early detection of vascular insufficiency, 6 were conducted to assess its accuracy in perforator detection, and 3 were conducted to assess both. Preoperatively, SBTI was used for perforator detection and compared with doppler ultrasound, CTA, or both. Intraoperatively, SBTI perforator detection was confirmed with ICG-FA, doppler ultrasound, or visual inspection. Post-operatively, flap perfusion monitoring by SBTI was compared against doppler ultrasound or visual inspection. Preoperatively, SBTI displayed 100% sensitivity and 98% specificity in detecting perforators, with a concordance kappa index of 0.975 ($p<0.001$) with the current gold standard CTA. Another study found SBTI outperformed doppler ultrasound in the detection of perforators (95.7% positive predictive value vs. 68.8%). SBTI has shown promise intraoperatively, predicting flap survival with a 100% correct rate in 9 cases of flap survival and

1 case of flap ischemia. Post-operatively, SBTI has revealed its ability to detect microvascular changes causing flap compromise before they can be seen macroscopically, allowing for prompt intervention and improved surgical outcomes.

Conclusions: Current literature supports SBTI as an effective method of perforator detection flap perfusion monitoring. In addition to perforator detection comparable to the current gold standard CTA and superior to Doppler ultrasound, SBTI can effectively predict flap survival and provide early detection of flap failure. SBTI also provides a quick-and-easy method for flap monitoring. An important limitation is the relative lack of literature available on SBTI technology. Overall, SBTI appears to be a cost-effective, contactless alternative to currently standard imaging modalities, although more studies are needed to confirm this.

A Descriptive Analysis of Outpatient Free Tissue Transfer in the United States

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Introduction: Microvascular free tissue transfer continues to advance through innovation in technology, surgical techniques, and optimizing postoperative care outcomes.[1] Immediate postoperative clinical monitoring remains critical for preventing flap loss. Concomitantly, many procedures that have historically been performed in the inpatient setting have begun to transition to outpatient settings in response to rising healthcare costs. However, further investigation is warranted prior to determining that ambulatory free tissue transfer is safe. This study aims to characterize patients who undergo outpatient free tissue transfer and the hospitals in which these procedures are conducted.

Methods: Data were extracted using the Healthcare Cost Authorization Project Databases Nationwide Ambulatory Surgery Sample (NASS) from 2016 to 2018. Current Procedural Terminology (CPT) codes that represent any free tissue transfer were included. Patient demographic factors such as age, sex, primary insurance, and median household income were collected. Hospital or surgical center information such as region, bed size, and teaching status were also collected.

Results: A total of 816 free flaps were reported, subdivided into five groups: free flaps comprised of muscle, skin, and/or fascia (n = 340); bone flaps requiring microvascular anastomosis (n = 324); osteocutaneous flaps including microvascular anastomosis (n = 132); toe-to-hand transfers (n = 20); and digestive system free tissue transfers such as free omental flap or

free jejunum transfer (n = 0). The mean age for the free flap subgroup was 52.1 years, bone flaps was 40.7 years, osteocutaneous flaps was 34.4 years, and toe-to-hand transfers was 14.7 years. In all but the free flap group, most patients were male, whereas in the free flap group, 99.4% of the patients were female. Private insurance was the primary payer for most patients. For the free flap, osteocutaneous, and toe-to-hand transfer groups, the largest percentage of patients were in the 75th-100th percentile median household income (42.2%, 28.9%, and 43.2% respectively), whereas most patients in the bone flap group were in the 26th-50th or 50th-75th percentile. Most of these procedures took place in urban, teaching hospitals but the regional distribution of these procedures varied. Most basic free flap and osteocutaneous procedures took place in the south (42.2% and 54.3%, respectively), bone flap operations in the west (36.1%) and toe-to-hand transfer in the Midwest (39.0%). Greater than 95% of patients in all groups had routine discharge, and no deaths were reported.

Conclusion: Outpatient free tissue transfer, while uncommon, does occur. Most patients receiving ambulatory free tissue transfer have private insurance with median household incomes above the 25th percentile and undergo these procedures in urban, teaching hospitals. Though no mortality was noted, more granular research, including morbidity, is necessary to determine if these outpatient procedures maintain the same outcomes as inpatient free flap operations.

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Prospective Outcomes of Semi-Occlusive Dressings Versus Non-occlusive Dressings Over Donor Sites for Split Thickness Skin Grafting

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Introduction: Proper wound care of the split-thickness skin graft donor sites is critical to reduce time to complete re-epithelialization, thus allowing for re-use of the donor site, and to prevent significant morbidity(1). Optimal donor-site dressings promote wound healing by preventing desiccation, removing excess exudate, allowing gaseous exchange, and accelerating re-epithelialization. Products for coverage of split thickness wounds can be loosely divided into occlusive/semi-occlusive vs non-occlusive. No large-scale studies have been performed to directly compare these classes of dressings, and smaller studies have shown no difference in infection rates(2). We used a semi-occlusive, flexible polyamide net coated with soft silicone

dressing (Mepitel, Molnlycke Health Care Peachtree Corners, GA) and compared it to a non-occlusive, bismuth impregnated dressing (Xeroform, McKesson 6555 State Hwy 161, Irving, TX) to assess any differences in pain, time to re-epithelialization, and infection rate. Our hypothesis is that these parameters do not significantly differ between these two options.

Methods: This is a single-center, prospective study of 50 patients comparing Mepitel vs Xeroform donor site coverings. Patients with a donor site >8 cm were included based on fine point discrimination in adults for the posterolateral thigh averaging 3-4 cm(3). Patients under the age of 18, with chronic pain, or opioid addiction were excluded. For every patient, half of the donor site was covered with Mepitel and the other half with Xeroform. The primary outcomes were patient reported differences in pain sensation between the two dressings using a standardized pain scale questionnaire, infection prevalence, and percent of wound re-epithelialization. All were measured by an independently trained Burn provider on post-op days five and 12. Data was analyzed with an independent T-test.

Results: Differences in patient reported pain sensation (on a scale of 0-10) between the Mepitel and Xeroform dressings were not significantly different on post-op days five ($p= 0.554$), or post-op day 12 ($p= 0.917$). Mean percent re-epithelialization of donor site wounds with Mepitel dressing on post-op day 5 and 12 were measured as 21.2% and 94.2%, respectively. Measurements for donor site wounds with Xeroform dressing were recorded as 22.1% and 89.2%, respectively. There was no significant difference in percent re-epithelialization between the two dressings on post-op day 5 ($p= 0.960$), or post-op day 12 ($p= 0.561$). No participants developed an infection over their clinical course.

Conclusion: Mepitel and Xeroform were comparable with regards to pain sensation, split-thickness skin graft donor site re-epithelialization, and wound infection rate.

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Minimizing Nerve Pain at the Neurotized Anterolateral Thigh (ALT) Flap Donor Site: Using Devascularized Vastus Lateralis Muscle as a Primary Regenerative Peripheral Nerve Interface

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Introduction: The anterolateral thigh (ALT) flap is commonly utilized for sensate reconstruction due to its consistent innervation pattern and predictable anatomy (1,2). Nerve harvest required for flap neurotization results in a neurotmetic injury of the lateral femoral cutaneous nerve (LFCN). Injury to the LFCN is known to cause morbidity from neuroma formation and neuropathic pain (3).

Use of regenerative peripheral nerve interfaces (RPNIs) have been shown to be an effective method to prevent neuroma formation after nerve transection (3, 4). ALT harvest typically involves devascularization of short segments of the vastus lateralis muscle during perforator dissection, these segments can be effectively repurposed for use as an RPNI (1, 5).
This study reports on the pain seen following iatrogenic injury to the LFCN, the use of primary donor-site RPNI in ALT flaps using devascularized vastus lateralis and discusses the future utility of this practice in mitigating the risk of postoperative donor site nerve pain following all neurotized flaps.

Methods: A systematic review following PRISMA guidelines was carried out to describe the incidence and clinical presentation of iatrogenic LFCN injury. A review of patients who underwent neurotized ALT reconstruction at a single academic medical center between 2020 and 2021 was performed. The RPNI was created using a muscle graft harvested from a segment of devascularized vastus lateralis adjacent to perforator dissection. Severity and characteristics of post-operative donor site symptoms and the resultant impact on patients' function and quality of life were assessed using a modified Mackinnon pain questionnaire.

Results: Twenty papers met the inclusion criteria. Iatrogenic LFCN injury was described in plastic surgery, orthopedic surgery, and urologic surgery with a wide range of incidence rates. Clinical presentation ranged from transient loss of sensation and neuropraxia to severe neuropathic pain requiring intervention.
At our institution, five patients underwent immediate RPNI at the time of neurotized ALT flap harvest; mean age was 37 years (range 25-60 years) at time of reconstruction and follow-up time was 6.2 months (range 3.7-11). Patients reported a mean pain severity at the donor-site of 0.6 out of 10 (range 0-2) in the last week and 1.0 out of 10 (range 0-3) in the last month; 3/5 patients reported zero donor site pain. Patients reported a minimal impact on overall quality of life, with a mean score of 0.75 out of 10 (range 0-2). Zero patients reported symptoms interfering with sleep, ability to work, or interpersonal relations.

Conclusions: Pain following iatrogenic injury to the LFCN is well described in the literature. The use of primary donor-site RPNI in this small cohort of patients with neurotized ALT reconstructions resulted in minimal to no post-operative donor site nerve pain, demonstrating the potential role of this technique in mitigating the morbidity associated with iatrogenic nerve

injury to the LFCN. By using the damaged zone of vastus lateralis muscle created during perforator dissection, no additional tissue injury is needed for muscle grafting required for RPNI. The addition of a primary RPNI is efficient with minimal risk to the patient and significant potential benefit. Based on this study we propose consideration of the routine use of primary RPNI in conjunction with all innervated ALT reconstructions.

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What's on the 'Gram': Social Media Content Among Integrated Plastic Surgery Residency Programs

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Background: Social media has emerged as an important tool for residency programs to highlight accomplishments and interact with applicants. This has been especially important during the pandemic. This study aims to compare integrated plastic surgery residency programs' Instagram accounts to identify the factors and types of content that attract the most followers and engagement.

Methods: All integrated plastic surgery residency programs listed on the American Society of Plastic Surgeons website were analyzed. For programs with Instagram accounts, data on account age, number of followers, number of posts, type of posts, and likes per post from January 2021 to December 2021 were collected. Posts were categorized as residency application-specific information (rotation opportunities, deadlines/timelines), research, educational (speakers, grand rounds), Operating Room photos (OR), or resident life. Independent t-test analyzed differences between popular (>2270 followers) and less popular accounts (<2270 followers). Spearman's correlation was run to identify factors associated with greater number of followers. All statistics were done using IBM SPSS Version: 28.0.1.0 (142).

Results: 72 integrated residency programs (90%) had associated Instagram accounts. Most accounts were managed by resident representatives. The average number of followers was 1,861 (SD=822). The top 3 most-followed programs were Johns Hopkins University (4,511), Stanford University (4,227), and Mayo Clinic College of Medicine and Science in Rochester (4,023). Most accounts were created in 2018, with an average account age of 3.28 years (SD=1.3). In 2021, programs posted an average of 34 posts each (SD=28.8), with roughly 3 posts per month. The most common post category was resident life (54.3%), followed by OR (18.4%), research (8.3%), educational (7.9%), and application-specific information (6.3%). Resident life posts had the highest engagement, accounting for 59% of all likes. Accounts with >2270 followers featured more diverse content, with significantly higher percentage of educational (9%) and application-specific information posts (8.2%) and significantly lower OR posts (15%) than accounts with <2270 followers (education: 7.1%, application-specific information: 5%, OR: 20%) ($p<0.05$). Programs with more popular accounts also had significantly higher Doximity-rank (15 [popular] vs 50), post frequency (54 posts/year vs 21 posts/year), and account age (4 years±1.3 vs 3 years±1.2) ($p<0.05$). Higher Doximity-ranked programs had more followers ($r(70)=-0.74$, $p<0.001$) and more posts ($r(70)=-0.32$, $p<0.05$). Account age ($r=0.6$), post frequency ($r=0.4$), and percentage of application-specific posts ($r=0.3$) were positively correlated with number of followers ($p<0.05$).

Conclusion: Plastic surgery residency programs use Instagram as a tool to highlight their strengths and share information with applicants. While posts about resident life were most frequent and most liked across accounts, more popular accounts also featured higher percentages of posts from other categories, including residency application-specific information. This suggests that diverse content, especially content targeting prospective applicants, attracts more followers. Name recognition and prestige (higher Doximity rankings), as well as duration of account visibility (account age) and post frequency in 2021 influenced the number of followers. This information may guide residency programs that hope to grow their social media to better engage future applicants.

Complications Following Breast Augmentation In Transgender Female: A Systemic Review And Meta-Analysis

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Purpose: Gender confirming surgery (GCS) improves quality of life and alleviates psychological distress in transgender and gender diverse individuals[1]. For a transgender female, breast augmentation with implants is a frequently sought-after procedure, as breast growth from hormone therapy alone is often inadequate[2]. Peri-operative complications such as infection, implant malposition, hematoma, and capsular contracture are well-described in the literature in treatment of hypomastia for cis-gender females, however their description in the transgender female community has been less elucidated and limited to case series. In this study, we performed a meta-analysis of the published literature to evaluate peri-operative complications following breast augmentation in transgender females to evaluate its safety and efficacy in relative to the similar procedure in cis-gender females.

Materials and methods: PubMed and the Cochrane Library and other resources were queried for studies published up to Jan 2022. The following keywords were used: "transgender", "transfeminine", "implant", "augmentation", "breast", and "chest". Primary outcomes of interest were complications (i.e. capsular contracture, hematoma or seroma, infection, implant asymmetry/malposition, hemorrhage, skin or systemic complications), patient satisfaction, and reoperation rates. Quantitative analyses were performed with STATA 16 statistical software (STATA Corp., College Station, TX, USA). Rates were pooled with the -metaprop function and reported in 95% confidence intervals. Breast implant surgery complications were compared between cis-gender and trans-gender patients. A chi-square test was performed to analyze the incidence of complications between cis-gender vs trans-gender female breast augmentation.

Results: A total 1864 patients from 14 studies were included for analysis in the transgender female group. Studies were conducted in various regions including the USA, Netherlands, Switzerland, and France. In the transgender female group, pooled rate of capsular contracture from 7 studies was 3.62% ((95% CI, 0.0038-0.0908); hematoma/seroma from nine studies was 0.63% ((95% CI: 0.0014-0.0134); infection incidence from eight studies was 0.08% (95% CI, 0.0000-0.0054); pooled rates of implant asymmetry/malposition from five studies was 4.51% (95% CI, 0.0089-0.1010.

A comparison between cis-gender vs trans-gender females was performed via chi-square test by comparison of our pooled data with previously published data from cis-gender breast augmentation meta-analyses[3,4]. There was no statistical difference between rates of capsular contracture (p=0.41) and infection (p=0.71) between the two groups, while there were higher rates of hematoma/seroma (p=0.0095) and implant asymmetry/malposition (p=0.004) in the

transgender female group.

Conclusion: Breast augmentation surgery has similar published rates of post-operative infection and capsular contracture between cisgender and transgender females but has higher rates of hematoma/seroma and malposition in the transgender group. This could be explained by contributing factors such as patient's chest size, differences in musculature and soft tissue envelope, and native nipple-areola complex position. Relative to the published literature on cisgender breast augmentation, there is a relative paucity, smaller sample size and inconsistent reporting in the transgender female group, which is a limitation of the study. Lack of reporting of complications relative to surgical approach (i.e subglandular vs submuscular implant positioning) is another limitation of the published literature in the transgender female group and an area of further study.

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The Timing of Acute and Late Complications Following Mastectomy and Implant-Based Reconstruction

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Background: Implant-based breast reconstruction is one of the most common plastic surgery procedures where clinical outcomes are well documented. However, the timing of key

complication endpoints is not well described. The goal of this study is to determine when patients are most likely to experience specific adverse events after implant-based reconstruction.

Methods: Retrospective consecutive series of patients 18-85 years who received mastectomy and implant-based reconstruction from January 1st 2015-January 1st 2021 were included. Complication endpoints including hematoma, seroma, wound infection, skin-flap necrosis, capsular contracture, implant rippling, and implant failure were identified from the medical record. A time to event analysis was performed and a Cox regression model identified patient and treatment characteristics associated with each complication.

Results: Of 1527 patients and 2518 total reconstructed breasts, 792 (31.5%) complications were identified. The 12-month cumulative incidence of hematoma was 1.4%, seroma: 4.3%, infection: 3.2%, skin-flap necrosis: 3.9%, capsular contracture: 5.7%, implant rippling: 7.1%, and implant failure: 3.9%. In a time to event analysis, 333/787 (42.3%) complications occurred within 60 days of surgery; 94% of hematomas, 85% of skin necrosis events, and 75% of seromas occurred during this period. Half of all infections and implant failures also occurred within 60 days of surgery. Of the remaining complications, 93% of capsular contractures and 93% of implant rippling occurred more than 60 days from surgery.

Conclusions: Complications following mastectomy and implant-based reconstruction exhibit a discrete temporal distribution. This data represents the first comprehensive natural history study of the timing of adverse events following implant-based reconstruction. These findings are immediately useful to guide post-operative care and clinical trial design.

Danger Zone for Paramedian Forehead Flap Elevation: Maximizing Flap Length and Viability

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INTRODUCTION: The supratrochlear artery (STA) demonstrates clinically relevant anatomical variability that impacts the utilization and success of facial reconstruction with a paramedian forehead flap. Surgical parameters including branching pattern variations of the STA 1 and the distance of the supratrochlear artery to the midline, 2 are well established. However, the location and variability of the STA pedicle have not been described adequately in the literature to date. This study will triangulate the location of the STA pedicle relative to known anatomical landmarks and outline a danger zone during dissection, aiding the surgeon in creating

maximum flap length and mobility while limiting pedicle disruption and flap compromise.

METHODS: To triangulate a danger zone surrounding the STA pedicle, measurements from the supraorbital neurovascular bundle, bony orbital rim, and the medial canthus to the STA flap pedicle were obtained bilaterally on 38 cadavers at Kansas City University and the University of Nebraska Medical Center. The facial midline to STA pedicle, a standard which has been previously described as 1.7-2.2 cm, was also measured to serve as a control.3 Data was tallied in Excel and statistically analyzed using Chi-square analysis.

RESULTS: The means and range of each measurement were used to create a surgical dissection danger zone. The measurement means and standard deviations were as follows: facial midline to pedicle 1.69 cm ± 0.14 (range of 1.3 to 2 cm); supraorbital neurovascular bundle to pedicle 1.50 cm ± 0.37 (range of 0.6 to 2.7 cm); orbital rim to pedicle 1.53 cm ± 0.38 (range of 0.6 to 2.2 cm); and medial canthus to pedicle 3.05 cm ± 0.37 (range of 2.3 to 3.8 cm). Of the 38 cadavers utilized for this study, 20 were male and 18 were female, with 35 of the specimens being embalmed cadavers and the other three fresh cadavers. No significant differences were found between right-sided or left-sided measurements ($p>.05$). Two clinically significant differences were identified ($p<.05$) between male and female cadaver measurements: the midline to pedicle and the medial canthus to pedicle. The supraorbital neurovascular to pedicle and the orbital rim to pedicle had no significant differences based on sex ($p>.05$).

DISCUSSION: Preserving the STA pedicle is vital to creating a viable tissue flap for a variety of facial procedures. Vascular disturbances of the STA pedicle may disrupt blood flow to the constructed tissue flap. This complication may lead to ischemia of the tissue flap and result in flap failure 4. Additionally, maximum flap mobility can be paramount to reach difficult defects such as nasal tip and columella. Precise isolation of the pedicle from known landmarks may help surgeons maximize flap length while still preserving blood supply.

CONCLUSION: This study has established a surgical dissection danger zone for the STA pedicle as it relates to the elevation and creation of a paramedian forehead flap. Using these measurements, the facial reconstructive surgeon can prevent pedicle violation while maximizing flap length and mobility to optimize safety and efficacy in this operation.

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Pedicled Vascularized Calcaneus Transfer: A Novel Surgical Technique for Tibial Deficiency To Improve Functional Outcome

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Background and Purpose: Tibial deficiency (TD), also known as tibial hemimelia, is a congenital lower limb deficiency that involves a spectrum of deformities of the tibia, ranging from a hypoplastic to completely absent tibia.1-3 Due to the rarity of TD and wide spectrum of presentation, there are no standard treatment guidelines. In many cases of TD presenting with complete tibial absence, early ablative procedures or partial amputation are suggested as treatment.4,5 Attempts at reconstruction have reported poor outcomes with conversion to amputation. Of the case reports that discuss reconstruction rather than amputation, treatment is dictated by the amount of residual normal anatomic structure present. For these reconstructive procedures, all require prolonged immobilization and staged reconstruction, which can be detrimental for the patient's achievement of ambulation. To date, there is a paucity of options for reconstruction that prioritize functional outcome and reduced recovery time to promote normal developmental milestone achievement.

Case Description and Results: A two-month-old male presented with absent bilateral tibias, with the classification of Paley Type 5c tibial deficiency with complete absence of the tibia. At 1 year and 24 days, a bilateral fibular resection with pedicled vascularized calcaneus transfer was performed, allowing for transfer of the calcaneus along with the overlying glabrous skin and soft tissues to the end of the femur. The flaps were designed to preserve nerve structures and protect sensation of the calcaneal skin as well as reduce the risk of neuroma formation. The transfers were temporarily secured with Steinman pins and dressed with a soft wrap. The patient was permitted to bear weight after the four-week post-operative follow-up at which time his radiographs and clinical exam demonstrated suitable bony and soft tissue healing. At the six-month follow-up, the patient was able to pull to stand and walk with assistance without any complaints of pain. He was fitted with Stubbies and has been using his prosthetics without issue. No complications have been noted to date at the nine-month follow-up.

Conclusion: This novel reconstructive technique utilizing pedicled vascularized calcaneus transfer for the treatment of tibial deficiency allowed for the preservation of weight bearing calcaneal skin, reduced the risk of neuroma formation, and avoided primary amputation and prolonged staged reconstruction. Due to the nature of a single surgery, non-weightbearing recovery time was decreased, which was crucial for preserving functional developmental milestones.

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Comparing Upper Extremity Amputation with Nerve-Related Procedures vs. Amputation Alone: A Retrospective Cohort Study

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Purpose: Major limb amputations are a last resort treatment due to irreversible trauma and disease. Unfortunately, chronic and phantom limb pain commonly occur as a result of the procedure. This study seeks to compare amputations alone to those with nerve interventions and identify any difference in hospital length of stay, readmissions, complications, and cost. Including a nerve transfer or nerve related procedure with an upper extremity amputation improves outcomes, decreases readmissions, and lowers overall costs associated with amputations.

Materials and Methods: The Vizient Clinical Database was searched from the years 2018 to 2022 to collect patient data and identify populations using ICD10 procedure codes for patients who received an upper extremity amputation alone and those who received an amputation with additional nerve related procedures. The average length of stay, number of readmissions at 30 days, complications, and cost were compared between groups using paired t-tests.

Results: 114 patients that received an amputation with a nerve-related procedure and 1842 patients that received an amputation alone were identified between January 2018 and February 2022. Differences in readmission rates at 30 days between the two groups were not statistically significant. However, the mean length of stay among individuals that received a nerve intervention along with their amputation procedure was shorter than those who did not ($p=.028$). Cases with one or more complications were significantly less common among individuals that received nerve interventions ($p<.001$). Cost comparison analysis revealed that including a nerve intervention at the time of initial amputation was a worthwhile investment, significantly decreasing the total average cost of care by $22,942 ($p=.024$).

Conclusions: Including nerve-related procedures for patients undergoing upper extremity amputations decreases length of stay, reduces complication rates, and decreases total cost compared to patients that receive an amputation alone.

Comparison of Intramedullary Screws, Plating, and K-Wires for Metacarpal Fracture Fixation: A Meta-analysis

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Purpose: Metacarpal fractures are common injuries with multiple options for fixation, including plating and screws, K-wires, and intramedullary screws. Our purpose was to compare outcomes, including DASH score, total active motion (TAM), grip strength, and rates of re-operation or infection, in metacarpal fractures treated with intramedullary screw fixation (IMF), K-wires, or plates/screws.

Methods: A systematic literature review using the MEDLINE Database was performed for studies investigating metacarpal fractures treated with IMF, plates/screw, or K-wires. We identified nine studies using IMF, eight using plates/screws, and 17 using K-wires. A meta-analysis using random or fixed effects models was performed to calculate pooled effect size estimates, controlling for heterogeneity between studies. Outcome measures included mean DASH scores, mean TAM, mean grip strength (percentage to contralateral), mean time to

radiographic healing, and the proportion of patients with infection and re-operation.

Results: Patients with IMF of metacarpal fractures had significantly lower mean DASH scores at an average of 0.6 [95% CI: 0.2, 1.0] compared to both K-wire (7.4 [4.8, 9.9]) and plates/screws (9.8 [5.3, 14.3]) (both $p<0.001$). IMF also had significantly lower rates of reoperation at 4% [2%, 7%], compared to K-wires 11% [7%, 16%], $p= 0.001$ and plate/screw fixation at 11% [0.07, 0.17] $p=0.01$. Grip strength was significantly higher in IMF (104.4% [97.0, 111.8]) compared to K-wires (88.5%, [88.3, 88.7]) and plate/screws (90.3, [85.4, 95.2] (both $p<0.001$). There were no statistically significant differences in time to radiographic healing of evidence, mean TAM, or rates of infection. Mean OR time was similar between IMF (average of 21.0 minutes [10.4, 31.6]) and K-wires (20.8 minutes [14.0, 27.6]), but both were shorter compared to plate/screw fixation (average 52.6 minutes [33.1, 72.1]) with K wires being significantly shorter ($p<0.001$).

Summary: This meta-analysis compares outcomes of metacarpal fixation with IMF, K-wires, or plates/screws. IMF provided statistically significant lower DASH scores, higher grip strength, lower rates of re-operation, when compared to K-wires and plates/screws for fixation of metacarpal fractures. There were no statistically significant differences in rates of mean TAM, time to radiographic healing, or rates of infection between the 3 groups. OR time was lower for both IMF and K wires as compared to plates and screws, but only K wires had enough data points for significance.

Conclusion: Intramedullary screw fixation of metacarpal fractures provides lower DASH scores, higher grip strength, and lower rates of re-operation when compared to K-wires and plates/screws.

Umbilical Delay in Secondary Abdominoplasty: Is it Necessary?

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Background: The mini abdominoplasty procedure often includes transecting the umbilical stalk, creating an "umbilical float," to allow for continuous muscle plication without suture interruption. Because the vascular supply is transected, it has been postulated that later conversion to full abdominoplasty with umbilical translocation leads to umbilical necrosis. To prevent this outcome, performing a delay procedure prior to transposition to encourage neovascularity to the umbilicus has been suggested (Parsa et al). There is a lack of evidence supporting or refuting the necessity of this procedure. The purpose of this study was to analyze the outcomes of secondary abdominoplasty with umbilical translocation after umbilical stalk transection without the use of a delay procedure. Primary endpoints were the incidence of

delayed wound healing of the umbilicus, partial umbilical necrosis, and full umbilical necrosis.

Methods: A retrospective analysis of patients who underwent secondary abdominoplasty with umbilical transposition after an umbilical float procedure by a single surgeon between March 2018 and October 2021 was performed. All surgeries took place at an accredited ambulatory surgical center. Surgical technique and post-op care were uniform across the cohort. Patient demographics, comorbidities, body mass index (BMI), operative details, and postoperative complications were recorded and reviewed.

Results: Four patients met inclusion criteria with operative dates between March 2018 and October 2021. All patients were female (ages 39-55, BMI 19-23), non-smokers, and non-diabetics. The average time between mini abdominoplasty and full abdominoplasty was 16 months (range 5 to 33 months). The average follow up length after the full abdominoplasty was 9.5 months, (range 5 months to 11 months). There were no incidences of delayed wound healing of the umbilicus, or partial or complete umbilical necrosis.

Conclusions: Umbilical delay in preparation for revision abdominoplasty with umbilical transposition is not required after previous umbilical stalk transection. Considerations should be given to factors including time from previous abdominoplasty, patient BMI (not recommended for high BMI), comorbidities that are known to delay wound healing (Diabetes, smoking, chronic steroid use, etc). Any incidence of umbilical necrosis should be treated conservatively with local wound care. Most cases of partial necrosis will heal without surgical intervention. In the case of complete necrosis, neoumbilicoplasty can be performed at a later date if the resultant scar is unacceptable to the patient. Ultimately, we recommend full abdominoplasty with umbilical translocation should be delayed until 5 months after mini abdominoplasty with umbilical float.

References:

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