CSPS 76TH ANNUAL MEETING

SCCP 76e RÉUNION ANNUELLE

June 13-17 *juin* 2023

Whistler, BC/C-B

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CANADIAN SOCIETY OF PLASTIC SURGEONS
SOCIÉTÉ CANADIENNE DES CHIRURGIENS PLASTICIENS
76th Annual Meeting / *76e Réunion Annuelle*

ABSTRACTS / *RÉSUMÉS*

The Calgary Kids' Hand Rule: External validation of a prediction model to triage pediatric hand fractures (001)
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PURPOSE: The Calgary Kids' Hand Rule (CKHR) is a clinical prediction rule intended to guide referral decisions for pediatric hand fractures presenting to the emergency department, identifying 'complex' fractures that require surgical referral and optimizing care through better matching of patients' needs to provider expertise. The objective of this study was to externally validate the CKHR in two different tertiary pediatric hospitals in Canada. **METHOD**: We partnered with British Columbia Children's Hospital (BCCH) and the Children's Hospital of Eastern Ontario (CHEO) to externally validate the CKHR using data from retrospective cohorts of pediatric hand fractures (via electronic medical record and x- ray review). Model performance was evaluated at each site using sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, and the C-statistic. **RESULTS**: A total of 954 hand fractures were included in the analysis (524 at BCCH and 430 at CHEO. At BCCH, the CKHR had a sensitivity of 91.1% (133 predicted complex out of 146 total complex fractures), specificity of 71.4% (269 predicted simple out of 377 total simple fractures), and C-statistic of 0.81. At CHEO, the CKHR had a sensitivity of 98.3%, specificity of 30.2%, and C-statistic of 0.64. **CONCLUSION**: The CKHR performed well at two different tertiary care centres with high sensitivity, supporting its ability to facilitate hand fracture triage in other populations without further modification. This work should be followed by rigorous implementation analysis to determine its impact on patient care. **LEARNING OBJECTIVES**: At the end of this presentation, the learner will be able to: 1. Identify the Calgary Kids' Hand Rule as a prediction rule for pediatric hand fractures. 2. Describe the process of external validation of a clinical prediction rule. 3. Explain what it means that the prediction rule had a high sensitivity.

The temporal artery biopsy debate: Does a positive TAB result influence steroid use in giant cell arteritis? (02)
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PURPOSE: The utility of a temporal artery biopsy (TAB) in diagnosing giant cell arteritis (GCA) has been debated due to its surgical risks and high rate of false negative results. The objective of this study was to investigate whether TAB results impact steroid treatment duration in patients diagnosed with GCA in Calgary, AB. **METHODS**: A retrospective chart review was performed in patients undergoing TAB at a single center in Calgary, AB. Steroid treatment duration between patients with a positive TAB (TAB+) and negative TAB (TAB–) were compared. **RESULTS**: One hundred and seven patients undergoing TAB for suspected GCA were included, with a median age of 74 years (46-91) and 75 (70.1%) women. Of the total 107 TAB results, 23 (21.5%) were positive, 74 (69.2%) were negative, and 10 (9.3%) were found to be indeterminate. Markers of inflammation were not significantly different between TAB+ and TAB- patients (mean erythrocyte sedimentation rate [60.2 versus 43.7, P = 0.45] and C-reactive protein [38.8 versus 18.1, P = 0.17]). Both TAB+ and TAB - patients had a similarly high rate of prebiopsy steroid initiation (82.6% versus 70.3%, P = 0.32). More TAB+ patients remained on steroids at 6 weeks (95.0% versus 57.4%, P = 0.004), 6 months (95% versus 37.7%, P < 0.001), 1 year (65.0% versus 31.1%, P = 0.024), and 18 months (50.0% versus 19.7%, P = 0.045). This difference was no longer statistically significant at 2 years post steroid initiation (35.0% versus 14.8%, P = 0.12). **CONCLUSION**: A positive TAB result appears to have an impact on the maintenance of steroids in patients diagnosed with GCA for up to 18 months in Calgary, AB. **LEARNING OBJECTIVE**: Participants will be able to describe and compare the American College of Rheumatology criteria and TAB in establishing a diagnosis of GCA.

Non-operative airway interventions for infants with Pierre-Robin Sequence: a systematic review (03)
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PURPOSE: Pierre-Robin Sequence (PRS) is a triad of micrognathia, glossoptosis, and airway obstruction. There is no standardized consensus on the management of respiratory distress for patients born with PRS. However, the majority of PRS infants are successfully managed non-operatively. The primary purpose of this study is therefore to appraise all existing modalities of non-operative airway intervention for PRS infants described thus far, and evaluate the prevalence and associated clinical outcomes for each. **METHODS**: Following PRISMA 2020 guidelines, MEDLINE, EMBASE, EMCARE, the Web of Science Core Collection, and the Cochrane Central Register of Controlled Trials were searched for studies published from 1992 to 2022 that report on PRS infants under 1 year of age who were managed with any non-operative intervention. Data extraction and analysis regarding treatment modality prevalence, as well as secondary outcomes, is in process. **RESULTS**: 3291 abstracts were screened and 97 articles were included. Preliminary data demonstrates that non-operative interventions include infant positioning, nasopharyngeal tube insertion, non-invasive ventilation, and orthodontic appliances. Reported clinical outcomes vary considerably, but commonly included measures are biomarkers of oxygenation (including apnea-hypopnea index, pulse oximetry, and capillary blood gas), as well as polysomnography, weight gain, and hospital admission statistics. **CONCLUSIONS**: The present study is the largest and most recent systematic review of non-operative interventions for PRS infants thus far. Pending final data analysis, the prevalence of each non-operative treatment modality, as well as the varying subsequent clinical outcomes of each, will provide clinicians with important information regarding non-operative options for the majority of PRS infants. **LEARNING OBJECTIVES**: Participants will be able to identify several non-operative treatment modalities that alleviate respiratory distress in PRS infants and describe them in terms of their reported prevalence.

Streamlining the management of children with simple hand fractures (04)
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PURPOSE: Hand fractures are common pediatric injuries. Most simple pediatric hand fractures do not require surgery and can be treated with immobilization alone, yielding good outcomes and complete bony healing in 3-4 weeks. An informal survey previously performed at our institution revealed practice variation in treating simple hand fractures with many being overtreated with unnecessary follow-ups. The objective of this study was to develop a streamlined care pathway to manage "simple" pediatric hand fractures. **METHOD**: A single institution prospective study was conducted to develop a streamlined care pathway for simple pediatric hand trauma. All patients who presented to CHEO Plastic Surgery clinic with a simple hand injury from September to November 2021 were screened. Patients were initially managed according to standard practice with either thermoplastic splinting or buddy taping. Patients received verbal and written instruction on care and reasons to seek follow-up. No routine in-person follow-up was arranged. Participants were then contacted by telephone approximately 6 weeks post-injury to review course and outcomes and verify that there were no concerns or need for follow-up. **RESULTS**: 101 children with simple hand fractures were included. Sixty-one participants completed the telephone survey. Of those, 90% did not have any problems during healing and 85% were able to resume all activities. Ten participants requested a follow-up at the time of telephone survey; however, 4 of them did not attend. The remaining 6 patients were provided with reassurance and did not require any change in treatment plan. **CONCLUSIONS**: The majority of simple pediatric hand fractures seem to heal adequately with simple immobilization as measured by pain-free return to activity. Care can be likely be streamlined by not providing unnecessary follow-ups for simple pediatric hand fractures. Uptake of such a hand pathway can make a significant quantitative impact by relieving socioeconomic costs and improving healthcare utilization.

Percutaneous pinning of hand fractures in an outpatient clinic: a cost-reduction analysis in a Quebec University affiliated center (05)
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Montréal, QC

PURPOSE The University of Sherbrooke's Hospital Center operating room has not been spared by the impact of the Covid-19 pandemic. This has led many surgeons to find alternative ways to operate on patients presenting with acute injuries requiring surgical intervention. In the spring of 2020, we started performing percutaneous pinning of hand fractures in our outpatient clinic. Consequently, we wanted to estimate the amount saved in 2021 by performing percutaneous fixations in the outpatient clinic instead of the operating room. **METHOD**: We identified all patients with a hand injury who received percutaneous pinning in 2021 using billing codes related to this type of procedure. We reviewed all patient files in our electronic medical records to include only those whose procedure was performed in the outpatient clinic. We estimated the cost of a hand fracture fixation procedure done in the operating room by taking into consideration the following: the anesthesiologist's fee, the hospital's hourly rate for a one-hour hand surgery (including a respiratory therapist and two nurses and equipment used), the salary bonus for unfavorable hours and subtracted the cost difference in equipment used in the outpatient clinic. **RESULTS**: Based on the billing codes, we identified 114 patients and 93 of them were included in the study. With our calculations, we obtained a cost reduction of 55,789$. **CONCLUSION:** Percutaneous pinning of hand fractures done in an outpatient setting resulted in a cost reduction of over 55,000$ in one year in a single hospital center. The new

mini C-arm that was allocated to our clinic would therefore be reimbursed after approximately two years. **LEARNING OBJECTIVES**: - Discuss the benefits for patients of having hand surgery fixation in an outpatient clinic - Discuss the cost reduction associated with performing percutaneous pinning outside of the OR.

Development and evaluation of a mixed reality model for metacarpal reduction and K-wire fixation (06)

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PURPOSE: The purpose of this study was to develop and evaluate a mixed reality model of metacarpal fracture reduction and K-wire fixation. **METHODS**: A full-size physical model of a Bennett's fracture was 3-D printed using a CT scan of a reference hand and then cast in silicone. A K-wire driver was scanned, digitized and 3-D printed. Electromagnetic sensors were embedded in the fracture fragment, metacarpal base, and K-wire driver with each element tracked independently in real time. Five plastic surgeons performed the fracture reduction and placement of virtual K-wires. The model was assessed by each user and its utility as a teaching tool for fracture reduction and K-wire fixation was assessed with multiple questions using a five-point Likert scale. Responses ranged from "1 = strongly disagree" to "5 = strongly agree". Results were compiled, with averages and standard deviations calculated. **RESULTS**: Overall, average responses to the questions assessing the model ranged from 4.2 to 5.0 on the 5-point scale. Questions that performed best among reviewers were: "pre-reduction fracture represents the clinical situation" (4.8 ± 0.4), "the model is a valuable training tool" (4.8 ± 0.4), and "I would recommend the model as a training tool", which was uniformly scored as a 5 amongst reviewers. **CONCLUSIONS**: This mixed reality model simulating a Bennet's fracture reduction and K-wire fixation allowed real-time tracking and was perceived by users to closely replicate important elements of the clinical scenario. Users rated the model as a valuable training tool and would recommend it for teaching of K-wire fixation. **LEARNING OBJECTIVES** To demonstrate the creation of a 3-D mixed reality model for reduction and K- wire fixation of a metacarpal fracture. To demonstrate that the mixed reality model of K-wire reduction and fixation simulates elements of the clinical scenario and is thought to be a valuable teaching tool.

Retrospective evaluation of outcomes of patients with closed phalangeal or metacarpal fractures treated with permanent hardware fixation in an abulatory clinic setting (07)

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PURPOSE: Phalangeal and metacarpal fractures are common injuries of the hand.5 Treatment of these fractures aim to restore anatomy and function of fracture deformity conservatively or surgically dependent on nature of the injury, pattern, and stability.9,10 11 Literature is increasing on Wide-Awake, Local Anesthesia, No Tourniquet (WALANT) surgery done in minor procedure settings where full operating room (OR) sterility is consolidated, decreasing equipment and staffing. Studies demonstrate safety of this practice with limited procedures. It is important to consider risks associated with operative sterility in the ambulatory setting including non-laminar airflow, specifically related to surgical site infection 1–4. This is critical in permanent hardware fixation where infection may result in loss of fixation construct. The purpose of this study is to evaluate the short and long-term outcomes of patients with closed phalangeal or metacarpal fractures fixated with permanent hardware in both clinic and main OR setting. **METHOD**: A retrospective chart review was performed for patients treated with permanent hardware fixation for closed phalangeal or metacarpal fractures from a single surgeon's practice at The Ottawa Hospital from 2019-2023. **RESULTS**: Forty patients (65% male, mean age 43.8 ± 14.4 years, 70% metacarpal injuries) were treated in a minor procedure setting and thirty patients (80% male, mean age 37.8 ± 15.7 years, 63% metacarpal injuries) treated in the OR. One patient was treated for cellulitis with oral antibiotics from the minor procedures group. Results of long-term complications including hand function to be discussed pending further data collection. **CONCLUSION**: The findings of this study provide insight into the safety of placing permanent implants in an ambulatory setting. **RESULTS** demonstrate safety of this procedure to ultimately increase patient access, decrease wait times, reduce cost and environmental impact. **LEARNING OBJECTIVES:** Compare safety of permanent hardware fixation in clinic vs OR setting for informed decision making.

Complex proximal interphalangeal joint fractures: Hemi-hamate arthroplasty or dynamic external fixation? (08)

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PURPOSE: PIPJ fractures are common hand injuries. Hemi-hamate arthroplasty (HHA) and dynamic external fixation (i.e., Suzuki) are the most common surgical interventions for unstable fractures, although no comprehensive meta-analysis has investigated postoperative functional outcomes. This meta-analysis evaluates techniques for specific patients and fracture types. **METHODS**: Studies assessing postoperative outcomes in patients with acute or chronic complex PIPJ fractures (>30% intra-articular involvement) who received HHA or Suzuki were retrieved from PubMed and Google Scholar. Screening was performed in duplicate. Meta-analyses examined mean postoperative PIP and DIP ROM, grip strength, pain (VAS), and DASH ratings. Heterogeneity was assessed using the I2 statistic. **RESULTS**: Fifty-three studies were included; HHA (n=19 studies), Suzuki (n=34 studies). The mean postoperative DASH score was 7.9 [4.6-11.3] (n=5 studies,

I2=20.9%) for HHA and 6.7 [3-10.4] (n=5 studies, I2=99.2%) for Suzuki. The mean PIP ROM score was 78 [73-83] (n=16 studies, I2=84%) for HHA and 79 [74.6-83] (n=25 studies, I2=86.9%) for Suzuki. The mean DIP ROM score was 62 [52.8-70.5] (n=11 studies, I2=95.6%) for HHA and 47 [43-51] (n=10 studies, I2=68.3%) for Suzuki. The mean GRIP strength was 90 [85-94] (n=8 studies, I2=58.8%) for HHA and 87 [80-91] (n=8 studies, I2=90.4%) for Suzuki. The mean VAS score was 0.95 [0.48-1.43] (n=9 studies, I2=89%) for HHA and 0.83 [0.33-1.32] (n=5 studies, I2=83.7%) for Suzuki. **CONCLUSIONS**: In patients with complex PIPJ fractures, regarding the fracture and patients? characteristics, HHA and Suzuki techniques appear to provide acceptable postoperative functional outcomes; however, the grip strength was stronger with HHA for patients with the same fracture characteristics. **LEARNING OBJECTIVES:** 1. Understanding why HHA and Suzuki are used for complex PIPJ fractures. 2. Learn to stratify PIPJ fracture patients by treatment approach. 3. Quantify functional improvement and categorize surgical technique-related adverse events.

Goal-directed-therapy versus conventional fluid management in free flap reconstruction of head and neck cancer: A systematic review and meta-analysis (09)

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INTRODUCTION: Free flaps are very sensitive to hemodynamic status. Recently, anesthesiologists have been using FloTrac™ to measure patients' intraoperative hemodynamic status by measuring stroke volume variation and cardiac index. This method is used to manage patients intraoperatively by goal-directed fluid therapy (GDT) rather than conventional fluid management (CFM). The aim of this review is to compare the outcomes of GDT with CFM for head and neck cancer patients undergoing free flap reconstruction. **METHODS**: A systematic review and meta-analysis were carried out in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Guidelines. An electronic database search was performed to identify Randomized Controlled Trials (RCTs), case-control studies, and cohort studies comparing outcomes of GDT versus CFM. The key outcomes were free-flap failure and reoperation. The secondary objective measures were ICU stay, complications, and colloids administered. The analysis included random effects modeling. **RESULTS**: Five studies were included with a total of 487 patients involved. A significant reduction in free flap failure was found in the GDT group. (OR=0.4, CI = 0.22 to 0.76, P = 0.005. No statistically significant differences were seen in reoperation rates (OR=0.63, CI = 0.34 to 1.18, P = 0.15). Secondary outcome reports showed significantly shorter ICU stays for the GDT group and a similar number of complications and volume of colloids given. **CONCLUSION**: In head and neck cancer patients undergoing free flap reconstruction, GDT outperforms CFM due to a significant reduction in the incidence of free flap failure and shorter ICU stays. GDT does not compromise reoperation rates and overall complications. More RCTs are needed to validate this conclusion and the clinical applicability of GDT. **LEARNING OBJECTIVES**: Overview of the effects of intravascular volume on free tissue transfer, and identifying the differences and evidence between GDT vs CFM in intra-operative management.

Full-thickness mastectomy flap necrosis: Outcome in a breast reconstruction program (10)

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BACKGROUND: Mastectomy flap necrosis (MFN) is a complication of mastectomy that may affect breast reconstruction patients. Full thickness mastectomy flap necrosis FTMFN, defined as necrosis which exposes acellular dermal matrix or implant, has a reported incidence rate varying widely from 1-20%. The treatment of FTMFN remains a challenge and subject to surgeon preference with lack of evidence- based guidelines. This study aims to determine the experience of a multi-surgeon breast reconstruction group practice with FTMFN, its treatment, and surgeon- reported outcomes. **METHODS**: Retrospective chart review was conducted for 755 consecutive patients who underwent immediate alloplastic reconstruction between January 2010 and December 2020. Inclusion criteria included immediate alloplastic breast reconstruction with at least 6-month follow-up, complicated with FTMFN. Patient comorbidities, oncologic, surgical, post-operative factors, and BREAST-Q scores were collected. FTMFN rates were elucidated, and descriptive statistics were performed. **RESULTS**: A total of 755 patients with 6-month follow-up reviewed, with 36 FTMFN patients meeting our inclusion criteria. The incidence rate of FTMFN is 4.8%. Radiation therapy preceded FTMFN in 34.3% of patients. Most patients during this treatment period had subpectoral reconstruction (82.4%), FTMFN was most commonly on the tumour side (82.4%), and SPY fluorescence imaging was used 48% of the time. Management of FTMFN included excision and primary closure or local advancement flaps (55.6%), transposition flap (5.7%), conversion to autologous reconstruction (22.2%) and ultimate explantation and termination of reconstruction (11.1%). BREAST-Q questionnaires scores for transposition technique versus primary closure or advancement flaps will be examined. **CONCLUSIONS**: This study provides descriptive data of the multiple modalities for treatment of FTMFN to guide clinicians in evidence based FTMFN management. **LEARNING OBJECTIVES**: Identification of surgical treatment modalities in FTMFN and their relative success in both final reconstruction type as well as patient satisfaction.

Altered foreign body response at the posterior surface compared to anterior surface of human silicone breast implants (11)

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PURPOSE: Capsular contracture is the most common complication of breast implant surgery and is linked to dysregulation of the foreign body reaction (FBR). Breast implant capsule is assumed to be uniform, however the implant is asymmetric and placed in a non-uniform implant pocket with differential surrounding mechanical factors that have been shown to alter the FBR. Currently, little is known about how spatiotemporal factors influence capsule physiology. Our study compared the inflammatory and fibrotic phenotypes of anterior and posterior human breast implant capsule and determined how they change across device lifespan. **METHODS**: We collected human breast implant capsule from patients undergoing revisions. Within each breast, both anterior (N = 31) and posterior (N = 31) capsule was collected. Capsule was assessed histologically. Capsular cell populations were measured by immunohistochemistry (fibroblasts, myofibroblasts, total macrophages, M1 macrophages, and M2 macrophages). Expression of proinflammatory cytokines (IL-1β, IL-6), extracellular matrix (Col1, Col3) and profibrotic growth factor TGF-β were measured with RT-PCR. **RESULTS**: Posterior capsule displays increased thickness ($p<.05$), disorganized collagen organization ($p< .05$), increased macrophages ($p<.05$) and increased immature type 3 collagen expression ($p <.05$), compared to anterior capsule. Expression of pro-inflammatory cytokines (IL-1, IL-6) displayed a significant positive relationship with implant duration in posterior capsule ($p<.05$). Anterior capsule displayed increased mature type 1 collagen expression ($p<.05$) and a significant positive relationship between mature type 1 collagen expression and implant duration ($p<.05$). CONCLUSIONS: Collectively, our results support spatiotemporal heterogeneity in inflammation and fibrosis within breast implant capsule. Over time, posterior capsule becomes increasingly inflammatory, while anterior capsule becomes increasingly fibrotic. **LEARNING OBJECTIVES:** • Breast implant capsule is heterogenous. • Posterior breast implant capsule is characterized by inflammation, while anterior breast implant capsule is characterized by fibrosis. • Therapeutic target of the spatial differences in the peri-prosthetic environment could reduce breast implant associated morbidity.

Barriers to immediate breast reconstruction in Canada (12)

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PURPOSE: Immediate breast reconstruction (IBR) may not be utilized to its full potential in Canada. To receive IBR, referral to a reconstructive surgeon for discussion of reconstructive options must occur prior to definitive cancer surgery. A potential barrier to IBR lies in the referral process from breast to reconstructive surgeons. We aim to identify barriers to patient referral and shared decision-making for IBR. **METHODS:** An online survey was distributed to general and plastic surgeons across Canada. Questions explored plastic versus general surgeons? practices relating to time spent counselling patients, referral patterns, and personal opinions on reconstructive barriers. All statistical comparisons were made using chi-squared or Fisher exact testing with a p-value of 0.05 considered significant. **RESULTS:** Responses were received from 57 general and 81 plastic surgeons. Plastic surgeons were more likely to spend 40+ minutes on pre-operative reconstructive counselling (54% vs 26%, $p < 0.001$). Three quarters of their delayed reconstruction patients were not aware IBR may have been an option. Nearly half of general surgeons encourage breast conserving surgery (BCS) if both BCS and IBR are viable options and fewer than 60% refer these patients to discuss reconstructive options. In all scenarios, plastic surgeons were more likely than general surgeons to choose IBR (38-79% vs 0-56%, $p < 0.001$). **CONCLUSIONS:** We have identified potential biases in referral patterns to reconstructive surgeons for IBR, including a general surgeon bias towards BCS and a deficit in patient referral to plastic surgery for discussion of reconstructive options. We also see that general surgeons tend to spend less time counselling their patients on reconstructive options, which may prevent referral for some patients who are not aware IBR may be an option. **LEARNING OBJECTIVES:** Participants will understand: 1. Biases in reconstructive opinions that may affect practice decisions; 2. Potential barriers to patients receiving IBR.

Symmetrical breast surgery: balancing procedures versus prophylactic mastectomy and immediate reconstruction (13)

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BACKGROUND: Various techniques for management of the contralateral breast exist in patients with unilateral breast cancer including contralateral prophylactic mastectomy with immediate breast reconstruction (PMIBR), or symmetrisation techniques including augmentation, reduction, or mastopexy. The purpose of this prospective cohort study was to evaluate and compare complications and patient-reported satisfaction of patients with contralateral PMIBR versus having symmetrisation procedures. **METHODS**: A 7-year, single institution, prospectively maintained data base was reviewed. Patient-reported BREAST-Q were obtained at baseline, 3-months, and 12-months prospectively. Post-operative complications, oncologic outcomes and BREAST-Q scores were compared. **RESULTS**: 249 patients were included, 93 (37%) of which had contralateral PMIBR and 156 (63%) which had contralateral symmetrisation. The patients who underwent PMIBR were younger and had less co-morbidities compared to patients with symmetrisation. Rates of major and minor

complications were similar apart from higher rates of minor wound dehiscence in the PMIBR group. When comparing mean change at 12 months follow up to pre-operative results, there was a significant decrease in the physical well-being of chest in the symmetrisation compared to PMIBR group (2.94 vs. -5.69, p=0.042). There were no significant differences in mean breast satisfaction, psychosocial well-being, and non-significant decreases in sexual well-being between groups. **CONCLUSION**: Patients with unilateral breast cancer who underwent immediate contralateral breast management, with either contralateral PMIBR or symmetrisation techniques, demonstrated similar profiles of major complications and good overall satisfaction except one physical well-being domain. Management of the contralateral breast with symmetrisation may provide similar outcomes compared to PMIBR, which often is considered not necessary in patients without specific indications. **LEARNING OBJECTIVES**: Understand patient reported outcomes and complication differences between contralateral prophylactic mastectomy with immediate breast reconstruction (PMIBR), or symmetrisation techniques.

Aesthetic surgery before-and-after photography bias on Instagram (14)

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PURPOSE: This study aims to systematically assess body and facial aesthetic surgery before- and-after photography bias on Instagram. **METHODS**: An Instagram search using the term 'plastic surgeon' was conducted on October, 2020. The top 11 plastic surgeons' accounts were selected, and the first 15 images were selected from these profiles pertaining to different anatomical locations. Each photo were analyzed by a blinded board-certified plastic surgeon utilizing a 5-domain clinical photography bias score. The domains covered: (1) photo quality; (2) photo background; (3) position; (4) exposure/coverage; (5) bias. **RESULTS**: The search strategy identified a total of 161 sets of before and after. The most common anatomical site posted was the nose (n=47), followed by breasts (n=37). The most common angles posted were anterior-posterior view (n=61). The majority of images showed bias towards the post-operative image (70.8%). The main culprit with photo characteristics occurred due to there being a different post- operative background which was more flattering for the post-operative result (n=46, p=0.006) and a different view or angle, which again, flattered the post- operative image (n=36, p=0.02). Other factors that influenced the post-operative bias included photos of the patient covered with clothing (n=15, p=0.014) or standing (n=20, p=0.001), compared to a supine pre-operative image. **CONCLUSION**: Before-and after photography conditions in aesthetic surgery is biased towards the postoperative result on Instagram. This observation was noticed across all surgical anatomical areas. Accounts photographer tends to misrepresent the photo background, view of angle, patients pose or position or covering certain body parts. **LEARNING OBJECTIVES:** 1. The general public should be aware of bias in aesthetic pictures posted on social media. 2. Faculty and residents play a role in raising awareness about bias in aesthetic post operative pictures posted on social media channels.

Does combining abdominoplasty with bilateral breast reduction surgery increase the risk of complications: A 10-year retrospective analysis (15)

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BACKGROUND: It has become an increasingly common approach in plastic surgery to combine abdominoplasty with breast surgery in a single surgery. Advantageously, a combined approach reduces costs, demands on operating room time, and affords the patient a single recovery time for multiple surgeries. However, the question remains as to whether combination approaches are safe. Previous work is divided, with some showing an increased risk for post-operative complications. Nevertheless, there is a dearth of research interrogating this question. In this retrospective analysis, we evaluated whether combining abdominoplasty with breast surgery was associated with an increased risk for complications. **METHODS**: We analyzed a previous 10-year single-center retrospective chart review of 1022 patients who underwent bilateral breast reduction in Nova Scotia. We performed univariate and multivariate analyses to evaluate the relationship associated with concomitant abdominoplasty on the risk for complication with bilateral breast surgery. **RESULTS**: Of the 1022 patients, 44 patients underwent a concomitant abdominoplasty. In comparing these groups, univariate analysis showed no increase in the frequency of complications (36.4% with concomitant abdominoplasty vs. 37.7% isolated breast reduction, p=0.86). A multivariate analysis, likewise, demonstrated that when adjusting for other known prognosticators of complication, performing abdominoplasty alongside breast reconstruction was not an independent risk factor for major complications (OR: 0.99, 95% CI 0.51-1.96, p=0.99). However, patients who received a concomitant abdominoplasty had an increased number of follow-up visits (median: 4 visits vs median: 2 visits, p<0.001). **CONCLUSION**: Our single-center retrospective analysis supports the conclusion that combining abdominoplasty with bilateral breast reduction does not increase the risk for complications. However, patients who receive both may require more rigorous follow-up. **LEARNING OBJECTIVES:** 1. Review the safety of combining abdominoplasty and breast reduction surgery. 2. Discuss the most common complications of breast reduction and abdominoplasty surgery.

Street drugs and pain: The prevalence of complex pain management in plastic surgery patients (16)
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PURPOSE: To determine the prevalence of substance use disorder (SUD), opioid agonist therapy (OAT), and acute pain service (APS) utilization among the inpatient plastic surgery patients at the University of Alberta Hospital (UAH), in Edmonton, Canada. **METHODS**: This was a pilot, retrospective study of 112 patients over a 3-month period. Pediatric patients and patients not admitted under plastic surgery were excluded. Anonymous chart review of patients admitted under the burn/plastic surgery service at the UAH was conducted. We conducted non-parametric Mann- Whitney U t-tests to examine for differences between the OAT naïve and the OAT group regarding hospital length of stay (LOS), patient age, and number of surgeries (NOS) during hospital admission. Significance was $p<0.05$. **RESULTS**: Of the patients included in this study (n=112), 29.5% had SUD and 17% received consultation of the APS. Burn patients (n=22) had a higher rate of APS consultation (13.6%) and SUD (40.9%) compared to plastic inpatients, (7.7%) and (26.6%) respectively. Of the patients who had received OAT previously (n=10), 40% received consultation of the APS. Of the OAT naïve population (n=102), 14.7% received APS consultation. We report no statistically significant differences between the LOS ($p = 0.1017$), patient age ($p = 0.9940$), and NOS ($p = 0.6173$). **CONCLUSIONS**: Burn and plastic surgery patients have a high proportion of SUD and complex pain management requiring additional services. There is incongruity of acute pain services that are offered in high-risk patients, as 60% of patients on previous OAT did not receive APS. We plan to expand the timeline for this study, to further demonstrate this need, and this data can be used to pursue future resources for complex pain management and addiction services in the Plastic Surgery and Burn population. **LEARNING OBJECTIVE**: Education in complex pain management and addictions should be considered in plastic surgery training.

Defrosting the evidence: Iloprost may reduce the amputation rate in severe frostbite injuries (18)
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PURPOSE Multiple adjuncts exist for the treatment of frostbite, including iloprost, a metabolite of prostaglandin I2, which is becoming increasingly popular in Canada despite not yet undergoing a systematic evaluation. **METHODS** We completed a systematic review of the efficacy of treating frostbite with iloprost by searching Ovid MEDLINE, Embase, and Cochrane Central Registry of Controlled Trials. Articles discussing the treatment of adult frostbite patients with iloprost were included. Review articles were excluded. Eligible Non-English papers were translated for inclusion. Extracted data included patient demographics, mechanism of injury, frostbite severity, timing since injury, iloprost dose and duration, adjunctive medications and amputation rates. **RESULTS** Of the 2603 papers screened, 11 papers met inclusion criteria, with a total of 87 patients receiving iloprost. Based on prior publications, patients with grade 3 frostbite would have a predicted amputation rate of 67% without treatment, however our review demonstrated a reduction in this rate to as low as 0% with iloprost. A benefit was also demonstrated for patients with grade 4 frostbite, for whom the amputation rate after treatment was reduced to 48%, from a predicted 98-100% without treatment. If iloprost was administered after 72 hours from injury, the amputation rate was 100%. The most common additional medications administered during treatment were NSAIDS, antibiotics, anticoagulation, and tPA. The study with the largest patient population administered both iloprost and tPA to patients with grade 4 frostbite. **CONCLUSIONS** Iloprost appears to decrease the rate of digit amputation for patients with more severe frostbite, however research remains limited. The administration of additional medications, particularly tPA makes commenting on iloprost utility is isolation challenging. **LEARNING OBJECTIVES**: 1. List the indications for iloprost administration in frostbite injuries. 2. Describe the common adjunctive medications used to treat frostbite.

Development of an artificial intelligence embedded burn injury mobile application to guide first responders (19)
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PURPOSE Accurate assessment and early interventions in the field are paramount to the prognosis of burn injuries. First responders play a pivotal role in immediate burn management, particularly for patients in remote areas. Frequently, the appearance of burns can overshadow other life-threatening injuries, and determining the initial fluid resuscitation can be challenging. An intuitive mobile smartphone application that incorporates Advanced Burn Life Support protocol with integrated artificial intelligence (AI) to calculate burn size and depth with photos is needed. **METHOD** The mobile application was designed with an experienced team of burn specialists, physicians, and software engineers to identify the gaps in first responder burn care and to standardize methods for initial burn assessment. The application was developed using Adobe X. The front end was encoded in Flutter, the AI served using SkinAI, and a novel Skinopathy OS software has been used to integrate all data as an anchoring platform. **RESULTS** Upon initial assessment, the user is prompted to complete a primary survey, providing management options if issues are encountered. Once stabilized, the patient's medical information is inputted. The application ensures the collection of pertinent information for burns, such as the patient's weight for calculating fluid resuscitation. The burn information is inputted using an interactive diagram and the smart device's camera. The embedded-AI automatically calculates the total burn surface area (TBSA) and recommendations for initial treatment and resuscitation. The application can be used to update the depth of injury post-

debridement and recalculate the fluid resuscitation. **CONCLUSIONS** A smartphone burn application provides an integrated way to improve the efficiency and accuracy of first responders to manage and triage burns before reaching the hospital. Management recommendations are tailored to the extent of the injury and a detailed report is provided to first physicians. **LEARNING OBJECTIVE** Learn how a mobile application for first responders can optimize burn care

Incidence and risk factors associated with microbial colonization of burn wounds: An observational study (20)

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PURPOSE: Microbial colonization of burn wounds leads to infection, a major cause of morbidity/mortality, prolonged admission, and cost. This study aims to investigate the incidence of positive burn wound colonization, as a surrogate for infection, and its associated risk factors in a provincial referral center within a single-payer system. **METHODS**: We performed a retrospective review of all adult (≥ 18 years) patients admitted to a single, tertiary burn center, with a primary burn diagnosis between January 2011-2021. Microbiology records were screened to identify patients with culture positive burn wounds. Univariable and multivariable logistic regression analyses were used to evaluate risk factors associated with burn site colonization. **RESULTS**: The sample included n=634 participants. Most were male (72.1%), with a flame injury (62%), and had a mean age of 47.6 (±18.0) years, and TBSA of 13.5% (±14.8). The incidence of positive burn wound colonization was 27.3%. Increasing participant age, diabetic status, larger burn TBSA, presence of full-thickness burns, inhalation injury as well as lower limb and trunk involvement were associated with statistically significant ($p \leq 0.05$) increased odds of a positive burn wound culture. **CONCLUSION**: This study provides an estimate of the incidence of primary burn wound colonization at a single, tertiary care, burn center as well as identifies potential risk factors associated with this outcome. Clinicians should consider closely monitoring patients with these risk factors for possible progression to clinical burn site infection. Future research should address strategies to mitigate colonization in patients with identified risk factors. **LEARNING OBJECTIVES**: The audience will learn the incidence and risk factors associated with microbial colonization of burn wounds at a single Canadian institution over a 10-year period. The methods used will adjust for potential confounding variables in a retrospective cohort study.

The effect of silver on re-epithelialization, infection, and hypertrophic scarring of partial thickness burns in pediatric patients: A randomized control trial (21)

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PURPOSE: The ideal pediatric burn dressing minimizes discomfort and frequent changes, aids in re-epithelialization, and prevents infection. Silver-impregnated dressings have historically been preferred due to their proposed antimicrobial activity, but the necessity of silver to prevent infection is unfounded and some research has suggested it may contribute to hypertrophic scarring. We sought to evaluate the effect of silver on re-epithelialization, infection rates, and hypertrophic scarring by comparing two otherwise identical dressings: Aquacel® and Aquacel Ag® (ConvaTec). **METHODS**: We performed a single-blind, prospective, randomized controlled trial on pediatric patients presenting within 72 hours of injury with uncomplicated partial thickness burns. After presentation, patients were randomized to either the Aquacel® or Aquacel Ag® group. Outcomes of interest were time to re- epithelialization, incidence of infection, and hypertrophic scarring. Scarring was assessed at 2- and 6-months post-burn using the Vancouver Scar Scale (VSS). **RESULTS**: A total of 79 patients were recruited during the study period (Aquacel n=39, Aquacel Ag n=40). There was no significant difference between groups in time to re-epithelialization (p-value 0.16) or VSS scores at 2 and 6 months (2 month p-value 0.82, 6 month p-value 0.70). There were no clinically significant infections in either of the groups. Two patients, one from each study arm, were disqualified from the study as their burns converted to deep. **CONCLUSIONS**: Infections in uncomplicated, partial thickness pediatric burns are exceedingly rare. Based on the results of this study, we conclude that silver containing dressings are not necessary in the treatment of simple, partial thickness pediatric burns and should be used sparingly and at the discretion of the treating care provider in certain clinical scenarios. **LEARNING OBJECTIVES**: Attendees of this presentation will learn about qualities of ideal pediatric burn dressings and review evidence that supports the use of non-silver based dressings in uncomplicated pediatric burns.

A review of bear attacks: Patterns of injuries and interventions at a single institution over a 16 year period (22)

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PURPOSE: To analyze the incidence, injuries, surgical treatment and outcomes of bear attacks treated at a level 1 trauma center. **METHODS**: A retrospective chart review of adult patients admitted for bear attacks between January 2006 until February 2022 was conducted. Demographic data, injury patterns, management, and outcomes were analyzed. The severity of injury was evaluated using the Injury Severity Score (ISS) and mortality rate. Treatments evaluated included surgical intervention, prophylaxis and

therapy for infection, in hospital complications and psychological intervention. **RESULTS**: During the study period there were 18 bear attacks, 6 fatal prior to presenting to hospital. The mean age of patients was 46 years and 83% were male. Most attacks were by grizzly bears (89%) and defensive (78%). Of patients that presented to hospital, soft tissue injuries involved the upper extremity (83%), scalp (67%), face (42%), lower extremity (42%) and trunk (25%). Fractures were present in 60% of patients involving the upper extremity (33%), craniofacial skeleton (25%) and lower extremity (8%). The average ISS was 27.5, and the pre-hospital mortality rate was 33%. Management strategies used included surgical intervention for fractures and soft tissue injuries, as well as wound care and antibiotics for infected wounds. Of the 12 hospitalized patients 100% underwent surgical intervention and there was no mortality. **CONCLUSIONS**: Bear attacks are a rare but potentially severe injury that can result in significant morbidity and mortality. Soft tissue injuries to the upper extremity and scalp were the most common. Surgical intervention, wound care, and antibiotics are effective management strategies. Importantly, education and awareness of bear safety should be emphasized to prevent bear attacks and their sequelae. **LEARNING OBJECTIVES**: 1. Recognize the spectrum of severity and patterns of injury sustained from bear attacks; 2. Describe common approaches to these patterns of injury; 3. Anticipate common complications from these encounters.

The use of cartilage grafting techniques to mitigate alar retraction in complex nasal reconstruction (23)
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PURPOSE: Nasal alar retraction poses a difficult challenge in nasal reconstruction. Scar contracture, poor tissue quality, and lack of natural structural support, work in conjunction against the reconstructive surgeon. This is especially challenging when performing complex nasal reconstruction that involves a vertical scar along the alar rim. Although alar rim grafts can be used to provide structural support, without any vertical buttressing they can migrate cephalically. Once alar retraction has occurred, this can be challenging to correct. **METHOD**: In this paper we describe two techniques to prevent nasal alar retraction. In both cases, alar rim grafts are used to stent open the external nasal valve and shape the alar rim. In one technique, a second graft is used in an "A-frame" fashion between the dorsal septal graft and the alar rim graft. In the second technique a modified alar batten graft is secured to the alar rim graft. In both techniques, these additional grafts provide a vertical buttress to help maintain the position of the alar rim grafts and prevent alar retraction with graft migration due to scar contracture. To our knowledge, neither of these techniques have been previously described in the literature. **RESULTS**: Post-operative results show maintenance of alar position in cases of complex nasal reconstruction involving vertical scars along the alar rim, both in reconstruction as an isolated alar subunit as well as part of more complex nasal reconstruction. **CONCLUSIONS**: These techniques offer a simple and effective method to prevent nasal alar retraction during complex nasal reconstruction. A larger series of cases will allow for more extensive evaluation of these techniques. **LEARNING OBJECTIVES**: 1. Participants will describe new techniques for combatting nasal alar retraction using cartilaginous grafts during complex nasal reconstruction.

Restoration of tibial nerve function with transfer of multiple branches of the femoral nerve to vastus medialis to the medial and lateral gastrocnemius (24)
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PURPOSE: Tibial nerve injuries cause significant disability to patients due to inability to plantarflex and initiate gait. Previously described femoral-to-tibial nerve transfers utilized one branch from the vastus medialis and vastus lateralis to gastrocnemius, with nerve grafting for tension-free coaptation of the lateralis branches. We describe a novel technique for reconstruction after tibial nerve injury using transfer of two femoral nerve branches to the vastus medialis to the gastrocnemius. **METHODS**: This case series describes transfer of two femoral nerve branches to vastus medialis to the medial and lateral gastrocnemius branches of the tibial nerve for bilateral tibial neuropathy following cauda equina syndrome. **RESULTS**: Two identical twin males presented with bilateral absent tibial nerve function (absent motor unit potentials (MUPs)) and evidence of peroneal reinnervation (MUPs present) 5 months after laminectomy for cauda equina syndrome. Patient A underwent transfer of two femoral nerve branches to vastus medialis to the medial and lateral gastrocnemius branches. A nerve graft was used during transfer of the medialis branch to lateral gastrocnemius branch on the first leg. The subsequent leg, and both transfers for patient B were modified to include interfascicular dissection of the gastrocnemius branches within the sciatic nerve for 15-17cm; and were transposed without grafting. **CONCLUSION**: Tibial nerve function was reconstructed by transfer of two vastus medialis branches of the femoral nerve to the medial and lateral heads of the gastrocnemius. When combined with interfascicular sciatic nerve dissection, grafting was avoided. While these patients functional outcomes are still being followed, a shorter distance to muscle target with two medialis branches and avoidance of interposition grafts should increase the number of axons successfully reinnervating the target muscle. **LEARNING OBJECTIVE**: Participants will learn a novel technique for restoring tibial nerve function using transfer of multiple branches of the femoral nerve transferred to the gastrocnemius branches.

Improving biocompatibility: rat sciatic neurons form synapse-like structures adjacent to synthetic dendrimer-coated microspheres (25)

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PURPOSE: We have previously shown that in vitro, IPS-derived human motor neurons can undergo functional synaptogenesis onto microspheres coated with either poly-D-lysine (PDL) or an experimental hyperbranched polyglycerol named dendrimer (DND). The purpose of this study is to evaluate the potential of these synthetic polymers to induce the formation of synapses in a rat sciatic nerve in vivo model. **METHOD**: Uncoated and coated PDL and DND microspheres were injected into rat sciatic nerves after crush injury 5 mm distal to the crush site and incubated for 2 days, 1, 2, 4, 6 or 8 weeks before harvest and fixation. Neurons were identified using neurofilament and immunostained for presynaptic marker synaptophysin. Confocal microscopy was used and new synaptic formations surrounding the microspheres were quantified using FIJI. Statistical analysis using One-way ANOVA was completed using GraphPad Prism 9, and significance level was set at 0.05. **RESULTS**: A total of 54 rat sciatic nerves were analyzed. The PDL group showed a significantly higher number of synaptophysin puncta around its microspheres relative to control at 6 weeks ($p \leq 0.05$), but became comparable at 8 weeks. Similarly, DND-coated microspheres had a significantly higher synaptophysin staining compared to uncoated beads starting at 2 weeks ($p \leq 0.01$). The DND group displayed significantly more synaptophysin than the PDL group at 4 weeks ($p \leq 0.05$), but were comparable at 6 weeks. **CONCLUSIONS**: This study demonstrates both poly-D-lysine and dendrimer can induce synaptogenesis of rat peripheral neurons when injected into sciatic nerve. Dendrimer-induced synapses remain stable to at least 8 weeks *in vivo*, supporting a potential role in designing synaptogenic biocompatible electrodes. **LEARNING OBJECTIVES**: Learn about the synaptogenic properties of synthetic substances; Understand molecular methods of identifying nerve and synaptic vesicles in an animal model

Is there still a niche for temporal artery biopsy (TAB)? A Negative TAB may be useful after all (26)

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PURPOSE: We have retrospectively shown that most TAB referrals are for patients already meeting the American College of Rheumatology (ACR) diagnostic criteria for giant cell arteritis (GCA) and are already treated with steroids. This study aimed to prospectively validate the impact of TAB on steroid duration and complications. **METHODS**: Consecutive, multicenter recruitment was performed over 2 years. Primary outcomes included initiation, discontinuation, and duration of corticosteroid therapy from the time of biopsy. TAB results and details of GCA management were obtained via electronic medical records. A t-test was used with a p-value <0.05 for significance. **RESULTS**: 21 TABs were performed in 20 patients (53% female; mean age 71). Accidental sampling of a vessel other than the superficial temporal artery occurred in 9.5% (n=2) of patients rendering no pathological diagnosis. 19% of TABs were positive (TAB+), 71.4% negative (TAB-). 52% received steroids prior to TAB, on average for 8 days regardless of ultimate biopsy result (p=0.22). Biopsy length was notably shorter in TAB- patients (p=0.01). Interestingly, the average pre-biopsy ACR score was close to diagnostic threshold of 3 (1-4) (p=0.74). Post-biopsy ACR score rose to 3.5 for TAB+ patients but remained 2.4 for TAB- (p=0.02). TAB+ patients were treated for 300 days, TAB- for 19.2 days (p=0.001). There were major steroid-related complications (adrenal insufficiency (n=1), palpitations (n=2), dyspepsia (n=1), irritability (n=1), and Pneumocystis jiroveci pneumonia (n=1)), but no no surgical complication from TAB. **CONCLUSION**: In patients with a pre-biopsy borderline suspicion for GCA, a negative TAB leads to a shorter steroid duration. **LEARNING OBJECTIVE**: Support an informed application of TAB in patients with suspected GCA based on a borderline ACR score

Can artificial intelligence on a smartphone be used to screen for skin cancer? (27)

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PURPOSE: Skin cancer is the most common form of malignancy among the Caucasian population, and it carries with it a substantial economic burden [1,2]. While non-melanoma skin cancers (NMSC) are rarely fatal, they may still cause tissue destruction that can result in significant patient morbidity [3]. Despite advances in adjuvant targeted therapy, melanoma continues to result in significant morbidity and mortality. Currently, there are many mobile applications that use artificial intelligence (AI), automation or clinicians to analyze skin lesions but are not rigorously tested [4,5]. We have sought to create a mobile skin analyzer that can provide high accuracy assessments and connect patients with physicians. **METHODS:** A convoluted neural network (CNN) based skin lesion model was created that was trained on approximately 900 high-resolution images, and 37000 synthetic images generated from the original 900 images of four skin cancers (melanoma, dysplastic nevus, BCC and SCC) and four common non-cancerous lesions (dermatofibroma, benign keratosis, vascular lesions and melanocytic nevus). This model was tested on 36 malignant and 32 benign lesion images collected retrospectively at the University of Alberta to predict histopathology. **RESULTS:** The accuracy range was calculated using three levels of stringency, namely 1) top prediction, 2) probability-based, and 3) average of top 3 predictions; the three most commonly used methods in the literature [4,6,7]. Accuracy was on average 78% from all 3 methods. Specificity range was 66%-81% and sensitivity was 75%-89%.

CONCLUSIONS: This CNN has achieved clinical accuracy and surpassed clinical sensitivity compared to the average board-certified dermatologist published in the literature [5,6,7]. However, the false positive rate for benign lesions can be further reduced by training the system with malignant and benign lesion images that have highly similar visual features. **LEARNING OBJECTIVE:** Attendees will identify new methods of triaging skin cancer care using AI technology.

Margin status of basal cell carcinoma: What can be done better? (28)

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PURPOSE: Guidelines on clinical margins for basal cell carcinoma excisions were recently published, yet ambiguity remains for surgeons and pathologists. The purpose of this study was to determine the incomplete excision rate of basal cell carcinomas, determine significant predictors of incomplete excision, and evaluate completeness of reporting between surgeon and pathologist. **METHOD**: A retrospective analysis was conducted on all pathology reports from single excisions of basal cell carcinoma specimens, from one academic institution, between January 1, 2019, to December 31, 2020. The primary outcome was incomplete excision rate (positive margins reported by pathologist). Secondary outcomes included the relationship between incomplete excision rate and anatomical location, pathologist, and surgeon, determined by logistic regression. Completeness of surgeon pathology requisition forms was evaluated. **RESULTS**: Seven-hundred-and-sixty-two pathology reports were included. The incomplete excision rate was 12% (n=95). The most common site of incomplete excision was head and neck (n=88, 15%), followed by trunk (n=5, 7%), and extremities (n=2, 2%). To minimize overfitting, the logistic regression analysis included 584 specimens from 6 surgeons and 9 pathologists. Wald test showed location to be a significant predictor of incomplete excision ($p < 0.00$), whereas surgeon and pathologist were not. Regarding missing information, only 35 (5%) pathology reports included "excision" in the label. Four-hundred-and-four (53%) specimens had no clinical history or text provided with the specimen. **CONCLUSIONS**: Despite recent guidelines on basal cell carcinoma clinical margins, the rate of incomplete excisions is high. Pathology requisition forms often have missing information. Surgeons should include necessary clinical information with specimens to aid pathologists in histopathological examination. ***LEARNING OBJECTIVES***: Attendees will: 1) recognize factors influencing incomplete excision of basal cell carcinoma, and 2) apply quality improvement initiatives to their practice, which should include communicating pertinent information in pathology requisition forms.

Epidemiology of frostbite injury in Manitoba and patient factors as a predictor of amputation (29)

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PURPOSE: Amputation of limbs or digits is a common outcome among patients presenting with frostbite injury. As a result of our region's extreme winter temperatures, we manage a large volume of frostbite injuries each year. Amputation is a direct measure of frostbite injury severity. The objective of this study is to predict which frostbite patients are at risk for amputation based on preexisting patient related risk factors. **METHODS:** This is a retrospective chart review spanning 2015-2022 which includes both inpatients and outpatients 18 years and older at the time of presentation at a single center. Variables included age, sex, days from injury to amputation, length of stay, circumstances of injury, amputation, and comorbid conditions. Statistical analysis was performed including a multivariate logistic regression model. **RESULTS:** Over the 6-year period there were a total of 372 frostbite patients. Males accounted for 76% of frostbite patients. Rates of males presenting with frostbite injury requiring amputation was 86% compared with 13% of females. Length of stay was greater for those requiring amputation. Comorbid patient variables were not found to be predictors of amputation. Subgroup analysis of circumstances at time of injury showed high amputation rates among those who were elderly (35.5%) or sustained their injury from a vehicular related incident (45%). **CONCLUSIONS:** This is the largest frostbite injury cohort published to date. Males more commonly present with frostbite injury and are 1.92 times more likely to require an amputation compared to females. Substance-use disorder, psychiatric illness and experiencing homelessness are common among those requiring amputation however they are not indicators of increased amputation risk. Rates of amputation are highest in the elderly and those who sustain their injury as a result of a vehicle related situation. **LEARNING OBJECTIVES**: Identify patient risk factors that increase risk for amputation from frostbite injury.

Impact of medicolegal complaint amongst Canadian Plastic Surgeons (30)

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BACKGROUND: The current impact of medicolegal complaints in Canadian plastic surgery is unknown. We aim to obtain a subjective evaluation from the surgeons' perspectives and elucidate how to prevent and navigate through the medicolegal process. **METHODS:** An anonymous survey was sent to plastic surgeon members of the Canadian Society of Plastic Surgeons and Canadian Society for Aesthetic Plastic Surgery. The survey collected data on surgeon demographics, medicolegal complaint history and outcome, impact on practice, and insights into the process. Surgeons with an inactive practice and invalid

contact information were excluded. **RESULTS:** The survey response rate was 24% (108/456). Of the 100 included responses, 62% (62/100) were named in a medicolegal action. The most common reasons were related to treatment complications (42%, 26/62) and poor outcome/ disease progression (34%, 21/62). Majority of legal rulings were in favour of the surgeon - 57% (36/62) were dismissed or withdrawn before trial, 17% (11/62) were settled before trial, 8% (5/62) of trial verdicts were in favour of the surgeon, and 2% were in favour of the plaintiff. Medicolegal process duration varied from one to five years and most of surgeons spent up to 25 hours on their legal defenses. Most respondents felt the final medicolegal outcome was fair (76%, 47/62) and the Canadian Medical Protection Agency (CMPA) provided adequate legal defense (83%, 53/62). However, overall experience had strong negative impact on most surgeons? mental health (77%, 48/62). Most common practice changes included increasing documentation/ consent process (47%, 29/62), avoiding certain procedures (23%, 14/62), and avoiding care of high-risk patients (19%, 12/62). **CONCLUSION:** Canadian plastic surgeons experience strong medicolegal protection and favourable medicolegal outcomes. Impacts were mostly felt around time loss and related mental stress. This may be minimized through clear documentation around consent and adopting a cautious approach to high-risk cases. **LEARNING OBJECTIVES:** Participants will 1. be able to understand the process of a medicolegal complaint; 2. learn the potential impact from receiving a complaint; 3. be able identify how to prevent medicolegal complaints.

Multidisciplinary management of adult head and neck arteriovenous malformations using a combined onyx embolization and resection approach and pathway-targeted immunotherapy with MEK inhibition. (31)

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PURPOSE : Head and neck arteriovenous malformations (AVMs) are abnormal connections between arteries and veins that while congenital, on rare occasions may present for the first time in adults. These AVMs remain quiescent until a stimulant such as hormonal shifts or trauma causes rapid, symptomatic growth. We report the largest case series of a combined approach that consists of aggressive embolization with Onyx followed by complete surgical resection. When curative intent is not possible, we use Trametinib as a targeted, palliative therapy due to the presence of a somatic mutation in the KRAS-MAPK pathway. **METHOD**: All patients were identified to have a curable AVM based on MRI and angiograms were treated with Onyx embolization followed by surgical resection within 1-2 weeks. Post-operative angiograms were performed every 6 months following surgery. Tissues samples were obtained for genetic testing to look for somatic mutations in the KRAS-MAPK pathway. **RESULTS**: Twenty-seven patients (mean age 37 years) were treated with our combined embolization/surgery approach since 2016. Complete angiographic occlusion was achieved in 20 (74%) patients, whereas 25 (93%) patients were cured following surgery. Two patients developed a post operative hematoma and 1 patient suffered permanent facial paralysis. Two patients were found to have residual AVM on follow-up imaging and are considered non-curative. One patient received daily oral Trametinib as palliative treatment over the course of 18 months resulting in clinical reduction in the size of her AVM. **CONCLUSION**: Onyx embolization combined with immediate surgery may provide curative treatment for adult AVMs. Increasing awareness of this treatment strategy is important as many of our patients were previously told no treatment options were available for them. **LEARING OBJECTIVES**: 1) To describe a multidisciplinary curative treatment approach for adult AVMs 2) To discuss the future of genetic testing and immune modulation therapy for the treatment of adult AVMs.

Development of a mobile artificial intelligence application to track real-time range of motion recovery in the hand (32)

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PURPOSE: Range of motion (ROM) after hand surgery is often referred to as the hallmark of rehabilitation. Tracking this recovery requires multiple clinic visits and onerous encounters with hand therapy. Through the COVID-19 pandemic, we learned that virtual care can improve efficiency through remote means. Currently, telemedicine follow-up of hand recovery is difficult and subjective. Recent advances in artificial intelligence (AI) have been used for remote screening of skin cancers and burns from still images. An algorithm has yet to be developed to track hand recovery through video capture. The tracking of the hand proves to be most complex with multiple joints working in tandem. **METHOD**: The University of Alberta and Skinopathy AI have integrated computer vision models into an algorithm to track and measure hand movements. The algorithm first identifies the hand in the field-of-view and its 21 major landmarks from the wrist joint to tips of the distal phalanges. It then creates a real-time augmented-reality skeleton on the hand and calculates the angular changes in the phalanges. Specifically, the angle made by the distal interphalangeal and proximal interphalangeal joints for all hand digits are measured. **RESULTS**: We have modified the algorithm to analyze 10-20 second videos, therefore making it feasible for remote asynchronous monitoring. The algorithm has been tested on videos from 5 patients who have undergone hand surgery or are in post-burn physiotherapy. The algorithm can track and quantify full digital flexion and extension, as well as thumb flexion, adduction and opposition. **CONCLUSIONS**: This is the first mobile video algorithm that detects real-time hand ROM of all 21 hand landmarks. Future directions will include validating prospective measures with goniometric confirmed end ROM. **LEARNING OBJECTIVES** Attendees will learn of novel techniques to remotely and

accurately track the progress of hand rehabilitation after trauma and surgery.

Safety outcomes of prepectoral and subpectoral breast reconstruction: A prospective cohort study (33)

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PURPOSE Subpectoral breast reconstruction (SPBR) has previously been considered the gold standard alloplastic technique. To circumvent pain, dynamic deformity, and contracture associated with SPBR, the prepectoral (PPBR) technique has evolved with increased use of acellular dermal matrix. This study aims to comparatively evaluate the safety profiles of PPBR and SPBR patients undergoing immediate breast reconstruction (IBR). **METHODS** In this prospective longitudinal cohort study, all patients who underwent mastectomy and alloplastic IBR at the University of British Columbia from March 2021 to October 2022 were consecutively enrolled. Patient demographics, oncological and surgical details were collected. Safety outcomes, including device loss, reoperation, readmission, infection, seroma, and mastectomy flap necrosis (MFN) were recorded. Categorical data were compared using Fisher's exact test and continuous variables compared with Student's t-test. **RESULTS** Among 198 patients enrolled, 89 patients underwent SPBR and 109 underwent PPBR. Two-stage reconstruction with tissue expanders (59.2%, n=100) was more common than direct-to-implant (DTI) (40.8%, n=69), with no significant difference in plane of prosthesis placement between the groups. For staged reconstruction, the rate of readmission to hospital after the first stage surgery was significantly higher in PPBR compared to SPBR ([PPBR 22%, n=22] vs [SPBR 5.8%, n=4], $p < 0.05$). Other safety outcomes, including device loss, reoperation, infection, seroma, and MFN, were not significantly different between PPBR and SPBR in staged reconstruction. Patients with DTI surgery had no difference in safety outcomes between SPBR and PPBR groups. **CONCLUSION** The safety outcomes for patients who underwent direct-to-implant surgeries were comparable between PPBR and SPBR. Staged SPBR surgeries showed comparable safety profiles to staged PPBR surgeries with the exception of readmission rate, where SPBR patients experienced a lower rate of readmission. **LEARNING OBJECTIVE** Learner will describe the safety outcomes of SPBR and PPBR.

Protective pre-conditioning with fat grafting in the irradiated breast prior to nipple sparing mastectomy and immediate pre-pectoral breast reconstruction: A case study and MRI assessment (34)

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PURPOSE: Implant-based breast-reconstruction in the setting of radiotherapy is associated with a high risk of complications. Fat grafting following reconstruction has been shown to reduce rates of complications and is thought to alter the tissues due to regenerative capacities induced by adipose derived stem cells. Here we present a case study demonstrating the multi-potential differentiation ability of fat grafting to augment the fat layer above the fascia in the irradiated breast prior to nipple sparing mastectomy and direct to implant reconstruction. We report our findings with sequential MRI and calculation of increased thickness of the fat layer prior to mastectomy and reconstruction. **METHOD:** A 42 yr. old patient with left breast cancer treated with lumpectomy and radiation therapy, eventually required a completion mastectomy due to a BRCA1 designation. Three sequential fat grafting episodes six months apart were performed (from 2019 to 2021) with 60 to 100 cc of lipo-aspirate injected into the subcutaneous layer of the breast using a modified Coleman technique. A segmentation protocol was applied to sequential MRIs to quantify differences in volume in the subcutaneous layer. The proportion of new fat in the subcutaneous layer above the fascia relative of the breast was calculated as the primary outcome and was compared between the MRIs for change of subcutaneous depth, post fat grafting. **RESULTS:** Potential confounding factors (medications, BMI) were reviewed. The results show an increase in depth of fat layer from 1.26 cm to 1.46 cm (increase of 15.87 %). Segmentation MRI analysis of an increase in total subcutaneous fat volume will be presented. **CONCLUSION:** Preconditioning fat grafting of the irradiated breast may be a valid protective technique for avoiding high rates of complications in implant-based breast reconstruction in the irradiated breast. **LEARNING OBJECTIVE:** Participants will be able to identify benefits of fat grafting in implant-based breast reconstruction.

Silicone particles in capsules around breast implants: Establishment of a new pathological methodology to assess the number of particles around breast implants (35)

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PURPOSE : Little data has been published regarding the amount of silicone particles that is susceptible to migrate into the capsule. The quantification of these particles could inform on the level of silicone exposure a patient with breast implants may experience in the short- or long-term. The objective of this study is to present a histological quantification methodology of the number of silicone particles present in breast implant capsules. **METHODS**: A prospective study was performed on capsule samples from patients requiring revision surgery. The slides were digitalized and analyzed with a viewer software. For each sample, we (1) manually counted each silicone particle, (2) measured the average particle size, (3) measured the capsule surface area, and (4) calculated the particle number density in each capsule sample. The average of all capsule samples' particle number densities was then compared to the total volume of the capsule to estimate the total number of silicone particles. **RESULTS**: Six capsules from six different patients were analyzed. Two capsules were from saline implants while four capsules were from silicone implants. All four silicone implant capsules contained

between 352,928 and 9,002,235 silicone particles. The particle number density ranged from 20.5 to 683.5 particles per mm3 of capsule. The two saline-filled implant capsules were free of silicone particles. **CONCLUSIONS**: We describe a new and reproducible methodology to quantify realistically the silicone particles in the periprosthetic capsule of breast implants. **LEARNING OBJECTIVES**: At the end of this presentation, the learner will be able to understand the method of calculation of particles and appreciate the quantity of silicone particles in the capsule.

SThe clinical impact of serial angiography and thrombolysis in the evaluation and treatment of frostbite (36)

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PURPOSE Initial evaluation of acute frostbite grade can be challenging, but is critical to help guide potentially limb-saving treatments. Angiography can supplement the clinical exam by demonstrating level of tissue perfusion. This retrospective study looks at a correlation of initial presentation, initial and follow-up angiography at 24-72 hours, and the surgical level of amputation after frostbite. Since all the angiography patients also received intra-arterial thrombolysis, this study also measures our digit salvage rates for Grades 3 and 4 frostbite. **METHODS** Patients who are candidates for thrombolysis undergo angiography of the affected limbs and intra-arterial catheter placement for thrombolytic administration by Interventional Radiology within 24 hours of rewarming. Approximately 24-72 hours later, follow-up imaging with angiography is performed on the same limbs. Patients are assessed clinically by Plastic Surgery on admission and at daily intervals. We reviewed 19 frostbite patients admitted to our center in 2021. Of these, 6 received serial angiography and intra-arterial thrombolysis. Angiography images were reviewed blindly by 3 IR reviewers. Photos and operative reports were reviewed separately, with results correlated by another separate author. **RESULTS** Serial clinical photos (pre and postop) will be shown with angiography images (pre and post-thrombolysis). Only 3/6 patient required surgical treatment. One patient had no response to thrombolysis, resulting in bilateral BKAs. One patient had 3 of 9 digits at risk salvaged post-thrombolysis. The other 4 patients had 100% digit salvage (30/30 digits). Overall the salvage rate in for our 2021 patients was 37/49 digits, or 67%. **CONCLUSIONS** The correlation between initial angio results and clinical evaluation was poor, due to the concomitant direct soft tissue cold injury. However, the improvement in arterial inflow after thrombolysis, had a high correlation with digit salvage clinically. Statistics will be completed once additional data has been collected to increase sample size. **LEARNING OBJECTIVES** To evaluate correlation of data obtained from serial clinical and angiography examinations of limbs affected by frostbite, pre and post-thrombolysis treatment.

Evidence-based algorithms for free deep inferior epigastric perforator (DIEP) flap salvage in autologous breast reconstruction (37)

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PURPOSE: Breast reconstruction with the Deep Inferior Epigastric Perforator (DIEP) free flap has become the gold standard for autologous breast reconstruction. Flap take-back to the operating room (OR) is an uncommon but difficult situation, requiring prompt and accessible resources. We conducted a literature review, and expert review, to inform evidence-based peri-operative algorithms in the event of DIEP flap compromise requiring return to the OR. **METHOD**: A review of the literature was conducted, including MEDLINE, Embase, Google Scholar, and Cochrane Controlled Register of Trials (CENTRAL). Twenty- one publications were selected for full text review, and data was abstracted a priori to populate peri-operative approaches to free-flap compromise. This data was used to inform three clinical algorithms to support return to the OR, management of vascular thrombosis and venous congestion. These algorithms then underwent expert review and revisions from six international experts in microsurgery. **RESULTS**: Three evidence-based management algorithms were created. Algorithm 1 outlines general peri-operative management strategies to optimize patient care and prompt return to the OR. Algorithms 2 (Venous Congestion) and 3 (Vascular Thrombosis) provide specific intra-operative strategies surrounding mechanical decompression, pedicle exposure, assessment and extraction of thrombosis, identification and use of alternative recipient vessels, vasospasm, and the use and dosage of intraoperative thrombolytics. Non-constricting flap inset after take-back, salvage medical strategies and post-operative management strategies following flap failure were additionally included. **CONCLUSION**: A coherent and stepwise approach to DIEP flap compromise in breast reconstruction was developed. These expert-reviewed algorithms provide an approachable and evidence-based structure to support return to the OR. **LEARNING OBJECTIVES**: 1. Participants will gain an understanding of relevant literature and expert opinion surrounding free flap salvage in breast reconstruction 2. Participants will identify possible contributors to free flap failure, and subsequent management options. 3. Participants will be able to navigate evidence-based algorithms for translation into clinical practice.

Post-operative management of pediatric craniofacial patients in a ward observation unit: A Covid-inspired Quality Improvement (QI) initiative (38)

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PURPOSE: The COVID-19 pandemic in Ontario saw a halt of elective surgical procedures in March 2020 with an 86% increase in Plastic Surgery wait list cases by April 2022. Access to the OR for pediatric craniofacial cases was significantly limited by ICU availability resulting in

cancellations. This led to a QI project to re-evaluate the need for post-operative ICU monitoring and build capacity for post-operative care on the in-patient ward. **METHODS**: Admission criteria were developed that would allow patients to recover and be transferred to the inpatient ward, avoiding ICU admission. Review of patients before (n=18) and after (n=20) implementation was performed by an independent reviewer. Parameters assessed included the Aldrete/Chung physiologic scoring systems (respiration, neurological status, circulation, post-operative pain, nausea, vomiting and hemodynamic stability), length of stay, narcotic use, pain scores and complications. **RESULTS**: No mortalities or major morbidities were encountered in either group. Ward recovery patients had a shorter hospital length of stay (2.33 days versus 3.14 days), used more doses of intermittent opioid in the first 24 hours post-operatively (3.89 doses on versus 2.79 doses) but were never placed on an opioid infusion compared with 36% of ICU patients. Ward patients had lower average pain scores (4.76/10 vs 5.45/10). Patient satisfaction scores were higher in ward patients. Cost savings were calculated to be $2146.00 CAD per patient. **CONCLUSION**: This project demonstrated that pediatric craniofacial patients may be safely managed in a ward setting with reduced narcotic use, shorter length of stay and significant economic benefit. **LEARNING OBJECTIVES**: 1. To highlight strategies to realign post-op care pathways for pediatric craniofacial patients. 2. To demonstrate advantages of a non-ICU post-operative paradigm for pediatric craniofacial patients.

Radical overlapping intravelar veloplasty during primary cleft palate repair results in decreased secondary speech surgery (GP19)

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PURPOSE: The impact on speech outcomes of performing a radical intravelar veloplasty (IVV) is unknown. The purpose of this study was to determine what the impact of a radical IVV during primary palatoplasty has on the rate of secondary speech surgery. **METHOD**: This is a single surgeon retrospective review of prospectively collected data of primary palatoplasty using an IVV performed over a 21-year period from the year 2000 to 2021. In 2008, the surgeon changed technique to involve a more radical IVV. The radical IVV involved release of the palatopharyngeus from the posterior hard palate and from the nasal component of the tensor veli palatini, release of the levator veli palatini to the levator tunnel, and overlapping of the palatopharyngeus-levator unit across the midline after retro-positioning. This separated the patients into a before and after technique change group. The rate of secondary speech surgery using a secondary Furlow or pharyngeal flap was compared between the two time periods. **RESULTS**: An IVV was performed during either a von Langenbeck or hybrid repair 272 and 231 times during the first and second time periods, respectively. The second radical IVV group had significantly ($p<0.05$) less secondary speech surgery procedures at 30 (12.99%) compared to 59 (21.69%) amongst the first conservative IVV group ($p<0.05$). The rate of pharyngeal flap surgery was significantly lower ($p<0.05$) amongst the second group of patients at 5 (2.16%) versus 32 (11.76%). **CONCLUSIONS**: Precise anatomical dissection, extensive release, retro-positioning and overlap of the velar musculature during IVV results in significantly less secondary speech surgery. **LEARNING OBJECTIVES**: Participants will learn that performing a more radical intravelar veloplasty during cleft palate repair results in less secondary speech surgery. Participants will also learn the technique of performing the more radical intravelar veloplasty.

POSTERS/*AFFICHES*

Intraoperative imaging to detect occult penetration of screws after volar plating of distal radius fractures: A cadaveric study (GP02)

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PURPOSE: Hardware prominence is one of the major established complications following volar plating of distal radius fractures. The purpose of this cadaveric study is to compare two conventional fluoroscopic imaging views (Carpal Shoot-Through [CST] and Dorsal Horizon [DH] views) with ultrasound to establish the best intra- operative imaging modality for surgeons to use to identify penetration of screws through the dorsal cortex and / or into the distal radioulnar joint. **METHODS**: Twelve human cadaveric upper limb specimens were instrumented with distal radius variable angle locking plates and four distal locking screws from a volar approach. CST, DH views and ultrasound evaluations were compared to identify prominent screws. There were 6 surgeons divided into 3 groups of different clinical experience performing the evaluations. Sensitivity and specificity of detecting screw penetration along with the surgeon's confidence in each modality were established. **RESULTS**: CST view was the most sensitive in identifying the presence of dorsal screw penetration (100%) and absence of dorsal screw penetration (78%). DH view had the highest sensitivity in recognizing DRUJ screw penetration (89%). Ultrasound evaluation had the lowest sensitivity and specificity (28%, 56% respectively). The fellowship trained upper extremity surgeons had the highest sensitivity and specificity rate of 78% and 78% respectively. Surgeon's ability to perform as well as confidence in evaluating for screw penetration was highest with the CST view. **CONCLUSION**: CST view was found to be the best intra-operative imaging modality to 'rule in' and 'rule out' screw penetration through the dorsal cortex. DH view was most reliable in detecting DRUJ screw penetration. Clinical experience was determined to be an important factor for both dorsal cortex and DRUJ evaluation. Ultrasound evaluation had the lowest sensitivity and specificity in all categories, demonstrating that this not a reliable modality for surgeons without specific training in point-of-care ultrasonography. **LEARNING OBJECTIVE**: Participants will be able to select the best intraoperative imaging modality to detect occult penetration of screws after volar plating of distal radius fractures.

Efficacy of oxygen delivery biomaterial for necrosis reduction of ischemic skin flap (GP06)

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PURPOSE: When performing a flap, the viability of areas that lie outside of the pedicled angiosome is at risk. The consequence of insufficient vascular supply is ultimately necrosis of the affected areas. This study investigated the ability of a subdermal oxygen delivery biomaterial to reduce necrosis of poorly vascularized skin in a rat model. **METHODS**: We developed an implantable solid peroxide biomaterial system to provide sustained delivery of oxygen directly to tissues. A preclinical trial was conducted on male Wistar rats divided into 2 groups (N=9 per group). A 9 x 2cm ischemic skin flap was created on the dorsum of each subject. A silicon sheet was placed under the flap to prevent revascularization from the underlying tissue. Then the oxygen-releasing film was positioned distally, and the skin was replaced on top of it and sutured. The control group received no film. In every group, five animals were sacrificed on day 6, four animals on day 10. **RESULTS**: When comparing time points, the skin flap in the control group showed a bigger area of necrotic tissue (40% vs 31%; $P<0.05$) and lower oxygen levels ($P<0.001$). Other measures of comparison were not significant (intradermal lactate quantification and thermal imaging). **CONCLUSION**: We report a novel subdermal oxygen-delivering polymer film composite biomaterial that shows promise in decreasing flap ischemia and necrosis. **LEARNING OBJECTIVES**: 1. Describe a model demonstrating a skin flap with distal ischemia-necrosis. 2. Explore whether a novel oxygen-delivering film can reduce distal flap necrosis.

A novel model for trainees to practice locoregional flaps on the hand and nose: a descriptive technique on chicken feet (GP07)

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PURPOSE: Surgical simulation models are aimed at developing skill acquisition in a controlled and calm environment before applying it at the bedside. Several non-live and live models have been previously described in the plastic surgery literature, but few have focused on common flaps for defects on the hand and nose. This study aimed to describe a novel chicken foot model that can be used to practice design, harvest and inset of common locoregional flaps of the hand and nose. **METHOD:** A feasibility study was conducted on a chicken foot model by harvesting four locoregional flaps on the hand (fingertip V-Y flap, four-flap Z-plasty for webspace release, cross finger flap and first dorsal metacarpal artery (FDMA) flap) and two flaps on the nose (Limberg and bilobed flaps). Non-live chicken feet were prepared and analysed in a surgical training laboratory by the senior authors. No participants were involved in this study. **RESULTS:** All flaps performed on the model had realistic anatomical landmarks for preoperative markings, skin and subcutaneous soft tissue texture, as well as flap harvesting and insetting steps. Maximal flap sizes were 10x7mm for volar V-Y advancement, 16x12mm for cross finger flaps and 18x9mm for FDMA flaps. The maximal webspace deepening with four-flap/five-flap Z-plasty was

14 mm and the FDMA pedicle length and diameter was 21mm and 0.75mm respectively. Maximal flap sizes for Limberg and bilobed flaps were 10x10mm. **CONCLUSION:** The chicken foot is an inexpensive and readily available non-live model that can effectively be used by surgical trainees to practice common flaps of the hand and nose. Further research includes testing for reliability and validity of the model. **LEARNING OBJECTIVES:** Participants will be able to learn a novel technique for practicing common locoregional flaps of the hand and nose on a non-live chicken foot model.

First Nations patients' experience receiving care for cleft lip and palate (GP08)
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PURPOSE: Our study seeks to understand the experiences of First Nations (FN) patients and their families while receiving multi-disciplinary care for the treatment of cleft lip and palate (CL/P) in Treaty 7 Territory in Southern Alberta. **METHODS:** First nations participants (patients and/or family members) identified by purposive sampling in a multidisciplinary cleft palate clinic agreed to qualitative, semi- structured. Interviews were by a FN member of the research team then transcribed verbatim, and then analyzed for recurrent themes. These themes were in turn further analyzed through the lens of the traditional Blackfoot (Niitsitapi) holistic medicine wheel which includes 4 domains of health: spiritual, emotional, mental, and physical. **RESULTS:** Patients and families highlighted a lack of cultural and spiritual components in their care. In particular, the traditions of smudging practice, assistance from FN elders and access to indigenous physicians and healthcare professionals were not overtly considered during the care process. Viewed in the context of the Blackfoot holistic medicine wheel, it is apparent that current care processes emphasize the physical domain of health but fall short in the spiritual, mental and emotional domains. **CONCLUSIONS:** FN patients value a holistic approach to health care with mind, body and spirit treated as one. Participants experienced a lack of access to cultural and spiritual supports when receiving cleft care. An understanding of FN traditional health models offers a pathway towards improved care for FN patients and families requiring treatment of clefts and other complex conditions requiring multidisciplinary care. **LEARNING OBJECTIVES:** 1. Appreciate how First Nations patients and families conceptualize healthcare as it relates to the Blackfoot medicine wheel. 2. Develop care models and services for FN families receiving complex multidisciplinary cleft care.

Sternal cleft reconstruction with acellular dermal matrix and full thickness calvarial graft (GP09)
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PURPOSE: A 10-month-old infant with a sternal cleft of 4cm at its widest between the clavicles was reconstructed using acellular dermal matrix, full thickness calvarial bone graft and myocutaneous pectoralis flaps. **METHOD**: Bilateral pectoralis major musculocutaneous flaps and perichondrial flaps lateral to the ribs were elevated, leaving a 5.5cm x 5cm defect of the cleft. A 1.5mm-thick segment of acellular dermal matrix was inset. Parietal bones were exposed through a bicoronal scalp incision, with 2 triangular full thickness parietal bone grafts taken to avoid a single large defect to facilitate reossification. The two segments were recontoured to a flatter profile and fixed with resorbable mesh and rivets. The bone graft was placed over the acellular dermal matrix and fixed to the ribs. The pectoralis flaps were advanced over Blake drains and closed. **RESULT**: The infant underwent an uncomplicated postoperative course. There was complete re-ossification of calvarial donor sites by 4 months. Additionally, there was good graft retention, chest excursion, and scar maturation by 12 months. (Video available) 4. **CONCLUSIONS**: Combining full thickness calvarial bone grafts with acellular dermal matrix is a safe and reliable approach to manage an infant with a large sternal cleft. **LEARNING OBJECTIVE**: Participants will learn the different surgical management techniques used for sternal cleft reconstruction.

Remote evaluation of thumb range of motion for hand therapy with the DIGITS web application (GP10)
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PURPOSE: Telemedicine increases hand rehabilitation accessibility for patients facing pandemic-, geographic-, and/or time-related barriers. Augmented reality pose estimation software, such as DIGITS, can be used to remotely measure finger joint range of motion (ROM) in a flexion-extension arc. However, the multi-planar nature of thumb ROM remains a challenge for remote assessment. In this proof-of-concept study, we extend the functionality of DIGITS into the thumb with a novel data collection and analysis protocol. **METHOD**: Participants without hand pathology were recruited for the study. Thumb carpometacarpal (CMC), metacarpophalangeal (MCP), and interphalangeal (IP) joint ROM measurements in full flexion, extension, and palmar abduction were captured by DIGITS and compared to goniometry measurements taken by a trained hand therapist (the current gold standard). Accuracy across camera views were also compared. Statistical testing was conducted using Bayesian analysis with the Lee-Wagenmaker interpretation model. **RESULTS**: Eighteen hands were measured. MCP extension, MCP flexion, and CMC palmar abduction measurements were found to be comparable between

DIGITS and goniometry with moderate evidence (BF=0.23, 0.29, and 0.31, respectively; average Δ=3, 10, and 13o, respectively). IP extension also appeared comparable between the two methods, though without statistical evidence (BF=2.1; Δ=8o), while IP flexion differed significantly (BF>3; Δ=43o). The best camera view for angle accuracy was 45o relative to the palmar surface for all ROMs except MCP extension, which was most accurate in the direct palmar view. **CONCLUSIONS**: DIGITS provides a convenient and accessible means for remote hand joint pathology monitoring. This proof-of-concept study demonstrates the potential of DIGITS in assessing thumb ROM. Next steps include optimizing the DIGITS' distal thumb phalangeal landmark to improve IP measurement accuracy and integrating rotating angle capture for simultaneous multi-joint assessment. **LEARNING OBJECTIVES**: 1. The role of technology in improving remote accessibility to hand therapy and assessment 2. Development of technological innovation in medicine

The effects of alloplastic vs autologous breast reconstruction on wait times to downstream ablative therapies (GP11)

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PURPOSE Immediate breast reconstruction (IBR) has been linked to increased time-delays with ablative breast cancer therapies due to the additional coordination of care required. To optimize patient outcomes and inform clinical decisions, we examined the impact of treatment order and reconstructive modalities on wait-times to downstream ablative therapies. **METHODS** This study extracted data from provincial and private records for breast cancer patients undergoing IBR following mastectomy from 2010 to 2021. Patients were categorized by treatment, Surgery First (SF) or Neoadjuvant Chemotherapy (NC), with reconstructive modality subgroups, including alloplastic implants or autologous flaps. Outcomes included wait times to key diagnostic and therapeutic milestones. Fisher Exact and Mann-Whitney U tests were used to compare proportions and median waits (days) to global benchmarks, respectively, with a secondary comparison between reconstructive modalities. **RESULTS** From a cohort of 417 patients, 77.0% (n=321) underwent SF and 23.0% (n=96) NC. SF patients were more likely to exceed the following benchmarks vs NC: 4 weeks from first consultation to first therapy (67.1%vs31.0%; p<0.001), therapy initiation within 6 weeks of biopsy (75.2% vs 42.4%; p<0.001), and radiotherapy initiation within 8 weeks of surgery (84.1% vs 40.3%; p<0.001). There was no difference in median time from surgical oncology consultation to first operation for alloplastic and autologous subgroups of SF (p=0.187) and NC (p=0.690) patients. The two modalities did not differ in delays to chemotherapy following surgery in SF patients, (p=0.821), or in commencing radiotherapy following surgery (p=0.283) and first surgical ablation following chemotherapy completion (p=0.203) in NC patients. **CONCLUSIONS** IBR patients with surgery upfront wait longer for therapy initiation, particularly radiotherapy, as compared to patients receiving neoadjuvant chemotherapy. Moreover, reconstructive modality does not appear to significantly impact time delays to subsequent therapies. **LEARNING OBJECTIVES** Understand the effects of reconstructive modality on wait-times to breast cancer therapies

Predicting the need for post-mastectomy radiotherapy for patients undergoing immediate breast reconstruction: A machine learning prediction model (GP12)

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PURPOSE: Immediate implant-based breast reconstruction (IIBR) is the most common form of reconstruction. Post-mastectomy radiation therapy (PMRT) increases the risk of IIBR surgical complications. A machine learning (ML) algorithm can aid clinicians to predict the need for PMRT pre-operatively. Our objective was to construct and validate a ML algorithm that predicts the probability of requiring PMRT in the preoperative setting for breast cancer patients seeking IIBR. **METHODS**: A retrospective cohort of adult patients with breast cancer who underwent mastectomy and alloplastic reconstruction (2010-2020), was used for model development, training, and testing. Eighty-one pre-operative factors, categorized as surgical, tumour, patient, and treatment-related, were used as predictors to train four ML algorithms: Elastic Net (EN), Logistic Regression (LR), Logistic Lasso (LL), and Random Forest (RF). Recommendation for PMRT was the primary outcome for prediction and the models were evaluated using the area under curve (AUC) performance metric. **RESULTS**: Out of 800 patients, 325 (40.6%) received recommendations for PMRT. Four models were trained and evaluated using a training- validation dataset of 600 patients. The best-performing models, EN and LL, both achieved AUC of 0.794 on the hold-out dataset of 200 patients. The most important PMRT predictors were imaging tumour size, suspicion of lymph node metastasis, HER2 status, histology grade, and lymph node biopsy recommendation. Using the best-performing model, an online calculator was created for physician use. **CONCLUSION**: The highest-performing PMRT prediction models were the EN and LL models. Machine learning algorithms can predict the need for PMRT based on pre-operative factors and help guide shared decision-making. **LEARNING OBJECTIVES**: 1. To learn about the use of machine learning and its application in clinical care. 2. To learn about PMRT and its impact on decision-making on the type and timing of breast reconstruction.

Recommendations for a Canadian Breast Implant Registry (GP13)

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PURPOSE: A 2021 report revealed breast augmentation and implant replacement procedures increased 47% from the year prior in the United States (APS, 2021). These patterns are reflected throughout North America, and therefore highlight the importance of breast implant registries to ensure safety and quality care with this growing demand. Despite wide adoption of implant registries in other countries, there is currently no Canadian system to track implantation of breast prostheses. This review aimed to identify strategies used by existing national breast implant registries and offer recommendations for the development and implementation of a Canadian breast implant registry. **METHODS**: Medline Ovid, Web of Science, Embase Ovid and grey literature databases were searched using the terms: (breast or mammo) AND (prosthesis or implant) AND (registry or database). Screening was completed in Covidence by two reviewers. Data were extracted for the following: registry structure, funding models, governances, reporting outputs, and institutional barriers. **RESULTS**: The following strategies are commonly implemented in national breast registries culled in our search. Dutch and Australian breast implant registries, use an opt-out structure to improve capture rate as compared to opt-in systems, which report low participant intake as a major barrier to registry development. Although funding models differ between Dutch and Australian registries, using government and private funding respectively, our review highlighted the importance of adequate long-term funding to ensure registry sustainability. Finally, existing registries recommend annual public output reports to increase transparency on registry findings and encourage public engagement. **CONCLUSION**: Based on strategies used in existing registries, it is recommended a Canadian breast registry is developed and implemented using an opt-out structure, adequate funding from stakeholders, and low administrative burden. **LEARNING OBJECTIVES**: Using recommendations of successful implant registries, learners will recognize strategies for the development of a Canadian breast implant registry.

Cost of care and surgical outcomes between direct-to-implant and staged tissue-expander breast reconstruction (GP14)

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PURPOSE Implant based breast reconstruction (IBBR) can be performed in a single-stage (direct to implant [DTI]) or two stages using a tissue expander (TE). Fixed costs and post- operative complications can incur a significant financial burden. Here, we compare direct costs of DTI to TE IBBR and determine price drivers to ascertain their relative costs. **METHODS** A retrospective chart review and analysis of specific cost data provided by institutional finance department of patients who underwent implant-based BR was conducted to evaluate differences in costs during an episode of care (EOC). Multivariable regression analysis and one-way sensitivity analysis were conducted to determine key price drivers for each operation. **RESULTS** 205 patients (310 breasts) undergoing DTI (n = 167, 54%) or staged TE (n = 143, 46%) reconstruction were evaluated over their entire EOC. The DTI cohort had a lower rate of major complications (13% vs 22%, $p = 0.033$) but similar rates of aesthetic revisions (18% vs 19%, $p = 0.835$). The average cost of a DTI ($13,719.39 ± $5,499) was significantly lower than for staged TE patients ($16,589.54 ± $6,586.95, $p < 0.001$), with lower operative costs ($10,460.2 ± $4,059.81 and $12,242.87 ± $4,403.81, $p = 0.002$) and number of postoperative visits (13.27 ± 7.76 and 23.03 ± 9.05 , $p < 0.001$). There were no differences in operative costs from complications and aesthetic revisions. The cost of a DTI reconstruction is most sensitive to the rate of bilateral operations. For staged TE, the episodic cost is most sensitive to the incorporation of acellular dermal matrices. **CONCLUSION** DTI BR incurs lower cost over an EOC compared to staged TE reconstruction, due to greater planned operative costs and number of postoperative follow-ups. **LEARNING OBJECTIVE** The attendee will be aware of differences in costs, complication rates and aesthetic concerns between DTI and TE.

A retrospective single-surgeon chart-review of fresh frozen costal cartilage in rhinoplasty (GP15)

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PURPOSE: Revision rhinoplasty is often made more challenging by the lack of available autologous septal tissue. While other autologous and homologous graft options exist, they are fraught with their own challenges, including increased operative time and donor-site morbidity for the former, and increased susceptibility to resorption for the latter. Fresh frozen costal cartilage (FFCC) is an increasingly popular alternative that yields the benefits of homologous tissue while having a lower theoretical risk profile. This study aims to analyze the long-term complication rates when implementing MTF (Musculoskeletal Transplant Foundation) FFCC. **METHOD**: A retrospective chart review of the use of FFCC in revision rhinoplasty in the senior author's practice was conducted. 287 cases were reviewed and analyzed for rates of infection, warping, and resorption. Inclusion criteria was cases with minimum 12 months follow-up. **RESULTS**: The mean age was 35.9 years old, with 28 males and 259 females. There were 41 primary rhinoplasty (inadequate septum due to previous septoplasty, trauma or medication/drug usage) and 246 revision rhinoplasty cases. Mean follow-up period was 20.3 months with minimum follow-up of 12 months. Six patients (2.1%) were treated with antibiotics for presumed infection, however bacterial cultures were negative, and no abscess was formed. Five patients (1.7%) required operative revision. There were zero patients with clinical signs of warping or resorption. **CONCLUSIONS**: To date, this is the

largest known study with the longest follow-up analyzing the complication profile of MTF FFCC in revision rhinoplasty. Acute infection, warping, and resorption rates were found to be no greater than rhinoplasty complication rates when autologous or homologous tissue are used. As such, FFCC is a safe, convenient, and patient-centered option for graft tissue in revision rhinoplasty. **LEARNING OBJECTIVE**: Participants will identify rates of common complications of fresh frozen costal cartilage in revision rhinoplasty.

Can artificial intelligence guided image assessment be as accurate as laser doppler perfusion scanning in predicting depth of burn injury? (GP16)

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PURPOSE Appropriate identification of burn depth and size is paramount. Despite the development of assessment aids [e.g., laser doppler imaging (LDI)], clinical assessments remain the gold standard, which assesses partial thickness burn depth with ~67% accuracy. We sought to develop an image-based artificial intelligence (AI) system that predicts burn severity and margins for use in acute burn triage. **METHOD** A convoluted neural network (CNN) was trained on 1855 mobile-device-captured burn images of different burn depths. The CNN was used to develop a novel Boundary-Attention Mapping (BAM) algorithm, using elements of saliency mapping, which was utilized to recognize the boundaries of burns. For validation, 144 patient charts that included clinical assessments, burn location, total body surface area, LDI-assessments, were retrieved for a retrospective study at the University of Alberta. The clinical images underwent CNN-BAM assessments and were directly compared with the LDI assessment. **RESULTS** The CNN-BAM system can highlight burns from surrounding tissue with high confidence. The CNN can classify four levels of burn severity with an accuracy of 80%. Results comparing the CNN-BAM outputs to clinical and LDI assessments have shown a high degree of correlation (approximately 85%) between the CNN burn severity predictions to those extrapolated from LDI healing potential. When compared to pre-LDI clinical assessment, the accuracy of the CNN-BAM outcomes has been equivalent or superior in most cases. A high degree of correlation has been demonstrated between the LDI scans and BAM maps created by the system when identifying the overall burn injury margins. **CONCLUSION** This novel AI algorithm gives approximately equal accuracy in detecting burn depth as an LDI with a more economical and accessible application when embedded in a mobile device. **LEARNING OBJECTIVES** 1. Learn how embedding AI can improve quantitative burn care 2. Understand patient characteristics in burn injuries that require LDI assessments

Outcomes of tendon and nerve transfers to restore upper limb function after spinal cord injury (GP17)

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PURPOSE: Loss of upper limb function after cervical spinal cord injury (SCI) significantly impacts quality of life. Nerve and tendon transfers are established surgical treatments after peripheral nerve injury. Their use for SCI remains less described. The aim of this study is to collate literature describing tendon and nerve transfers after SCI to compare outcomes and aid in informed decision-making. **METHODS**: A scoping review of the literature was performed using PRISMA guidelines. A combination of twenty key terms were included to capture all studies including SCI patients with upper limb tendon or nerve transfers. English-language articles published between 1946 and May 2021 were reviewed and identified through Embase, Cochrane Central Register of Controlled Trials, and Medline databases. Two authors independently screened 3328 studies; 125 met inclusion criteria. Data on patient demographics and clinical outcomes were extracted. **RESULTS**: Ninety-six studies described tendon transfer, 24 nerve transfer, and 5 both. These articles described reconstruction of elbow extension (53/125), wrist extension (21/125), finger and thumb extension (16/125), elbow flexion (2/125), forearm pronation (3/125), grip (50/125), pinch (56/125) and thumb abduction (3/125). Many articles included multiple reconstructed functions. While significantly more studies described tendon transfers, nerve transfer studies demonstrated a bias towards more recent publications with 58.3% (14/24) published since 2015, in comparison to 13.5% (13/96) of tendon transfer studies. No study directly compared nerve and tendon transfers. **CONCLUSION**: Nerve transfers after SCI are being described with increasing frequency in the literature. Both nerve transfers and tendon transfers improve function and quality of life. Subgroup analysis will be performed to compare tendon and nerve transfer outcomes specific to reconstructed function. **LEARNING OBJECTIVES**: The learner will understand the breadth of tendon and nerve transfers used to reconstruct upper limb function after SCI and understand the clinical outcomes and complications.

Nerve injury severity and outcomes in children: An analysis of supracondylar humeral fractures (SHF) (GP18)

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INTRODUCTION: Most reports of nerve injuries (NI) following pediatric supracondylar humeral fractures (SHF) focus solely on motor recovery, and state that injuries are predominantly neurapraxic, and involve the anterior interosseous nerve (AIN). The objectives of this study were to evaluate sensorimotor outcomes, patterns of nerve recovery, and predictors of NI severity in pediatric SHF. **METHODS**: A retrospective cohort study was performed of children 0-18 years with NI following SHF (2018-2021).

Demographics, injury characteristics, and sensorimotor assessments were collected. Descriptive statistics were performed, and patterns and timing of nerve recovery were analyzed. Potential predictors of NI severity (age, sex, mechanism, time to reduction, injury severity) are under analysis using logistic regression. **RESULTS**: Of 1144 children with SHF, 103 were complicated by NI (54% male; mean age, 6.7 ± 2.3 years). Seventy-two children (70%) had Gartland-3 fractures, and 95
(92%) were treated with closed reduction and pinning. The median nerve was most frequently injured (60%, n=62), followed by the radial (28%, n=29), and ulnar nerve (15%, n=15). Notably, no motor-only NI were seen (i.e., AIN). Motor and sensory recovery occurred at a mean of 24.1 ± 16.7 weeks and 24.8 ± 17.57 weeks, respectively. Three patients had neurotmetic injuries requiring reconstruction. Sixty- two percent (n=65) of NI took longer than four months to regain full sensory and motor function. Radial nerve injuries tended to be less severe, with 59% (n=17) achieving recovery within four months, versus 29% (n=18) and 33% (n=5) of median and ulnar NI, respectively. **CONCLUSION**: While NI following SHF are likely to recover spontaneously, the majority take longer than four months and are not purely neurapraxic injuries. Defining categories of NI severity and elucidating predictors of severe NI will optimize patient education, clinical triage, and management of these children.
LEARNING OBJECTIVE: To classify NI severity and outcomes following pediatric SHF.

Impact of SSRI and SNRI use on hematoma incidence following breast reduction: A retrospective review (GP23)

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BACKGROUND: Selective serotonin reuptake inhibitor (SSRI) and serotonin- norepinephrine reuptake inhibitor (SNRI) use is more common in the plastic surgery population compared to the general population. Due to the proposed impact of SSRIs and SNRIs on platelet function and supposed increased bleeding risk, there has previously been concern over whether these medications should be discontinued prior to elective surgery. However, there are significant concerns when considering cessation of psychoactive medications, including potential withdrawal and relapse of depressive symptoms. **METHODS**: A retrospective chart review of all patients who received bilateral breast reduction surgery over a 10-year period was performed. Patient charts were reviewed for post-operative hematoma formation as well as medications being used around the time of surgery. The rate of hematoma formation in patients actively taking SSRIs or SNRIs at the time of surgery was compared with the rest of the study population. **RESULTS**: A total of 1022 patients met inclusion criteria for the study. The overall incidence of post operative hematoma was 7.7%. Of these, 1.9% of patients had clinically significant hematomas that required operative evacuation - the remaining were treated conservatively. The only variable associated with a significantly higher risk of hematoma formation was advanced age ($p = 0.005$). **CONCLUSIONS**: In conclusion, there was no significant difference in hematoma incidence after breast reduction in patients taking SNRIs or SSRIs compared with the general population. This contradicts some of the previously published literature and should assist in guiding clinicians when counselling their patients pre-operatively. **LEARNING OBJECTIVES**: 1. To review the safety of continuing SSRI and SNRI use during breast reduction surgery; 2. Review incidence of hematoma post-breast reduction surgery

The impact of foregoing tongue reduction on ruture dentoalveolar development among Beckwith-Wiedemann patients (GP24)

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PURPOSE Patients with Beckwith-Wiedemann Syndrome/Spectrum (BWS/BWSp) are often referred to plastic surgeons due to macroglossia and its ensuing complications. While tongue reduction is the norm in cases of severe obstruction, conservative management may be attempted if this is not the case, which has been the rule at our institution. The literature is unclear, however, regarding the impact of such on future dentoalveolar development. The aim of this study is to determine the dentoalveolar impact of foregoing tongue reduction among BWSp patients, by studying their need for future corrective surgery and its predictors. **METHODS** A retrospective review of all BWSp patients presenting to our craniofacial clinic from 1993-2022 was conducted. Only patients without initially obstructive macroglossia were retained. Patient demographics, presence of cardinal/suggestive features of BWSp, initial dento-skeletal exam findings and orthognathic surgeries were collected. Logistic regression and/or Chi-square analyses were computed between BWSp score/dento-skeletal exam findings and the need for eventual oral and/or orthognathic surgery. **RESULTS** A total of 35 patients were included in the study, whom were followed up to an average age of 12.8 years (range: 1.9-27.8 years). Their average BWSp severity score was 5.0 +/- 2.7, although it was not significantly predictive for corrective surgery ($p = 0.941$). The presence of malocclusion, overbite, overjet, yaw, cant, labial incompetence and a frenulum were also not significantly predictive for corrective surgery ($p > 0.05$). Only two patients required eventual orthognathic surgery. **CONCLUSIONS** In the context of appropriate orthodontic follow-up, BWSp patients without obstructive macroglossia appear to be at an overall low risk of requiring future orthognathic surgery when foregoing tongue reduction. The severity of their phenotype and initial dento-skeletal exam do not seem to be predictive of such. **LEARNING OBJECTIVES** Gain a better understanding of the potential for conservative management of macroglossia among BWSp patients and its impact on dentoalveolar development

RESIDENTS CORNER POSTER SESSION
AFFICHES DU COIN DES RÉSIDENTS

Implementation of a CAD/CAM Craniofacial Trauma Fast Track Program (RP01)
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PURPOSE: The use of computer assisted design and manufacturing (CAD/CAM) to guide craniofacial surgery is ubiquitous. Less commonly is the presence of an on-site facility with capabilites to design and manufacture reconstruction guides and models that are helpful for intraoperative execution. With the high prevalence of ballistic craniofacial trauma at the study institution, a "Fast Track" workflow for CAD/CAM surgical adjuncts is an asset. Normal bony landmarks to guide reduction in these cases are often obliterated, reinforcing the advantage of surgical planning tools. **METHOD:** This represents a three patient case series of ballistic craniofacial trauma at the University of Alberta. CAD/CAM surgical guides that were designed and manufactured within a 72 hour window were used in all cases. All guides met the MDRD standards for sterilization. A novel "Fast Track" CAD/CAM manufacturing workflow was implemented. Simple techniques were used to design the surgical tools, including image registration and mirroring. **RESULTS:** Reconstruction models were designed, manufactured, and utilized within a 72 hour window from time of injury. Two patients underwent complex mandibular reconstruction, and one patient underwent midface reconstruction. The mandibular guides were used to help restore the native mandibular arch, and the midface guide aided in the design of an autologous rib graft complex. The surgeons agreed that the surgical planning tools were helpful in all cases and reduced the degree of subjective decision making. **CONCLUSION:** An on-site "Fast Track" CAD/CAM workflow is a helpful tool for complex craniofacial reconstructive surgery. **LEARNING OBJECTIVES:** Participants will be able to identify the key components to a simple and expedited CAD/CAM workflow that may benefit craniofacial surgeons intra- operatively with complex reconstructive surgeries.

Free tissue transfer for scalp reconstruction in the setting of persistent cerebrospinal fluid leak: A single-centre retrospective review and treatment algorithm. (RP03)
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PURPOSE: Surgical management of persistent cerebrospinal fluid (CSF) leaks can be challenging. CSF leaks often prolong admission, and may lead to intracranial infection. Management commonly involves dural reconstruction via primary closure or use of graft materials in larger defects. Grafts, whether autologous or xenograft, rely on recipient site blood supply to survive and integrate. Because persistent leaks often occur in composite scalp wounds with bone loss, radiotherapy, infection and multiple previous procedures, blood supply may be poor. Free tissue transfer is known to produce excellent outcomes in this context as they do not rely on local blood supply, but cause morbidity at the donor site, and require longer operating time and expertise not typically in the neurosurgical skillset. Consequently, they are often seen as salvage procedures. Though their efficacy in reconstruction of scalp wounds and CSF leak is clear, patient selection remains challenging. This study aims to clarify risk factors associated with CSF leaks following neurosurgery to identify patients who may benefit from free flap reconstruction. **METHODS**: This is a 10-year retrospective review of patients treated by the senior authors for scalp wound and associated CSF leak following oncologic neurosurgical intervention. Data were analyzed descriptively. **RESULTS**: We identified a series of patients in whom primary flap reconstruction is likely beneficial, and developed an algorithmic approach to reconstruction of complex scalp wounds with CSF leaks. **CONCLUSIONS**: Primary free flap reconstruction of scalp wounds and CSF leak should be considered in the appropriate patient population. **LEARNING OBJECTIVE**: Learn when to consider primary free flap reconstruction of CSF leak/scalp wound.

Primary recurrence rates and patient characteristics in Dupuytren's disease: A systematic review and Meta-Analysis (RP06)
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PURPOSE: To compare the primary recurrence rate of Dupuytren's disease and patient-reported outcomes after various established interventions. **METHOD**: A systematic review was completed following PRISMA guidelines using Medline, Embase, and Cochrane. The title and abstract as well as the full texts were screened in duplicate. Data were extracted by two independent reviewers and conflicts were resolved through consensus or by the third reviewer. Patient demographics, functional outcomes, and recurrence rates were collected. Meta- analysis was completed using RevMan 5.4.1 comparing different interventions using a random-effects model at 95% significance. **RESULTS**: A total of 44 articles were included, yielding 5413 patients accounting for 3111 Collagenase Clostridium histolyticum injections (CCH), 1760 percutaneous needle fasciotomies (NF), and 1023 open fasciectomies. The average age was 64.82 years old, and men were predominant (83.2%). Average wait time for treatment was 34.33 months. DASH scores improved from an average of 15.75 to 5.1, from 18.08 to 2.98, and from 55.00 to 6.97 for CCH, NF, and open fasciectomy, respectively. Forest plots totaling eight articles comparing CCH and NF did not show a significant

difference in terms of recurrence rate (p= 0.86), although open fasciectomy had a significantly lower recurrence rate than CCH (p= 0.004). All Forest plots showed low heterogeneity (I2 of 0 to 28%). **CONCLUSIONS**: Open fasciectomy for Dupuytren's disease was significantly associated with lower rates of recurrence relative to CCH and by inference to NF. All interventions showed improvement in patient-reported outcomes, although the selection of treatment should remain tailored to the needs of each patient. **LEARNING OBJECTIVES**: 1) Learn about the current evidence for recurrence rates after different interventions for Dupuytren's disease 2) To better understand the demographics of patients with Dupuytren's disease
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Pain and functional outcomes following targeted muscle re-innervation: A systematic review (RP07)
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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 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. **LEARNING OBJECTIVES**: Targetted Muscle Reinnervation is a promising novel therapeutic strategy for improving pain, prosthesis use, and functional outcomes after major limb amputation.

Restoration of shoulder function utilizing nerve grafts or nerve transfers in the treatment of brachial plexus birth injuries: A systematic review (RP08)
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INTRODUCTION: Brachial plexus birth injury (BPBI) occurs in 0.38-4.6 of 1000 live births secondary to excessive stretching of the brachial plexus during childbirth. While in most cases, deficits resolve with conservative management, 20-30% of infants with BPBI will have lasting disabilities without surgical intervention. We sought to determine the difference in restoration of shoulder function following the use of nerve transfers versus nerve grafts in the management of BPBI. **MATERIALS AND METHODS**: A systematic review of EMBASE, MEDLINE, PubMed, and Cochrane register was performed. The primary outcome was to compare shoulder function between patients who underwent nerve transfer techniques versus nerve graft techniques to reconstruct shoulder function. **RESULTS**: Twenty studies met inclusion criteria. A total of 606 patients, with a mean age of 9.5 months underwent surgery for BPBI. Nerve transfers were utilized in 368 patients, with spinal accessory nerve to suprascapular nerve and radial nerve to axillary nerve being the most common procedures for shoulder external rotation and shoulder abduction, respectively. The remaining 238 patients underwent nerve grafting procedures. The mean follow-up of all patients was 44.7 months (12-174.6 months). Functional assessments varied between studies. Seven studies utilized the Active Movement Scale pre and post-operatively to assess shoulder abduction, flexion and external rotation. Shoulder abduction had similar increases in scores from 1.7 to 4.76 and 1.9 to 4.8 for nerve grafts and nerve transfers, respectively. Nerve transfers saw an improved shoulder external rotation of 0.5 to 3.2, compared to 0.5 to 2.7 for nerve grafts. **CONCLUSIONS**: The current evidence in the literature suggests mainly equivocal outcomes in shoulder function between nerve grafts and nerve transfers while managing BPBI. However, considerable variation exists in outcome measurements and future studies should focus on standardized approaches to functional assessment. **LEARNING OBJECTIVE**: To review current nerve surgery options for BPBI.

Contralateral prophylactic mastectomy decreases patient fear of cancer recurrence (RP10)
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PURPOSE: Over the past decade, women with unilateral breast cancer are frequently interested in pursuing contralateral prophylactic mastectomy (CPM). This trend may be attributed to a number of factors, including physician advice, fear of cancer recurrence and desire for cosmetic

symmetry. It is unclear whether CPM reduces anxiety and fear of cancer recurrence, especially associated with follow-up mammograms. Our aim was to determine whether contralateral prophylactic mastectomy results in less anxiety and fear of cancer recurrence compared to breast conserving surgery and unilateral mastectomy. **METHODS**: Breast cancer patients (n=87) were recruited from general surgeons' offices in Victoria, BC at initial consultation. Patients completed BREAST-Q questionnaires pre-operatively, and post-operatively, and the State-Trait Anxiety Inventory, Concerns About Recurrence Scale, and Cancer-Related Worries Survey at time of follow-up mammogram. Patient and cancer characteristics were collected from the local electronic health record. **RESULTS**: Contralateral prophylactic mastectomy patients demonstrated lower recurrence anxiety (45 vs 52, $p = 0.36$) and fewer cancer-related worries (10.5 vs 8, $p = 0.19$) at the time of their follow-up mammography, in comparison to non- CPM patients (breast conserving surgery, unilateral mastectomy). CPM patients also demonstrated higher breast satisfaction (39 vs 23, $p < 0.05$), psychosocial well being (48 vs 41, $p < 0.05$), physical well being (50 vs 28, $p = 0.6$), and sexual well being (56 vs 50.5, $p = 0.9$) than unilateral mastectomy patients. **CONCLUSION**: Contralateral prophylactic mastectomy patients experience lower recurrence anxiety, and lower state and trait anxiety than non-CPM patients. **LEARNING OBJECTIVES:** 1. To describe anxiety and fear of recurrence in patients undergoing breast conserving surgery or unilateral mastectomy versus contralateral prophylactic mastectomy. 2. To evaluate national guidelines regarding prophylactic contralateral mastectomy recommendations

Evaluation of hypertrophic burn scar using artificial intelligence: A proof-of-concept (RP12)
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PURPOSE Current standards assess scars using subjective scoring systems (e.g., mVSS, POSAS) based on visual and tactile properties. Cutometers, ultrasound, and 3D- imaging technologies can obtain objective measurements but are cumbersome, expensive, and limited to specialized clinical settings. Alternatively, artificial intelligence (AI) embedded in mobile devices to track disease processes has been demonstrated. Visual media of scars on mobile devices may provide an affordable substitute for the initial and continual tracking of burns. A standardized protocol of AI tracking keloid maturation from non-burn trauma has been developed. The same computer-vision algorithms can be repurposed for the characterization of hypertrophic burn scars. **METHOD** A convolutional neural network (CNN) was trained on 6650 augmented mobile-captured images of keloid scars. Image-based and colorimetric algorithms using a fiducial marker to measure spatial and colour dimensions were developed to track the regression of scars. A novel CNN-based Boundary-Attention Mapping algorithm using elements of saliency mapping was created to distinguish scars from surrounding tissue with high confidence. This same algorithm can incorporate red and pigment color analysis to determine scar vascularity and volumetric analysis in addition to total size regression. **RESULTS** The CNN achieved a 98% F1 harmonized average accuracy in distinguishing keloid scars from normal skin. The color algorithm can normalize and supply colour- change data on scars with high resolution and spatial dimensions to <2 mm error rates. Not only can color be used to distinguish scar borders, but it can be used to determine scar quality based on redness and shadows for irregularity. **CONCLUSIONS** With clinical validation and embedding into a mobile platform, these algorithms will provide healthcare providers and patients with a precise, efficient, and convenient tool to measure and characterize functional scar healing. **LEARNING OBJECTIVE** Learn how artificial intelligence can be integrated to assess burn scars

Health literacy in patients with burn injury (RP13)
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PURPOSE: Health literacy (HL) is defined as the way patients obtain, process, and understand health information. Poor HL puts patients at risk of adverse outcomes and increased susceptibility to medical errors. Data concerning health literacy in patients with burn injury is limited. This study aims to determine the current levels of HL and variables associated with poor HL in the burn population. **METHODS**: All eligible patients presenting to a tertiary outpatient burn clinic were asked to participate. The Newest Vital Sign (NVS) health literacy assessment tool and a sociodemographic survey were administered. The NVS scores were divided into poor (0-2), moderate (3-4), and adequate (5-6) HL. Multivariable regression modelling was used to identify independent predictors of limited HL. **RESULTS**: Twenty-nine patients participated with a mean age of 46 years (SD=17.99). 59% (17/29) of patients identified as male. Most of the burn injuries (66%, 19/29) were less than 5% TBSA. HL rates were poor, moderate, and adequate in 24% (7/29), 24% (7/29), and 52% (15/29) of patients, respectively. Years of education, annual income, burn size, and age did not predict HL. **CONCLUSIONS**: This study suggests that patients with burn injury have variable levels of HL, which may be difficult to predict in a clinical setting. We hope this study highlights the importance of elucidating HL among patients with burn injury to improve literacy-adjusted discussions surrounding care. **LEARNING OBJECTIVES**: 1) Participants should identify health literacy as a barrier to obtaining care and an important social determinant of health. 2) Participants should identify the factors associated with poor health literacy among patients with burn injury.

Cost-utility analysis of gender affirming top surgery: Impacts from the public health system payer perspective (RP14)

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PURPOSE: Gender Affirming Surgery (GAS) has significant positive clinical impacts on the mental and physical health of transgender and gender diverse (TGD) individuals desiring surgery. The associated cost and utility impacts of GAS have yet to be appraised in Canada using economic analysis. To better understand the impacts of GAS on TGD individuals in the Canadian healthcare systems a cost-utility analysis (CUA) was conducted. **METHOD**: The CUA examined incremental cost per quality adjusted life year (QALY), a standardized measure of patient intervention impact, gained through the provision of gender affirming "top" surgery (i.e., chest reconstructive mastectomy or augmentation). A Markov model was used, where health care costs and QALYs were outcomes of interest. Given provincial funding differences, the analysis used the Ontario public payer perspective with costs reported in 2022 Canadian dollars. Costs, QALYs, and probability states were derived from health authority reports and the literature. The population was adult TGD individuals desiring top surgery. Top surgery was compared to no surgery, where both arms included sub-groups with and without hormone therapy. **RESULTS**: The 10-year incremental cost effectiveness ratio, measuring intervention costs per QALY was $6,654.10/QALY. Top surgery was cost-effective compared to no surgery over a 10-year time horizon when considering the impacts of mental health, suicidal ideation, and smoking, using a typical willingness to pay threshold of $50,000/QALY. Results were robust with 79% of the Monte Carlo simulations finding surgical intervention to be cost effective in the probabilistic sensitivity analysis. **CONCLUSIONS**: Economic evaluation findings suggest top surgery is cost-effective when compared to no top surgery for adult TGD individuals in Ontario. The model may serve as a base case for national evaluation of GAS in future research. **LEARNING OBJECTIVES**: 1. Understand how CUA supports clinical evaluation of surgical interventions. 2. Recognize the economic importance of provision of adult GAS.

Verrucous carcinoma of the lower extremity: A case series on diagnosis, management, and outcome (RP15)

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PURPOSE: Verrucous carcinoma (VC) is a low-grade cutaneous squamous carcinoma that usually develops in the oral cavity, the anogenital region, and the plantar surface of the foot. Clinically, there is low suspicion for malignancy given the slow growth of VC lesions and their wart-like appearance. Diagnosis can be difficult due to the benign histological appearance. Surgical excision is the only satisfactory form of treatment for plantar VC; however, this becomes difficult given its benign clinical appearance and the pathologic misinterpretation of the lesion as a benign hyperplasia. We present the largest case series of plantar verrucous carcinoma within North America. **METHOD:** We report on all the plantar verrucous carcinoma excised between 2015 to present. We report seven cases of VC, their treatment, and their outcomes. **RESULTS:** Seven patients obtained a diagnosis of plantar VC by incisional biopsy. All patients underwent excision of their lesions with negative margins reported on the final pathology. All patients had a recurrence of VC at the initial site. All patients underwent re-excision of the lesions with intraoperative frozen sections. Despite negative margins again on final pathology, all patients had a subsequent second recurrence. Ultimately, all patients underwent an amputation as definitive management. Patients had an average of 2.8 operations. There were 3 different surgeons and different pathologists reporting their findings. **CONCLUSIONS:** Our experience with plantar verrucous carcinoma suggests that an aggressive approach to surgical management is needed. Management is optimized with the combined expertise of an experienced dermatopathologist and surgeon. Despite negative margins and repeated excisions, VC lesions recur and invade local tissues to the extent that only amputation of the involved foot has resulted in cure. **LEARNING OBJECTIVES:** To describe management of plantar verrucous carcinoma and propose more aggressive intervention.

Angular modification to the bilobed flap to reduce trap-door deformity in nasal reconstructions (RP16)

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PURPOSE The bilobed flap is a staple, double transposition flap frequently used for nasal reconstruction. It provides excellent cosmetic match and is used to reconstruct deficits up to 1.5 cm. However, a frequent aesthetic consideration is the "trap- door" deformity: wherein a domelike elevation of the flap relative to the surrounding skin appears. Modifications, such as the rhombic bilobed, have some success in reducing trap-dooring by avoiding curvilinear flaps, but require precise measurements and use a larger area of skin. Here, we introduce the angular modification to the bilobed flap, which effectively reduces the trap-door appearance while remaining both simple in design and relatively skin-sparing. **METHOD** The new modification is based on a standard Zitelli bilobed template. After making the classic markings, the design is modified by transforming the far edge of each flap lobe into a point. Unlike the rhombic design, these flaps do not need to be precisely measured, but creating a sharp corner is necessary. The other edges of the flap remain curvilinear, eliminating the need for excess skin and facilitating flap rotation. Flap dissection and insetting proceeds in a standard fashion, with each flap rotating to fill the deficit left by the previous. **RESULTS** The principal investigator has used this technique for all bilobed flap reconstructions since 2020. During this time period, no cases of trap-dooring have been encountered post-operatively. An

aesthetically pleasing contour was maintained in all cases. The technique requires no additional operating time and no specific training. **CONCLUSIONS** We describe a novel angular modification to the bilobed flap, geared to reduce the trap-door deformity. While having a minimal learning curve, operative time remains consistent to a standard bilobed and aesthetic results are consistent. **LEARNING OBJECTIVES** Understand the trap-door deformity present in bilobed flaps Apply a simple modification to avoid this complication in practice.

Upper extremity infection related to intravenous drug use - Considering the true cost of the COVID-19 pandemic and lockdown (RP17)

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BACKGROUND: The COVID-19 pandemic caused significant morbidity and mortality in people who inject drugs (PWID). Upper extremity soft tissue infections are frequently associated with intravenous drug use (IVDU) due to poor compliance with aseptic technique. In Canada, multiple safe injection sites providing clean injection supplies closed, leaving many PWID with no alternatives to inject safely. It was hypothesized that these closures will correspond with increased morbidity and mortality among PWID. **METHODS**: This was a retrospective chart review study. The primary outcome of interest was the frequency of upper extremity infections in PWID. Data was filtered to include only those patients presenting to ED between March to June of 2019 and 2020. Chi-squared analysis was used to compare the number of IVDU patients among patients with upper extremity skin infections between these time periods. **RESULTS**: The number of IVDU patients treated for upper extremity (UE) infections in Hamilton significantly increased during the pandemic (relative risk = 2.0 (95% CI, 1.3-2.9, p=0.0012)) while total upper extremity infections numbers have decreased overall. During the pandemic, PWID made up a larger proportion of upper extremity infections ($\chi 2$=10.444, p=0.00123). Demographic data such as age and sex of IVDU patients presenting with UE infection was not significantly affected by the pandemic. **CONCLUSIONS**: The effect of the pandemic on accessing harm reduction services has led to evident increases in morbidity as described by this study. Further research on the impact of closures in PWID is needed to quantify these harms and work towards mitigation strategies. **LEARNING OBJECTIVES**: 1. To understand the effect of Covid on cases of upper extremity infection 2. To recognize a relationship between availability of harm reductions services and incidence of infections

Development of a simple assessment tool for methodologic quality of meta analyses: The MAC tool (RP18)

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PURPOSE: There are few accessible tools to assist new clinicians with the recognition of meta-analysis methodological pitfalls. The primary aim of this article was to develop a simple three-question tool that the reader can use to appraise meta-analysis quality. The secondary aim was to determine if meta-analyses quality in plastic surgery has improved since the introduction of AMSTAR criteria. **METHODS**: A novel three question "Meta-Analysis Critique (MAC)" tool was designed and tested by the authors. MEDLINE and EMBASE were searched from 2011 to 2021 for plastic surgery meta-analyses. Screening, data extraction and quality grading were performed by two independent reviewers. Reports were assessed by two reviewers using AMSTAR 2.0 and the MAC tool. Data were analyzed for temporal trends and correlation between MAC and AMSTAR. **RESULTS**: Of the 9,651 articles, 222 meta-analyses were included and assessed for quality. Meta-analyses within plastic surgery increased in the second half of the decade (n= 68 vs n=154). Conversely, the proportion of high research quality did not (12% vs 8%, p=0.34). When compared to AMSTAR 2.0 score, our novel tool obtained high sensitivities when assessing the research question (1.0, 95% CI: 0.80-1.0), appropriate statistical analysis (0.95, 95% CI: 0.73-0.99), and risk of bias assessment (0.9, 95% CI: 0.67-0.98) respectively. **CONCLUSIONS**: We present a novel, simple tool that enables assessment of plastic surgery literature, and identifies poor quality meta-analyses. It has a high correlation with the gold standard AMSTAR 2.0 score. Future studies should aim to validate this tool amongst multiple reader groups and determine its broader reliability in other specialties. **LEARNING OBJECTIVES**: 1. Participants will be able to utilize a simple tool to appraise critical weaknesses in meta-analyses. 2. Participants will understand the quality of meta-analyses in plastic surgery over time.

Development of an on-call assessment tool for use in a competency-based Plastic Surgery program (RP20)

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PURPOSE: A central tenet of competency-based medical education is the formative assessment of trainees. There are currently no assessments designed to examine resident competence on-call, despite the on-call period being a significant component of residency, characterized by less supervision compared to daytime. The purpose of this study was to design a formative on-call assessment tool and collect validity evidence on its application. **METHODS**: A consensus group was run using nominal group technique to identify critical elements of surgical resident competence on-call. A tool was developed based on these elements,

incorporating a novel five-point construct-aligned rating scale. The tool was piloted over six months in the Division of Plastic & Reconstructive Surgery at our institution. Validity evidence was collected by conducting a quantitative psychometric analysis of tool scores and by using thematic analysis to identify themes from semi-structured interviews with pilot participants. **RESULTS**: A ten-item tool was developed based on the consensus group results. 63 assessments were completed by seven staff members on ten residents during the pilot. The tool had a reliability coefficient of 0.67 based on a generalizability study and internal consistency was 0.92. Scores were significantly associated with year of training ($p<0.001$). Thematic analysis of interview transcripts found the tool improved the quantity and structure of feedback given and that the tool was considered feasible and acceptable by both residents and staff members. **CONCLUSIONS**: Our novel on-call assessment tool has multiple sources of validity evidence to support its intended purpose of assessing resident competence on-call. Further research is required to assess generalizability across different institutions and other surgical specialties. **LEARNING OBJECTIVE**: Participants will be able to understand assessment development principles and the importance of validity evidence in medical education.

Comparing surgical and nonsurgical outcomes for treatment of brachial neuritis (RP21

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PURPOSE: Brachial neuritis (BN), or neuralgic amyotrophy, is a disease of the peripheral nerves that typically presents with sudden onset upper extremity neuropathic pain with associated weakness and atrophy. At the authors' centre, BN is now frequently managed surgically with techniques including supercharge end-to-side (SETS) nerve transfers. The objective of this study was to compare clinical outcomes of patients treated with SETS nerve transfer versus nonoperative management. **METHODS**: A patient cohort was retrospectively identified from within a prospectively collected database between 2010-2020. All patients who were managed nonoperatively and those who had a SETS nerve transfer for treatment of BN were included in this study. Demographic information and clinical outcomes including MRC strength grades were extracted from patient charts. Statistical analysis was performed using descriptive statistics. **RESULTS**: Thirteen patients (92.3% male, mean age 44.5 ± 15.3 years) were treated nonoperatively, and sixteen patients (75.0% male, mean age 50.5 ± 10.8 years) were treated with SETS nerve transfer for BN. The average MRC at first visit for nonoperative patients was 2.72 (range 0, 5) and at last visit was 3.54 (range 0, 4+). For patients treated operatively, the average preoperative MRC scores combined to 1.43 (range 0, 4+) and improved postoperatively to 3.84 (range 0, 5). The average change in MRC in the nonoperative group was an improvement of 1.00 compared with 2.34 among operative patients. **CONCLUSION**: Novel treatment options for BN include SETS nerve transfer such as ECRB to AIN, FCR to PIN or FCR to brachialis. Our preliminary data suggests greater recovery of MRC strength grades among patients treated with surgical intervention compared to patients managed conservatively. **LEARNING OBJECTIVES**: Review diagnosis and treatment strategies including novel surgical options for brachial neuritis

GROUP FOR THE ADVANCEMENT OF MICROSURGERY (GAM) CANADA

42nd Annual Meeting / *42e Réunion annuelle*

ABSTRACTS

Limb salvage using microsurgical free tissue transfer in severe frostbite – a retrospective case series (G01)
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Purpose: Frostbite is often managed conservatively, however, in severe cases with full- thickness tissue loss, microsurgical free tissue transfer is required for soft tissue coverage and limb salvage. Given the rarity, the techniques and outcomes of these cases are not well described. Thus, the purpose of this study is to present a single-center retrospective case series of frostbite injuries requiring microsurgical reconstruction for limb salvage. **Method:** A single-center retrospective review was conducted of all patients who underwent free tissue transfer by a single surgeon from 2008 to 2022. Patients of all ages were included if they suffered a frostbite injury requiring free tissue transfer. Demographics, operative details, and surgical outcomes were recorded. **Results**: Eight patients (five male, three female) with frostbite injuries were included in the study. Patients had frostbite injuries either to the lower extremities (n=4, 50%) or to both upper and lower extremities (n=4, 50%). Sixteen free flaps were done in total including four paired chimeric and eight single free flaps. Flap recipient sites included knees (n=5), dorsal hands (n=2), thumbs (n=2), heels (n=2), and foot (n=1). Flap survival rate was 100%. Six (75%) patients had complications, with the most common being minor flap dehiscence (n=3). All lower extremity reconstructions were able to weight-bear or were cleared to weight-bear at an average of 125.2 days post-injury (range 87-164). Mean follow up time was 1.4 years (range 0.3-4.2). **Conclusions**: This case series demonstrates that free tissue transfer is a robust option for soft tissue coverage and functional limb salvage in patients with severe frostbite injuries to both upper and lower extremities. **Learning Objectives**: Participants will be able to describe the use of microsurgical free tissue transfer for limb salvage in severe frostbite.

Consecutive microsurgical cases performed by single surgeon at a Canadian tertiary care centre: A retrospective review (G02)
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Purpose: The practice of a plastic surgery trained microsurgeon varies over time with changes in clinical interests, practice standards, and the addition of other surgeons within the same catchment area. The aim of this study was to analyze consecutive microsurgical cases performed by a single surgeon during their 13- year experience at a Canadian tertiary care centre. **Methods**: A retrospective chart review was performed of all free tissue transfers between 2007-2020 completed by a single surgeon. The primary outcome was the annual number of free flap cases over time. Secondary outcomes included the type of reconstruction and rate of complications. **Results**: A total of 776 free flaps were performed on 530 patients. The most common type of reconstruction was breast, followed by lower extremity and head and neck. There was a significant change in the type of reconstruction cases over time ($p<0.005$). There were a total of 125 postoperative complications. After adjusting for the number and type of reconstruction, there was no statistically significant impact of years in practice on rate of complications ($p = 0.184$). Overall, there was a 96.5% success rate for free tissue transfer. There was no association between flap failure and year in practice ($p=0.757$). **Conclusion**: The type and volume of free flap reconstruction has changed with the addition of new plastic surgeons in a single catchment area. However, surgical experience does not seem to have a significant positive impact on the rate of free flap complications or success. At our center, free tissue transfer remains a valuable tool for reconstruction in both low- and high-risk patients. **Learning objectives**: The participant will be able to identify common complications of free tissue transfer. They will learn about common factors that impact the volume and type of reconstruction in a single surgeon's practice over time.

Identification of the anatomy of the deep temporal vein using computed tomography imaging: A retrospective cross-sectional review of patient imaging (G03)
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Purpose: The deep temporal vein (DTV) can be used in free flap procedures when the superficial temporal vein is inadequate. Despite its potential utility, its branching patterns have only been examined in one small anatomic study. The purpose of this study was to examine computed tomography angiography (CTA) images to determine DTV location, variation, and suitability as a microvascular recipient, to provide surgeons with a guide for its use in head and neck defects. **Method**: A retrospective chart review identified 152 patient CTA images (76 female; 76 male) in a single academic center imaging database, selected consecutively from January 2017 to April 2020. Reason for imaging, DTV caliber, laterality, distance to zygomatic arch (ZA [coronal and sagittal]), distance to lateral orbital rim (LOR), and branching pattern were recorded. **Results**: Average caliber was 3.46 ± 1.29 mm (95% confidence interval [CI] [3.32, 3.61]; range, 1.00–10.8). Bilateral DTVs were observed in 98.7% of patients. Average distance to landmarks were as follows: ZA (coronal), 13.8 ± 5.85 mm (95% CI [13.2, 14.5]; range, 2.7–33.8); ZA (sagittal), 15.1 ± 6.12 mm (95% CI [14.1, 16.1]; range, 2.8–47.2); LOR, 47.1 ± 9.09 mm (95% CI [46.0, 48.1]; range, 10.8–62.9). Seven branching patterns were identified, including a posterior vertical variant that bypasses the superficial temporal fat pad. **Conclusions**: The DTV is a "lifeboat" option for head and neck reconstruction. Its average caliber is sufficient for use in microsurgery. Knowledge of both its typical and aberrant courses allow for efficient preoperative planning and surgical dissection. CTA is a useful adjunct when planning to use the DTV for free tissue transfer. **Learning Objectives**: To identify the most common location of the DTV for use in head and neck flap reconstruction. To distinguish the utility of preoperative CTA for DTV identification

Outcomes of prophylactic lymphaticovenous bypass immediately following axillary lymph node dissection (G05)
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Purpose: Lymphedema following axillary lymph node dissection (ALND) for breast cancer is identified in up to 40% of patients. Prophylactic lymphaticovenous bypass (PLVB) is a novel microsurgical technique aimed at preventing lymphedema by redirecting lymphatic flow from the cut lymphatics into a vein. This study compared volumetric measurements and patient reported outcomes measures (PROMs) of PLVB+ALND vs. ALND. **Methods**: Patients who underwent ALND between 2011-2020 at our center were reviewed. Demographic (age, BMI, comorbidities) and oncologic data (adjuvant therapy, number/status of lymph nodes, surgical management of breast and lymph nodes) were noted. Primary outcomes included limb circumference measurements (finger, wrist, elbow, arm, axilla), bioimpedance scores, and perometer values. Secondary outcomes included PROMS, incidence of cellulitis, and need for subsequent lymphedema surgical management. **Results**: 539 patients who underwent ALND were identified, and 373 patients were included. 93 (25%) patients underwent ALND+PLVB. Demographics and oncologic features of ALND vs. ALND+PLVB groups were comparable. Average follow-up time with physiotherapy was 23 months (1-65 months). Circumferential measurements were significantly improved among ALND+PLVB patients at the elbow ($p<0.05$) and trended towards improved at the forearm ($p=0.07$). There was no difference in bioimpedance or perometer values, or the incidence of postoperative cellulitis. Patient-reported outcomes identified lower incidence of achiness/heaviness/tightness/pain to the affected limb in ALND+PLVB patients (26.9%) compared with ALND patients (40%). Further, patients reported improved limb function (16.7% vs. 21.4% impairment, $p=0.05$). ALND+PLVB patients (9.7%) were less likely to require therapeutic LVB than ALND patients (17.8%) in subsequent years. **Conclusions**: Our results suggest PLVBs contribute to decreasing lymphedema and improve patient comfort/satisfaction and limb functionality. We advocate that PLVBs should be routinely discussed with breast cancer patients undergoing ALND. Learning points: PLVB+ALND a) improves PROMs, b) improves limb circumference measurements, and c) decreases the need for future lymphedema surgery.

DIEP flap in breast reconstruction: a morbidity study of bilateral versus unilateral reconstruction (G06)
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PURPOSE: The DIEP flap is a modality in breast reconstruction of choice. Despite its well-documented benefits and complications, a lack of evidence remains with regards to the risks of performing a bilateral versus a unilateral reconstruction. As such, we sought to compare the rates of adverse outcomes in the perioperative and postoperative periods associated with a unilateral versus a bilateral DIEP flap breast reconstruction. **METHODS**: A retrospective cohort study of 178 consecutive patients undergoing unilateral versus. bilateral deep inferior epigastric perforator flap breast reconstruction was performed at our tertiary care center over a 3-year period. Data on demographics, operative time, intraoperative and postoperative complications, and surgical re-exploration, were extracted for both groups. Statistical analysis was performed on a per-flap basis. **RESULTS**: A total of 157 unilateral and 42 bilateral deep inferior epigastric perforator flaps were identified. The rate of intra-operative complications was 12.1% for unilateral versus. 4.8% for bilateral flaps ($p=0.26$). Total post-operative complications rates were 30.6% for unilateral versus 54.7% for bilateral flaps ($p=0.003$). Surgical re-exploration was performed in

12.7% of unilateral and 11.9% of bilateral cases (p=0.88). The rate of total flap loss was similar between types of reconstruction, occurring in 2.5% of unilateral vs. 2.4% of bilateral flaps (p=1). **CONCLUSION**: This study demonstrates the rate of complications per flap is significantly higher in bilateral versus unilateral DIEP flap breast reconstruction. Bilateral DIEP breast reconstruction should be decided on a case-by-case basis. **LEARNING OBJECTIVES**: After this presentation, the learner will be able to compare the differences in morbidity between simple and double DIEP flaps. It will give scientific data to the attendees to explain to the patients the level of complications. The surgeons may reconsider the indication of bilateral DIEP flaps for some patients.

The cost-utility of neurotization in post-mastectomy breast reconstruction from the healthcare payer perspective (GP07)
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Purpose: Neurotization following post-mastectomy breast reconstruction is associated with added costs and improved sensory function. However, the cost-effectiveness was not defined. The aim of this study was to assess the cost-utility of neurotization following autologous breast reconstruction compared to no neurotization from a healthcare perspective. **Methods**: We used a Markov decision analysis model, accounting for postoperative complications, the probability of protective sensation, added costs and utilities. We used a half-cycle correction with a 1.5% discount rate. The time horizon was a lifetime. The key parameters in the study were derived from data from a recent systematic review. The model assumed minimal added risks of complications following neurotization and no sensory recovery in the first two years following surgery. The outcomes were defined as added Quality-Adjusted Life Years (QALYs) and the incremental cost-effectiveness ratio (ICER). We compared no neurotization to neurotization using direct coaptation. **Results**: In the base case analysis, the incremental increase of QALYs was 1.7, favouring neurotization, with an added cost of $3,574. The ICER was $2100/QALY. The results were robust through a wide range of sensitivity analyses. **Conclusion**: Neurotization following breast reconstruction is cost-effective, and it should be routinely offered to patients undergoing autologous breast reconstruction. Healthcare policymakers should allow neurotization to be performed during autologous breast reconstruction. **Learning Objective**: The participants will understand the cost-utility of breast neurotization following breast reconstruction.

How to stay tight lipped (G09)
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The use of ansa cervicalis to marginal mandibular nerve transfer in facial nerve reconstruction. **Purpose**: Facial nerve reconstruction is a complex and intricate practice. Nerve transfers can provide an additional source of axons, may allow more rapid regeneration, and may decrease synkinesis. While the hypoglossal and hemi-hypoglossal nerve transfers have been used extensively in the setting of facial nerve reconstruction, there is less evidence for the use of the ansa cervicalis as a donor nerve. This procedure has not been described in North America before. In this pilot study we report the outcomes of ansa cervicalis to marginal mandibular nerve in 3 cases. **Method**: We have performed ansa cervicalis to marginal mandibular nerve transfer as a stand alone procedure or more commonly as part of other techniques for facial nerve reconstruction. We assessed patients clinically and electrophysiologically to determine lower lip tone and function. Complications were assessed. **Results**: Patients suffered few complications. Lower lip tone was improved. **Conclusions**: The ansa cervicalis to marginal mandibular nerve transfer provides an additional option for facial reanimation. **Learning Objectives**: 1. Recognize the need to improve lower lip tone and function. 2. How to perform ansa cervicalis to marginal mandibular nerve transfer. 3. To demonstrate the expected patient outcomes

Upper extremity nerve transfers in Acute Flaccid Myelitis: the first reported Canadian experience (G10)
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Purpose: Acute Flaccid Myelitis (AFM) is a rare but devastating pediatric condition. Recovery is variable and many have residual weakness of their extremities. We present our initial experience of upper extremity nerve transfers in AFM. **Method:** A retrospective review was conducted of all children who underwent upper extremity nerve transfers for AFM at our institution in 2019 and 2020. Transfers to restore shoulder and/or elbow motion were performed when recipient muscles had no signs of clinical or electrophysiologic reinnervation on serial examination, and when at least one donor nerve was available. **Results:** Nerve transfers were performed in six children (4M, 2F) on eight limbs. Mean age at disease onset was 5.8 years (range, 3.8?8.6). D68 enterovirus was detected in two cases. Three children presented with four-limb involvement; two required respiratory support. Median time from disease onset to surgery was 13 months (range, 12-19). Among the 10 shoulder nerve transfers performed, the most common were spinal accessory to suprascapular (4) and ulnar to axillary (5). Three transfers were performed for elbow flexion using median, ulnar or intercostal nerves as donors. One radial to triceps transfer was performed for elbow extension. One transfer was aborted intraoperatively owing to weak donor nerve. Median postoperative follow-up was 29 months (range, 22-30). Transfers for shoulder abduction achieved a median range of antigravity motion of 85 degrees (range, 30-155). All three patients undergoing transfers for elbow flexion achieved full antigravity motion. No donor site motor weakness was identified; transient median nerve paraesthesia was noted in one patient. **Conclusions:** Nerve transfers in AFM had variable outcomes. Our results support

the current literature in that restoration of motion at the elbow is more consistent than that of the shoulder. **Learning Objectives:** To understand what can be achieved with upper extremity nerve transfers in AFM.

Treatment of nerve injury following cervical spine surgery with upper extremity nerve transfers: A case series (G11)

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Introduction: Nerve transfers to restore or augment function following spinal cord injury is an expanding field. There is a paucity of information, however, on the use of nerve transfers for patients having undergone spine surgery. The incidence of neurologic deficit following spine surgery is rare but extremely debilitating. The purpose of this study is to describe the functional benefit following upper extremity nerve transfers in the setting of nerve injury following cervical spine surgery. **Methods:** A single-center retrospective review of all patients who underwent nerve transfers following cervical spine surgery was completed. Patient demographics, injury features, spine surgery procedure, nerve conduction and electromyography study results, time to referral to nerve surgeon, time to surgery, surgical technique and number of nerve transfers performed, complications, post-operative muscle testing and subjective outcome were reviewed. **Results:** Thirteen nerve transfers were performed in 6 patients following cervical spine surgery. Nerve transfer procedures consisted of a transfer between a median nerve branch of flexor digitorum superficialis into a biceps nerve branch, an ulnar nerve branch of flexor carpi ulnaris into a brachialis nerve branch, a radial nerve branch of triceps muscle into the axillary nerve and the anterior interosseous nerve into the ulnar motor nerve. Average patient age was 55 years old, all patients were male and underwent surgery on their left upper extremity. Average referral time was 7 months, average time to nerve transfer was 9 months and average follow up was 11 months. Average pre-operative muscle grading was 0.9 out of 5 and average post- operative muscle grading was 4.1 out of 5 (p value<0.00001). **Conclusions:** Upper extremity peripheral nerve transfers can significantly help patients regain function from deficits secondary to cervical spine procedures. Performing nerve transfer surgery has minimal risk to the patient by using expendable donors and minimal postoperative pain. **Learning Objectives:** 1. Participants will learn about the management options for nerve injuries following cervical spine surgery. 2. Participants will learn about the indications and outcomes of upper extremity nerve transfers for the treatment of nerve injuries following cervical spine surgery. 3. Participants will takeaway the importance of collaboration with spine surgeons to improve outcomes for this patient population.

SElectrophysiological evidence of hand intrinsic muscle reinnervation with median nerve axons after end-to-side or end-to-end distal anterior interosseous nerve to ulnar motor nerve transfer (G12)

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Purpose: To evaluate hand reinnervation patterns following distal anterior interosseous nerve (AIN) to ulnar motor nerve end-to-side (ETS) or end-to-end transfer (ETE) with clinical and electrophysiological data. **Method**: A retrospective cohort study was done with patients having undergone AIN to ulnar nerve ETS and ETE transfer from a single centre between 2017 to 2022. Motor reinnervation of the abductor digiti minimi (ADM) by the AIN was evaluated by recording motor nerve conductions from the median nerve at the elbow to the ADM. Muscle recruitment with and without pronation was also assessed by needle EMG. **Results**: A total of 16 patients were included in the study, with 12 having had ETS and 4 ETE nerve transfer. Post-operative EMGs were performed on average 17.4 months after the intervention. Nine of the 12 patients in the ETS group had undergone motor nerve conduction studies from the median nerve to ADM. Six of the nine showed positive amplitudes, ranging from 0.6mV to 3.7 mV, while the remaining three had no evidence of conduction from the median nerve to the ADM muscle. In contrast, all four patients in the ETE group had positive motor nerve conduction from the median nerve to the ADM muscle ranging from 0.3mV to 6.3mV. A qualitative increase in muscle recruitment was present in all patients while pronating in the ETE group, while a similar observation was present in 37.5% of the ETS group. **Conclusions**: This study shows clinical and electrophysiological evidence to support the growth of median nerve axons into muscles normally innervated by the ulnar nerve in patients with ETS as well as ETE distal AIN to ulnar motor nerve transfers. **Learning Objectives**: 1) Learn about the role of EMGs following nerve transfers 2) Understand the difference between ETS and ETE nerve transfers