

The Use of The 3D Printed Polyether Ketone (PEEK) Implant In Secondary Craniosynostosis Revision

Background: Skull deformities may be seen in patients years after craniosynostosis correction. These deformities cause psychosocial distress in affected patients. In this series, we describe the use of patient specific polyether ether ketone (PEEK) implants for correction of skull deformities after cranial vault remodeling for craniosynostosis.

Methods: A chart review was conducted for 3 revision procedures performed by one plastic surgeon in collaboration with one neurosurgeon, both affiliated with Northwell Health. Preoperative CT scans were used to design 3D printed PEEK implants manufactured by KLS Martin. Implants were used to correct frontal and orbital asymmetry and skull deformities in each patient. Outcomes were assessed at 1 week, 1 month and 3 months post-operation.

Results: Two males and one female, ages 13, 17, and 19, underwent revision cranioplasty or orbital rim reconstruction using a custom, single piece 3D printed PEEK implant. All 3 patients underwent cranial vault remodeling in infancy; one was treated for coronal craniosynostosis and two were treated for metopic craniosynostosis. Revision cranioplasty operative times were 90, 105, and 147 minutes, with estimated blood loss of 45mL, 75mL, and 150mL respectively. One patient went home on post op day 1 and two patients went home on post op day 2. All patients had an immediate improvement in structural integrity and cranial contour, and all patients were pleased with their aesthetic results.

Conclusion: Custom 3D printed PEEK implants offer a single piece solution in revision cranioplasty surgery to correct skull deformities after cranial vault remodeling for craniosynostosis.