

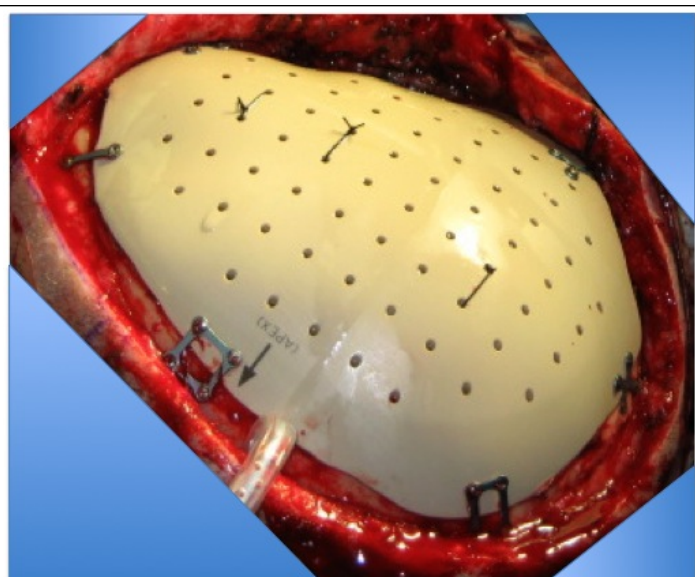
Custom-Made Polyetheretherketone (PEEK) Implants for Repair of Large Cranial Defects

Guy Rosenthal MD; Ivan H.B. Ng; Samuel Moscovici MD; Twyila D. Lay RN; Christine Martin RN, MS; Geoffrey T. Manley MD
University of California, San Francisco, Hadassah-Hebrew University Medical Center, and National Neuroscience Institute,
Singapore

Introduction

Large decompressive craniectomies are used to treat intractable elevated ICP as a result of severe traumatic brain injury, stroke and other pathologies. Calvarial reconstruction of these defects remains a challenge. While autologous bone remains the first choice for reconstruction, it cannot always be used due to infection, fragmentation, bone resorption, and other causes. Recently, computer-assisted 3-dimensional modeling has been used to design custom made synthetic implants.

Polyetheretherketone (PEEK) is a synthetic material which has many advantages in cranial-repair surgery, including strength, stiffness, durability, and inertness. We report our experience with custom-made PEEK implants in three institutions: San Francisco General Hospital, Hadassah-Hebrew University Hospital, and National Neuroscience Institute, Singapore.



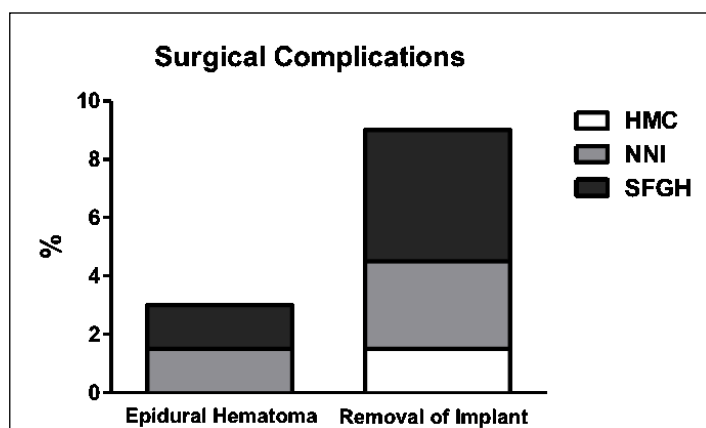
Intra-operative image of PEEK implant

Methods

A preoperative high-resolution CT was obtained for each patient for design of the PEEK implant (Synthes GmbH., Solothurn, Switzerland). The PEEK implant was sterilized pre-operatively and cranioplasty performed via standard technique with use of self-tapping titanium screws and mini-plates.

Results

Between 2006 and 2011, 63 cranioplasties with PEEK implants were performed in 62 patients (45 men, 17 women, mean age 34 ± 15 years) for repair of large cranial defects. There were 5 infections of implants and 1 wound breakdown requiring removal (infection and surgical removal rate of 7.9% and 9.5%, respectively). Two patients required drainage of post-operative hematoma (overall surgical complication rate, 12.7%). Non-surgical complications in 5 patients included seizures, non-operative collection, and CSF rhinorrhea that resolved spontaneously. Overall median patient or family satisfaction with the cranioplasty and aesthetic result was good, 4 on scale of 5 (95% confidence interval 4-5). Temporal wasting was the main aesthetic concern.



Conclusions

Custom-designed PEEK implants are a good option for patients with large cranial defects. The rate of complications is comparable to other implants or autologous bone. Given the large size of these defects, the aesthetic results are good.

Learning Objectives

By conclusion of this session, participants should be able to 1) Describe the utility of repair of large cranial defects with patient specific implants, 2) Discuss the advantages of PEEK as an implant material, 3) Identify the complications seen in cranioplasty with PEEK implants.

