Coronal synostosis is the second most common major vault synostosis in the pediatric population.

- Fronto-orbital advancement (FOA) and distraction osteogenesis (DO) are two surgical approaches
- DO is a newer technique in which a distractor device is secured within the strip craniectomy. The distractor is sequentially opened during the activation phase, allowing for forceful expansion of the skull.

**Objective**

To compare the volumetric expansion outcomes of the anterior fossa volume and total intracranial volume between patients treated with FOA or DO in coronal synostosis.

**Methods**

All coronal craniosynostosis, treated with either FOA or DO, between 2012 to 2019, at our institution were included for analyses (IRB approval through Western IRB). Work order #11777164-11. 30 patients were identified with coronal synostosis at our institution. 10 patient records and post-imaging criteria to be included in this study. 9 patients were treated with FOA, and 6 with DO.

**Radiographic analyses included:**

1. Anterior fossa volume (AFV)
2. Intracranial volume (ICV)

Volumetric measurements were performed using 3D Slicer software version 4.10 (https://www.slicer.org/) and OsiriX MD (Bernex, Switzerland). AFV was defined as the closed volume created by a plane between the edges of the lesser sphenoid wing and the 1 cm mark posterior to the coronal suture and the floor was defined as the anterior skull base. The superior extent of the anterior vault volume was taken to the superior extent of the cranium, and the inferior limit taken to the anterior skull base (Figure 1). Total intracranial volume was calculated as total volume within the skull.

T-test was used for all volume comparisons with unequal variances where indicated. Logistic regression analyses were performed to identify predictors of postoperative volume for AFV and ICV.

**Conclusion**

- Coronal synostosis may be treated through various surgical options including FOA or DO; however, DO shows approximately double the volumetric growth per day in the AFV (p=.013) and ICV (p=.034) as compared to natural growth of the skull after FOA. Whereas, FOA may result in immediate correction/overcorrection, DO may result in improved overall growth over time.
- DO technique results in lower blood loss (p=.013) and higher operative efficiency (p=.000) as compared to FOA. Contributing factors to reduced operative blood loss and operating time may result from a reduced hemi-coronal incision length and closure. Furthermore, DO utilizes open sutures for expansion requiring less overall osteotomies to advance the bandeau.
- Postoperative DO volumetric expansion can be modeled through logistic regression using CT interval and preoperative AFV as independent predictors
- DO results in a predictable growth expansion in the postoperative period; whereas FOA results in an unpredictable expansion in the postoperative period.

**Limitations of Study:**

- Retrospective review, small n, variable CT interval

**Future Directions of Norton Children’s Pediatric Craniosynostosis Lab:**

- Analysis of cosmetic outcomes including orbital cone volume, orbital rim symmetry and nasal radix symmetry between FOA and DO

**References**