ptosis lower than grade II were not significantly different between groups (29.1% vs 26.1%; p=0.699). Median follow-up was 20.3 and 21 months in the prepectoral and subpectoral group, respectively. Average mastectomy weight was 300g (185–425) and 355g (203–500). Average implant size was 410cc (330–465) and 425cc (315–534) in the prepectoral and subpectoral group, respectively. Alloderm was used in all reconstructions. Total number of complications was 4 (7.2%) and 8 (11.6%) in the prepectoral and subpectoral group, respectively (p=0.227). BREAST-Q demonstrated mean patient satisfaction was high and similar among groups (75 and 74, p=0.211).

CONCLUSION: Based on these results, we believe prepectoral DTI is safe, reliable and a promising reconstructive option for selected patients, with equivalent results to other reconstructive options. Our present treatment recommendations are for patients who wish to maintain the same breast size, and have minimal or no breast ptosis.

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Dental Agenesis and Maxillary Growth Restriction in Cleft Lip and Palate Patients

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PURPOSE: Maxillary retrusion is well known facet of the cleft palate pathology, however whether that underdevelopment is an intrinsic process or secondary to surgical scarring after palatoplasty remains the subject of controversy. The aim of this study is to evaluate the relationship between hypodontia and maxillary volume.

METHODS: After IRB approval, a retrospective review of patients age 6–9 with unilateral cleft palate at Lurie Children’s Hospital and Case Western University who underwent CBCTs in preparation for alveolar bone grafting between 2010–2016 was conducted. Serial Panorex scans were reviewed by two researchers to determine the number and location of congenitally absent teeth. Dolphin Imaging was used to measure SNA angle, ANB angle, and maxillary volume. Group 1 (poor growers) consisted of the bottom 50% of ANB angles and Group 2 (good growers) consisted of the top 50% of ANB angles.

RESULTS: 38 patients were identified that met inclusion criteria and had adequate imaging. The lateral incisor was the most commonly missing tooth (29%), first pre-molar on either side (18%). As seen in table 1, patients with higher ANB angles had fewer missing teeth and higher maxillary volume compared to patients with lower, Class III ANB angles.

CONCLUSIONS: Cleft patients with Class III occlusal relationships are more likely to have more congenitally missing teeth and decreased maxillary volume. The causative nature of this relationship requires further study.

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Identification of Novel Sub-Populations of Resident and Inflammatory Myeloid Cells and Osteogenic Progenitor Cells in Musculoskeletal Trauma

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PURPOSE: Despite the high frequency of musculoskeletal extremity trauma, little is known about the dynamics of the complex inflammatory response that can result in pathologic healing in the form of heterotopic ossification (HO). While posttraumatic inflammation is a critical element of normal wound healing, aberrant inflammatory processes in response to musculoskeletal trauma have been described to initiate ectopic bone formation through endochondral ossification. Therefore, accurate identification of cells present at the injury site is critical to understanding the pathophysiology and cellular interactions between inflammatory cells and resident mesenchymal progenitors (MSC). Here, we utilize single cell RNA sequencing to obtain an unbiased analysis of the cellular composition at the injury site and to identify dynamic changes in these cell subpopulations over time in a model of HO.
METHODS: Male C57BL/6 mice were subjected to a musculoskeletal extremity trauma model of HO formation involving a 30% total body surface area dorsal burn and Achilles tenotomy. Single cell RNA sequencing (10X genomics) and downstream unsupervised clustering analyses were performed on the extremity injury HO site at baseline (D0), during inflammation (D3), and mesenchymal progenitor cell condensation (D7) (n=3/group).

RESULTS: Canonical correlation analysis yielded 14 transcriptionally unique cell clusters identifiable at the injury site with characteristic profiles attributable to phenotypically distinct cell types. While recruited granulocytes significantly reduced in numbers from 36.1% on day 3 to only 10.7% at day 7, macrophages/monocytes and dendritic cells were the predominant cell populations and constituted over 35% of total cells on day 7. Subpopulation analysis revealed distinct monocyte/macrophage clusters with M2 characteristic gene expression including Mrc1 (CD206), H2-Eb1 (MHC II) and Cd163 as well as Arg1 (cluster 1, 3, 5 and 8). While cluster 1 showed expression of all three markers, cluster 3 showed high expression of Arg1 but not Cd163 indicating that these are phenotypically unique cell populations with distinct functions. We further observed a significant increase in HO progenitor subpopulations (cluster 2, 4, and 6) on day 7 which were almost entirely absent on day 3. Clusters 2, 4, 6 and 11 showed high expression of Pdgfra, a marker known to identify mesenchymal progenitor cells. Cluster 11 completely disappeared on day 7, suggesting that these cells likely differentiated into HO forming cells. Interestingly, mesenchymal cell clusters further demonstrated high expression of chondrogenic differentiation genes Acan and Sox9 as early as on day 3 indicating early cell fate determination.

CONCLUSION: To elucidate HO pathophysiology, it is critical to characterize the intricate interactions of inflammatory cells and progenitor cells. Using single cell RNA sequencing as a novel tool, we identify the presence of yet unidentified and functionally distinct subpopulations of monocytes and progenitor cells with unique transcriptional characteristics. Isolation of cells based on these findings may allow for a more granular understanding of HO and future design of targeted treatment.

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Minimizing Implant Infection and Capsular Contracture Through the Use of Antibiotic-Eluting Nanofiber Coatings

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PURPOSE: Bacterial contamination following implant-based soft tissue reconstruction contributes to significant healthcare costs and patient morbidity. In addition to acute infection, subclinical bacterial colonization is thought to contribute to long-term capsular contracture. The purpose of this study was to design an antibiotic-eluting nanofiber-hydrogel composite sheet for use in implant soft tissue pocket reinforcement. A murine implant infection model was developed to test the impact of the device on implant infection and infection-associated capsule formation.

METHODS: Polycaprolactone (PCL) impregnated with linezolid and rifampicin was electrospun into a random-pattern sheet and suspended within a nanofiber-hydrogel composite. Interfacial bonding between the nanofibers and hydrogel matrix was used to improve structural integrity of the material. Mechanical properties and antibiotic release kinetics were assessed in vitro. Silicone disk implants were incubated with a bioluminescent Staphylococcus aureus strain for 24 hours. Biofilm formation was confirmed via crystal violet staining. Thirty-five mice were implanted with either the infected implant alone, infected implant with overlying composite sheet, or infected implant with overlying antibiotic-eluting composite sheet. Bioluminescence imaging was used to assess the in vivo bacterial burden between postoperative days 0 and 15. Postmortem bacterial colony forming unit (CFU) quantification, histology, and immunohistochemistry were performed on harvested tissues.

RESULTS: A 1mm-thick nanofiber-hydrogel composite sheet embedded with linezolid and rifampicin was designed and demonstrated favorable mechanical properties, suture-ability, and antibiotic release kinetics. Use of the antibiotic-eluting composite sheet device resulted in complete prevention of clinical signs of cellulitis.