DOES THE BANDEAU GROW: QUANTIFYING POST-OPERATIVE CHANGES IN THE BANDEAU OVER TIME AFTER FRONTO-ORBITAL ADVANCEMENT

Introduction
Temporal hollowing is a known late sequela of fronto-orbital advancement (FOA) surgeries, and much work has highlighted the effect of soft-tissue manipulation as a cause. However, bony manipulation including devascularization and under-correction may also contribute to temporal hollowing. Currently no long-term quantitative assessments exist which evaluate the bony changes after FOA. We sought to objectively assess how such bony morphology changes over time.

Methods
A multi-center, IRB-approved retrospective study identified craniosynostosis (CS) patients treated with FOA between 2008-2018 at Children’s Hospital of Pittsburgh or Children’s Hospital of Philadelphia. Syndromic and non-syndromic patients with both early post-operative and late follow-up (>12 mos) head CT scans were included. Scans were reconstructed, oriented in a standardized fashion, and manually segmented into surgical fragments that delineated the osteotomies of interest for a given patient (Figure 1, fragments with false color). Two craniofacial surgeons confirmed all segmentations and data points of interest. 32 data points and 35 discreet metrics were collected from each patient and evaluated for changes over time.

Results
Twenty patients matched inclusion criteria (12 female:8 male). CS subtypes included metopic (7), unilateral coronal (6 right, 3 left), multisutural (2), sagittal (1) and sagittal and metopic (1). Mean age at surgery and time to follow-up scan was 1.4 years and 2.8 years respectively.

Average growth of the inter-eurion distance and glab.-opistho. distance was 3.3% and 10.4% respectively. The bandeau AP length increased 18.2%, and height increased by 29.5%. While average bitemporal width increased 4.7%, anterior bandeau width decreased by 4.1%, leading to a transverse deficiency in the anterior temporal region.

The average initial zygomatico-frontal (ZF) osteotomy offset was 3.8mm laterally and 7.0mm anteriorly; these remodeled, eliminating the gap. The average initial bandeau orbital width was 3.8mm wider than the midface orbital width and decreased by 2mm while the midface orbital width increased by 2mm over time (~50% loss of overcorrection). Data was significant to p<0.05 by paired t-test.

Conclusion
The long-term shape and position of the bandeau determines surgical success of FOA. We found that the skull continues to widen bitemporally after surgery, however widening at the anterior temporal region is negligible. This is the first comparative demonstration of the bony contribution toward temporal hollowing in early and late post-operative patients.