PURPOSE: Neurocognitive studies in school-age children with craniosynostosis reveal lower scores compared to controls. Optimal age at surgery in craniosynostosis continues to be debated. In addition, individuals with craniosynostosis may undergo reoperation to improve residual skull irregularities. It is unknown whether reoperation affects neurocognitive outcome. This study examined impact of age at whole-vault cranioplasty and reoperation on neurocognitive outcome in children with nonsyndromic sagittal craniosynostosis (NSC).

METHODS: 39 school-age children (age 6–16 years) diagnosed with NSC who underwent whole-vault cranialplasty were included in this analysis. Participants were administered the Wechsler Abbreviated Scale of Intelligence (WASI) and the Wechsler Fundamentals (WF) subject tests. The WASI assesses full-scale IQ, verbal IQ, and performance IQ, while the WF assesses achievement in word reading, reading comprehension, spelling, and numerical operations.

RESULTS: Children with NSC operated at age 3–6 months (n=17) performed significantly better on all neurocognitive testing measures compared to children operated on after age 6 months (n=25). Score on full scale IQ was 114.59 (SD = 10.91) vs 101.00 (SD = 12.48) (p=0.002), verbal IQ was 117.29 (SD = 9.83) vs 100.48 (SD = 15.00) (p=0.001), and performance IQ was 110.18 (SD = 11.18) vs 101.52 (SD = 11.18) (p=0.027). All findings remained significant after controlling for patient sex and maternal educational attainment.

Controlling for patient sex, maternal educational attainment, and patient IQ, score on word reading was 120.20 (SD = 13.69) vs 85.31 (SD = 22.54) (p=.001), reading comprehension was 113.05 (SD = 10.55) vs 84.00 (SD = 18.79) (p=.003), spelling was 112.25 (SD = 16.06) vs 81.64 (SD = 16.89) (p=.004), and numerical operations was 108.60 (SD = 12.24) vs 84.86 (SD = 13.79) (p=.002).

Of the original sample, reoperation status was available for 27 participants. 9 participants underwent reoperation (6 augmentation craniorplasies, 3 cranial vault osteotomies) and 18 did not. No statistical differences in intelligence and achievement measures were observed in those who underwent reoperation versus those who did not. Sample size limited ability to examine potential statistical differences between reoperation types. However, participants with minor reoperations obtained higher means on all measures than those with extensive reoperations.

CONCLUSIONS: Earlier age at whole-vault calvarial reconstruction for NSC is associated with improved neurocognitive outcomes. Preliminary subanalysis suggests that reoperation does not impact neurocognitive outcomes in NSC.

Location and Time of Maximal Head Shape Change in Strip Craniectomy with Barrel Staves and Helmet Therapy by 2D and 3D Imaging for Treatment of Sagittal Craniosynostosis.

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OBJECTIVE: Sagittal strip craniectomy, is widely used for the treatment of sagittal craniosynostosis to normalize head shape, yet few 3D studies have investigated the rate and location of shape change following surgery. The aim of this study was to determine the velocity and location of the major shape changes after limited incision sagittal strip craniectomy with barrel staving and postop helmet therapy.

METHODS: After IRB approval, a retrospective chart review of all patients treated with strip craniectomy and barrel stave’s at our institution was undertaken. Selection criteria included: 1) diagnosis of sagittal craniosynostosis; 2) treatment age less than 200 days; 3) compliance with and completion of helmet therapy through 1 year of age. Results of cranial index (CI), maximal anterior-posterior length and maximal width were obtained from preoperative 3D surface scans to the end of helmet therapy. In addition, the change in head shape from preoperative to postoperative was evaluated using 3D analysis.

RESULTS: 20 patients met selection criteria (6 Female, 14 male). The average age of surgery was 109.2 ± 19.7 days (range 83–146). There was a significant increase in the CI from 71.7 ± 3.8 (range 63–77.9) preoperative to 81.1 ± 4.2 (range 73–89.8) postoperative. 60% of patients had an
excellent result and 40% had a good result. The average duration of postoperative helmet therapy was 334 ± 97.8 days (range 132–514). The average postoperative time until stabilization of cranial index was 52.4 ± 24.7 days. 3D analysis demonstrated the posterior third to have the most change in shape, and this was both in skull height and anterior-posterior dimension. No postoperative complications occurred.

CONCLUSIONS: Limited incision sagittal strip craniectomy with barrel staving and postop helmet therapy produces a rapid change in CI and head shape. This suggests that the duration of helmet therapy may be shortened which could impact cost and burden of care. Further studies are needed to determine the effects of varied duration of postoperative helmet orthotic therapy and head shape.

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Experience of 106 Cranial Distraction for Craniosynostosis; Evaluate Surgical Outcome and Complications

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PURPOSE: The purpose of this study was to assess the long-term clinical outcomes following cranial advancement and/or remodeling with cranial distraction techniques for the treatment of craniosynostosis.

MATERIALS AND METHODS: The authors performed a retrospective outcome assessment of 106 cases treated with cranial expansion by distraction techniques for both syndromic and non-syndromic (brachycephaly, plagiocephaly, scaphocephaly, trigonocephaly and oxycephaly) craniosynostosis between 1998 and 2015. Surgical duration, blood transfusion, complications, and long-term clinical outcomes were assessed.

RESULTS: Of 106 patients with cranial distraction, 49 have syndromic craniosynostosis (Apert; n=18, Crouzon; n=15, Pfeiffer; n=14, others; n=2), and 57 have non-syndromic craniosynostosis (scaphocephaly; n = 17, trigonocephaly; n =5, plagiocephaly; n = 11, brachycephaly; n = 16, oxycephaly; n = 6, others; n=2). The mean age of surgery was 9.5 months (4 months to 5 years). Mean follow up period was 97 months (6 to 203 months). There was no death.

Complications included 3 cerebrospinal fluid leak, 2 local infections, 6 device exposures, and 1 epidural abscess. In two cases cranial distraction was discontinued. For 4 cases (3.8%), major reoperation was performed. The amount of blood transfusion (73% of traditional method) and operating time (76% of traditional method) are fewer than traditional method.

CONCLUSION: In this experience of cranial distraction for frontal advancement and total vault remodeling, rates of morbidity, mortality, the amount of blood transfusion and reoperation were significantly lower than those rates in traditional method, reported in the literature.1–3 Based on our study outcome, we believe that cranial expansion by distraction techniques may be as effective as traditional method, and less invasive surgical techniques than traditional method for the treatment of craniosynostosis.

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Posterior Vault Distraction in Multi-Suture Craniosynostosis: A Radiologic Morphometric Assessment

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PURPOSE: The first-line treatment of multi-suture syndromic craniosynostosis has shifted to an emphasis on