different from the control cohort. Metopic skulls demonstrated a significantly decreased anterior cranium area (average, 2466.12 mm^2; $P < 0.001$) and significantly increased anterior-posterior (AP) length (average, 4.00 mm; $P = 0.003$) and craniocaudal length of the anterior cranium (average, 6.41 mm; $P = 0.01$) compared with control skulls. There was a significant negative correlation between the anterior cranial area and both the vertical length and AP length. The frontal angle significantly correlated with the increases in vertical height and AP length, whereas the aEBF correlated with only the AP length. Other measurements did not significantly correlate with changes in anterior calvarium dimensions. Receiver operating characteristic curve analysis identified a frontal angle of 101.3° as the diagnostic threshold between operated metopic synostosis and normal skulls. Sixteen metopic subjects with existing EEG data were evaluated. Six patients with frontal angles more acute than the diagnostic threshold exhibited significantly attenuated EEG signals compared with controls ($P = 0.037$). Patients with frontal angles greater than the diagnostic threshold did not exhibit any significant change in their EEG compared with controls.

CONCLUSIONS: In the largest radiographic series of metopic synostosis patients to date, this study examined the validity of measurements for severity of metopic craniosynostosis. The frontal angle provides the strongest correlation with growth compensation in the most severe cases of trigonocephaly. Furthermore, a severity classification using the frontal angle correlates with preoperative EEG analysis. The bitemporal/biparietal ratio, metopic index, cranial volumes, cranial base structures, and orbital structures should be reconsidered as measures of metopic severity as they are either nonconcordant with the anterior-cranium compensatory changes or not significantly different from control.

The Chimeric Scapulodorsal-Vascularized Latissimus Dorsi Nerve Flap for Immediate Total Parotidectomy With Facial Nerve Sacrifice Reconstruction: About 24 Cases

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OBJECTIVE: Total parotidectomy with facial nerve sacrifice presents 2 challenging reconstructive problems: facial contour restoration and facial nerve rehabilitation. Strong evidences suggesting that vascularized nerve grafts are superior to non-vascularized ones motivated our team to develop a chimeric scapulodorsal flap combining usual harvestable local tissues with the vascularized latissimus dorsi motor nerve. We present our retrospective results, emphasizing on the quality of facial nerve reanimation and facial contour restoration.

MATERIALS AND METHODS: From 2010 to 2018, 24 free chimeric scapulodorsal-vascularized latissimus dorsi nerve flaps have been performed in 13 females and 11 males (median age 48 years) undergoing at least a total parotidectomy with facial nerve sacrifice. The basic flap structure was composed of at least the vascularized LD nerve and a thoracodorsal artery perforator flap but could include, depending on the defect a second LD flap and/or a lateral segment of the scapula. One patient required a second simultaneous free flap. Mean follow-up is 5 years (range, 10–1 year). Assessment of facial nerve used the House-Brackman scale and the Yanagihara 40-point system. Quality of life used the FaCE scale. Evaluation was every 3 months.

RESULTS: Twenty out of the 24 patients had postoperative radiotherapy. No local tumor recurrence had to be reported. Facial contour restoration was found excellent in all patients but one (a combined maxillectomy-mandibulectomy). Overall facial nerve function has been scored 1 and 2 in 15 patients, 3 in 7 patients. Two patients are scored 4 and 5. The average reinnervation time is 9 months ranging from 3 to 15 months. Best facial subregion function is the orbitopalpebral region followed by the commissural one. Eyebrow-frontal subregion has the poorest recovery.

CONCLUSION: The scapulodorsal-vascularized latissimus dorsi nerve flap is a highly resourceful solution to reconstruct complex parotid defects including the facial nerve. Soft and hard tissues components enable near-normal facial contour restoration. The vascular nerve graft allows primary facial reanimation. Nerve recovery seems to be superior to what could be expected with a conventional nerve graft. Although, only a prospective randomized study could prove this affirmation true, sufficient data are available to make such a study questionable.

Intracranial Volume After Cranial Vault Remodeling: To What Degree Does Intracranial Composition Change After Surgery?

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BACKGROUND: The intracranial cavity is composed of brain tissue as well as cerebrospinal fluid (CSF), blood, and air. These fluid components allow volume to be shunted out of the intracranial region in the setting of skull-based compression to minimize the effect of compression on the brain. The degree of change to the intracranial compartment in the setting of craniosynostosis and the speed at which they occur and resolve after surgery are not fully understood. This study sought to rigorously analyze the intracranial volume compositions of patients with craniosynostosis prior to and after CVR.

METHODS: The authors compared volume measurements for age-matched patients with unicoronal (n = 4), metopic (n = 4), and sagittal (n = 4) craniosynostosis. Intracranial segmentation and analysis were performed on Materialize Medical 21.0 (Materialise; Leuven, Belgium) using the following segmentation thresholds: bone 226-3066 HU, CSF -281-18 HU, and air 19-225 HU, and then manually edited utilizing typical segmentation techniques. On expert consultation, brain segmentation volumes were determined to be less reliable measurements than intracranial, CSF, and air volumes and were thus calculated by subtracting the other volumes from ICV. Paired *t* tests, one-way analysis of variance, and multiple regression analyses were performed on STATA 15.1 (StataCorp, College Station, TX).

RESULTS: The average age at surgical repair was 8.7 ± 0.83 months. All postoperative imaging was performed between 3 and 5 days postoperatively aside from one patient with imaging at 19 days postoperatively. There was a significant increase in total ICV (913772.5 ± 102480.5 mm^3 versus 1068165 ± 95752.5 mm^3; $P < 0.001$) and intracranial air volume (18608.8 ± 9639.1 versus 53230.2 ± 32607.4; $P = 0.001$) after CVR. On subgroup analysis by affected suture, there was a significant increase in ICV (851748.9 ± 87438.1 versus 1043117 ± 149763; $P = 0.009$) and brain volume (737312.3 ± 80166.5 versus 829060.9 ± 61405.6; $P = 0.021$) in the metopic cohort and a significant increase in ICV (1006379 ± 31359.5 versus 1133497 ± 45574.1; $P = 0.013$) and intracranial air volume (18056.21± 5397.634 versus 53230.16± 32607; $P = 0.001$) in the sagittal cohort. The metopic cohort had the largest percent change in intracranial volume (18% ± 3.4%) and CSF volume (28% ± 24%). There were dramatic postoperative increases in intracranial air volumes in all cohorts (percent change: unicoronal 46% ± 16%; sagittal 58% ± 36%, metopic 58% ± 23%) at this postoperative time period. On multiple regression analysis with affected suture, type of CVR, age at repair and time from surgery to postoperative imaging as independent variables, age at repair was the only significant predictor of percent change in ICV (coef, −5.35; 95% CI, −10.2 to −0.51; P= 0.04) at the 0.05 significance level.

CONCLUSION: The ICV increase created by CVR allows subsequent increases in brain, CSF, and air volumes in the early postoperative time period. Significant brain tissue volume increases were seen in the metopic cohort with significant intracranial air volume increases in the sagittal cohort. We hope to perform additional analysis with follow-up data to determine if some of the noted air volume increase is redistributed to brain tissue or CSF at a later time.

Opportunities for Risk Reduction in Pediatric Craniofacial Imaging Protocols

Presenter: Hillary E. Jenny, MD, MPH

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BACKGROUND: Imaging-associated radiation exposure is often considered in terms of a single computed tomography (CT) scan's effect. However, managing craniofacial pathology may require more than 1 CT across the patient's lifetime. Understanding the impact of these diagnoses therefore requires longitudinal analysis, particularly when considering that the pediatric population has a longer follow-up period and greater potential for development of radiation-associated neoplasia. We aim to quantify the lifetime oncologic risk of the image-related radiation exposure associated with craniofacial diagnoses and discuss ways in which practice patterns might be optimized to mitigate risk.