RESULTS: SSO demonstrated decreased whole-brain intrinsic connectivity compared to controls in left BA-39 and bilateral BA-7’s (p=0.071), which are the superior parietal lobules and the angular gyrus. UCS had significantly decreased intrinsic connectivity throughout the prefrontal cortex (PFC, p=0.031). On seed-based analysis, UCS had significantly increased connectivity between left BA-40 and bilateral BA-6, BA-8, and BA-9, and left BA-32 (p=0.050), between left BA-7 and the anterior PFC (p=0.065), and between left BA-7 and right BA-7 and BA-9 (p=0.077). MSO demonstrated increased connectivity between the left BA-7 seed and the right inferior frontal gyrus and right insula (p=0.090).

CONCLUSION: NSC is associated with altered brain connectivity that varies by type of synostosis. SSO had decreased connectivity in regions of the parietal cortex associated with spatial cognition, visuomotor integration, and attention. UCS demonstrated significantly decreased intrinsic connectivity in the PFC, which plays a crucial role in executive function, as well as increased connectivity between the PFC and the right parietal cortex. Finally, MSO was the only group to demonstrate aberrations in the right insula and right inferior frontal gyrus. This study provides neurologic evidence of long-term sequelae of NSC that varies by suture type, which may underlie different phenotypes of neuropsychiatric impairment.

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INTRODUCTION: As the third most frequent type, metopic craniosynostosis presents with a trigone-shaped skull and parieto-occipital bossing. Standard of care reconstruction includes an anterior cranial vault remodeling with fronto-orbital advancement. A paucity of literature exists regarding the long-term anthropometric outcomes and neurocognitive assessment in this patient population.

METHODS: A prospectively maintained database of patients at the NYU Department of Plastic Surgery was retrospectively reviewed to identify patients who underwent open surgery for metopic craniosynostosis. Inclusion criteria consisted of patients who had a diagnosis of metopic craniosynostosis, pre-operative photographs, a history of an open procedure, and were amenable to late long-term follow-up. Patients were recalled for a comprehensive interview, examination and 2D/3D digital photography.

RESULTS: Forty-one patients met inclusion criteria. Mean age at the time of follow-up was 14.3 years with a mean age of 10.3 months at surgery. The majority of patients, 83%, underwent only one operation. In total, 33% of patients underwent physical therapy or occupational therapy while 37.5% had speech therapy at some point during development. Learning disabilities were identified in 21% of patients with 8.3% of patients held back academically or requiring remediation. 8.3% of patients had diagnoses of anxiety, depression, and attention deficit disorder while 4.2% had autism, dyslexia, obsessive compulsive disorder, or oppositional defiance disorder.

On physical examination at late follow-up, temporal hollowing was noted in 83% of patients. Persistent calvarial defects greater than 1cm² were identified in 8.3%. Another 12.5% of patients had significant irregularities in frontal bone contour following remodeling.
CONCLUSION: Open cranial vault remodeling with fronto-orbital advancement is a safe and reproducible procedure with excellent literature to support short-term outcomes. However, little data exist to evaluate this patient population as they mature. Our study critically evaluates physical exam findings, neurocognitive development, and anthropometric assessments in this patient population at or near skeletal maturity.

MAIN OBJECTIVES: Learners will understand the physical exam findings and neurocognitive long-term outcomes following open procedures for metopic craniosynostosis.

Minor Suture Fusion Analysis in Infants with Syndromic and Non-Syndromic Craniosynostosis

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INTRODUCTION: While not definitively proven, cranial base suture fusion is thought to affect both facial and cranial growth patterns. Previous work from our institution and others has demonstrated a high rate of cranial base, so-called “minor”, suture fusion in infants with syndromic craniosynostosis. The purpose of this study is to compare rates of minor suture fusion amongst three groups of patients: non-affected controls, patients with non-syndromic craniosynostosis, and patients with syndromic craniosynostosis.

METHODS: We performed a retrospective review of infants diagnosed with syndromic synostosis, non-syndromic synostosis, and/or controls. CT scans were graded on degree of major and minor suture/synchondrosis fusion: 0—open and 1—partially/completely fused by an attending craniofacial surgeon and neuroradiologist. Statistical comparisons were then conducted on location of fusion, rates of fusion, age, and diagnosis.

RESULTS: One-hundred and forty patients met inclusion criteria: 55 syndromic craniosynostosis, 64 non-syndromic craniosynostosis, and 21 control infants. The average age of syndromic subjects (3.6 months) differed from non-syndromic subjects (5.4 months, p=0.001) and trended towards younger than controls (5.1 months, p=0.058). Overall, syndromic infants had twice the rate (20.5%) of minor suture fusion than non-syndromics (9.1%) and controls (9.2%) (p<0.001), whose rates of fusion were statistically equivalent (p=0.818). Sites of fusion also differed significantly among groups. Using a multivariate logistic regression that controlled for age, relative to control subjects the fronto-ethmoidal suture was fused less often in non-syndromic (39.06% vs. 76.19%, OR 0.054, p<0.001, respectively) and syndromic subjects (22.64% vs. 76.19%, OR 0.055, p<0.001, respectively). Syndromic subjects had a significantly greater degree of minor suture fusion in the coronal branches (fronto-sphenoidal, sphenosquamosal and sphenopetrosal), squamosal arch (parieto-squamosal and parieto-mastoid), and posterior intraoccipital minor suture/synchondrosis than both non-syndromics and controls (OR 7.94 and 7.94, 7.74 and 3.52, 3.39 and 3.39, 22.63 and 6.10, 29.82 and 29.82, 12.16 and 6.99; p<0.05; respectively).

CONCLUSION: Our data suggests that a small percentage of cranial base sutures begin to fuse in infancy under normal circumstances. Patients with non-syndromic craniosynostosis have similar rates of, and sites of, cranial base suture fusion as controls. In contrast, patients with syndromic craniosynostosis have higher rates of cranial base suture fusion in infancy with a concentration in the region of the coronal branches. Future work will attempt to determine the phenotypic ramifications of these differences.

Treatment of Craniosynostosis: The Impact of Hospital Surgical Volume on Cost, Resource Utilization, and Outcomes

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