Title: An Objective Assessment of Outcomes of Endoscopic Sagittal Craniosynostosis Re-lease

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Introduction: One in 2,200 newborns is diagnosed with craniosynostosis. The sagittal suture is involved most often. Endoscopic strip craniectomy with post-operative helmet-guided re-modeling has risen in popularity over the past decade as a treatment method. An objective outcome of results has been elusive. Since machine learning now enables an objective evaluation of head shape, we sought to determine if the head shapes of patients treated endoscopically for sagittal craniosynostosis were normal at the end of treatment.

Methods: After IRB approval, patients treated with endoscopic strip craniectomy/helmet re-modeling between 2017 and 2021 were collected from our institutional EPIC database. Patients with pre and postoperative calvarial 3D imaging were included in the assessment. Objective evaluation of head shape using an existing machine learning algorithm based on a normative statistical model (age 0-10 years) was performed at the end of the treatment course to calculate the risk of patients presenting abnormal head shapes associated with craniosynostosis.

Results: Twenty-six patients were identified and analyzed. Our quantitative evaluation method identified 19/26 (73%) with a normal head shape post-operatively at discontinuation of helmet therapy with risk scores ranging from 0.79% to 20%. Within the group with normal outcomes, 4/19 (21%), 9/19 (47.5%), 4/19 (21%), and 2/19(10.5 %) were operated upon at 2-3, 3-4, 4-5, and 5-6 months of age, respectively.

Conclusion: In this cohort, objective evaluation of surgical outcomes shows that minimally invasive endoscopic treatment followed by helmet-guided remodeling successfully creates normal head shapes in 73% of patients with sagittal craniosynostosis. An analysis of those for whom treatment failed may identify reasons for which treatment was not successful.