



Two Birds, One Stone: Novel Approach to Correct Cranial Defect and Soft Tissue Deficiency with Custom Polyether Ether Ketone (PEEK) Implant

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Introduction

Reconstruction of the frontotemporal cranium following emergent craniotomy is frequently complicated by long-term temporal hollowing, often due to injury to the temporalis muscle at the time of the craniotomy. Even after successful bony reconstruction, patients are dissatisfied with frontal asymmetry. Fat grafting, attempted resuspension of the temporalis, and additional autologous augmentation require additional surgery and patient burden. We present a novel approach to primary cranioplasty in which a customized polyetheretherketone (PEEK) implant is designed with overcorrection of projection in the temporal region to compensate for the overlying soft tissue temporal hollowing.

Methods

Patients who were candidates for PEEK implant reconstruction of craniotomy defects were included. Virtual surgical planning was utilized to design a PEEK implant to precisely occupy the area of the craniotomy defect, using each patient's contralateral contour to establish projection. The projection of the implant was then increased by up to 20% at several points of anticipated tissue deficiency and resultant hollowing. The augmented implant was surgically implanted, and short-term post-operative outcomes were analyzed.

Results

Two patients requiring reconstruction of craniotomy defects underwent placement of customized PEEK implants with the described adjustments for augmentation. The average size of PEEK implant was 135 cm². In both cases, incisions were closed primarily under minimal tension using wide, circumferential undermining and galeal scoring where needed. There were no wound-healing complications. At an average of 2.5 month follow up, there have been no short-term surgical complications following placement of augmented PEEK implants.

Conclusions

We suggest a novel design of custom PEEK implants in which projection is selectively augmented in comparison to the patient's contralateral frontotemporal profile. This allows for permanent, reliable compensation of soft tissue deficiency that would otherwise yield clinically significant temporal hollowing. Thus far, this technique does not subject patients to significant risks beyond those inherent to the use of alloplastic cranial implants, and is therefore a safe and reliable option for cranioplasty with the potential to address a commonly-held aesthetic concern.

