patients in this study were thought to have obtained sufficient cranial volume by distraction and reached the gradual phase of cranial growth which is not dependent on the patient suture. Higher risk of secondary synostosis is expected when performing posterior vault distraction, especially when the compression force is exerted on the patent suture during distraction. It is important to obtain sufficient cranial volume by distraction so that cranial volume is maintained with gradual cranial growth even after secondary synostosis. Further study is warranted to elucidate the incidence, mechanism, and impact of secondary synostosis after cranial vault distraction.

Surgical Management of FGFR2 Mutation-Related Syndromic Craniosynostosis: Retrospective Review of a 45-Year Experience By a Single Surgeon

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**PURPOSE:** Mutations in the fibroblast growth receptor 2 (FGFR2) gene have been identified in syndromic craniosynostosis syndromes such as Apert, Crouzon, and Pfeiffer syndrome. Patients have severe malformations of the skull and face requiring multiple complex reconstructive procedures. As described by Paul Tessier, surgical correction of such patients is performed for 3 main reasons: functional, morphologic, and psychological. The surgical treatment algorithm has evolved over time. Despite numerous articles describing treatment of syndromic craniosynostosis, there are few reports of long-term results. Long-term follow up of patients after midface surgeries is important for evaluating which techniques result in consistent favorable outcomes, and which should be improved. We present a retrospective review reporting surgical procedures performed by a single surgeon in patients with Apert, Crouzon, and Pfeiffer Syndrome over a period of 45 years, with the intent to delineate procedures that have been effective over time. We also present our surgical treatment algorithm for pediatric patients with FGFR2 mutation–related syndromic craniosynostosis based on the senior author’s experience.

**METHODS:** A retrospective review was performed of all patients with FGFR2 mutation–related syndromic craniosynostosis that underwent reconstruction for craniofacial defects, as performed by the senior author between 1975 and 2020. Patients without syndromic craniosynostosis were excluded. Inclusion criteria was limited to Apert, Crouzon, and Pfeiffer syndromes. Surgical procedures and complications were recorded for patients at all stages of the reconstructive process.

**RESULTS:** A total of 68 patients were identified who had complete records for evaluation, including 30 patients with Apert syndrome, 27 patients with Crouzon syndrome and 11 patients with Pfeiffer syndrome. The average patient age was 30±15.8 years, with a range of 3–77 years of age. Mean long-term follow-up after initial surgery was 10.5 ± 10.1 years. Primary procedures performed for correction of craniofacial deformities included posterior distraction or expansion (10.3%), frontal expansion (14.7%), fronto-orbital advancement (39.7%), facial bipartition (11.8%), Le Fort III (19.1%), and Le Fort I (23.5%). Mean ages at which procedures were performed were 1.5 ± 1.6 years for posterior distraction or expansion, 1.1 ± 1.2 years for fronto-orbital advancement, 6.2 ± 3.8 years for monobloc frontofacial advancement, 4.6 ± 1.8 years for monobloc frontofacial advancement with facial bipartition, 13.2 ± 8.2 years for Le Fort III, and 17.0 ± 3.8 years for Le Fort I. Additional procedures commonly used included nasal bone grafts (25.0%) and lateral canthopexies (19.1%).

**CONCLUSIONS:** This study, with an extensive long-term follow-up period, presents a pediatric surgical treatment algorithm for patients with FGFR2 mutation–related syndromic craniosynostosis. Our treatment algorithm entails a posterior distraction or expansion and fronto-orbital advancement at 6 months, monobloc frontofacial advancement ± facial bipartition at age 6 or 7, or a Le Fort III if morphologically indicated, and in most cases, a Le Fort I at age 17 or 18. Although multiple reconstructive procedures are necessary, complications are rare. This treatment algorithm results in good results in adolescence, allowing patients to integrate into mainstream life. However, patients tend to prematurely age, a problem that is not addressed by the current pediatric surgical treatment algorithm. Future directions include defining aesthetic surgical management of adults.

The Facial Artery Cheek Subunit and Extended Facial Artery Cheek Subunit Perforator Flaps in Fasciocutaneous Head and Neck Reconstruction