

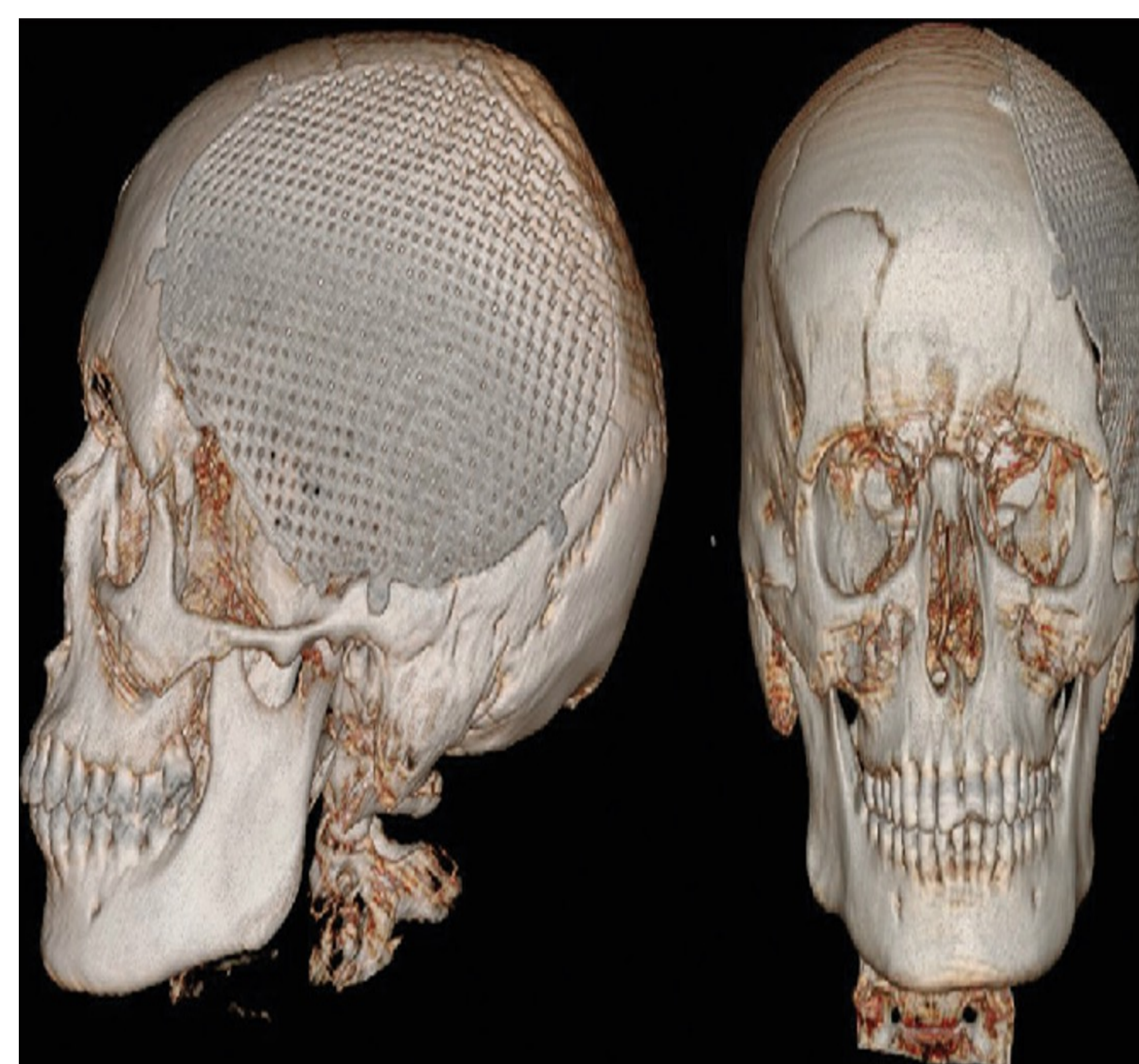
Comparing Patient Outcomes with Different Materials in Calvarial Reconstruction and Cranioplasties

Kevin Puerta Durango, B.S, B.A, Raysa Cabrejo, MD, Gary L. Freed Jr. MD, PharmD
Geisel School Of Medicine At Dartmouth

Introduction

Cranioplasty is one of the oldest neurosurgical procedures conducted with the goal of repairing a bone defect in the cranium. The procedure attempts to provide the patient with a cranial contour that structurally resembles their preoperative form while also protecting it from possible future events. The optimal material to obtain bony coverage of the brain is still up for debate with many options including bone grafts, polyetheretherketone (PEEK), hydroxyapatite and titanium mesh available but still with shortcomings. Complication rates vary but the current literature shows rates that tend to range from 10-40% regardless of the material. When considering the material, it is important to keep in mind surgical site infection, size and sustainability of the graft, and rates of post surgical complications.

Titanium Mesh



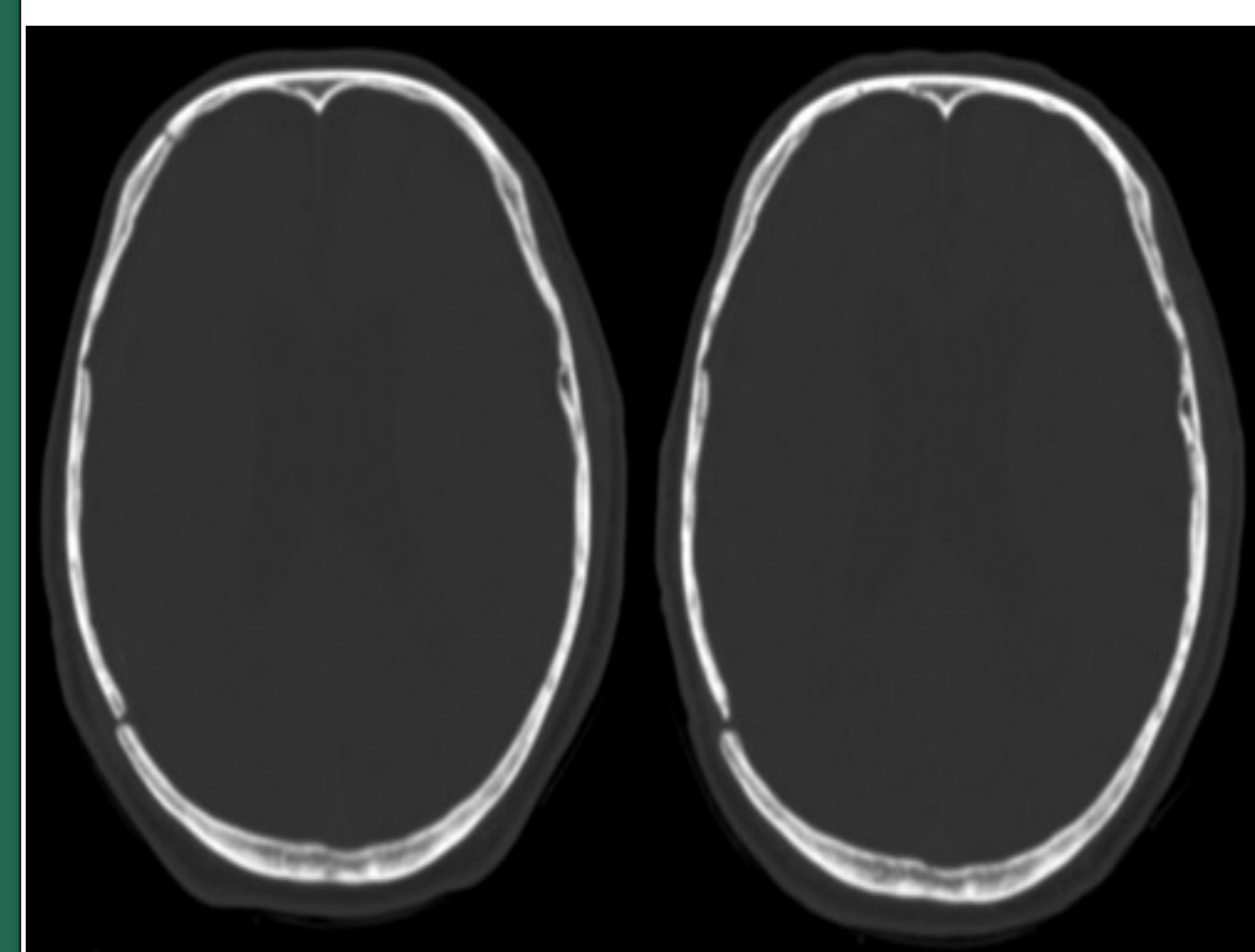
- Improved Aesthetic and Functional Outcomes
- When full treatment considered, cost are similar to those of autologous cranioplasty
- Increased removal rate due to infection

PEEK

- High aesthetic satisfaction rate, 81% Satisfied
- Rate of complication comparable to autologous bone and other materials
- Risk of complications requiring reoperation but with possibility of resterilization



Autologous Bone



- Patients own bone flap presumably allows for lower rates of rejection
- Revascularization and ossification benefits have always been suggested
- Requires preservation methods

Discussion & Plan

• In this retrospective chart review study, the plan is to collect and compare patients that had cranioplasties and calvarial reconstruction with implants and assess outcomes. Calvarial reconstruction presents many challenges and complications of up to about 28%. These complications are linked to the multiple materials, including polyetheretherketone (PEEK) and titanium mesh, used to replace bony coverage of the brain. In addition, we will utilize pre-operative and post-operative CT scans to evaluate the progression of the reconstruction prior to complications, including volume of defect, scalp thickness, fluid collections, etc. Therefore, this study will be able to correlate complications with possible ongoing structural changes in the reconstruction.

Acknowledgments & Citations

- Geisel Medical Student Research Fellowship
- Honeybul, Stephen et al. "A Randomized Controlled Trial Comparing Autologous Cranioplasty with Custom-Made Titanium Cranioplasty." *Journal of neurosurgery* 126.1 (2017): 81–90. Web.
- Jonkergouw, J et al. "Outcome in Patient-Specific PEEK Cranioplasty: A Two-Center Cohort Study of 40 Implants." *Journal of cranio-maxillo-facial surgery* 44.9 (2016): 1266–1272. Web
- Mukherjee, Soumya et al. "Complications of Titanium Cranioplasty—a Retrospective Analysis of 174 Patients." *Acta neurochirurgica* 156.5 (2014): 989–998. Web.
- Piitulainen, Jaakko M et al. "Outcomes of Cranioplasty with Synthetic Materials and Autologous Bone Grafts." *World neurosurgery* 83.5 (2015): 708–714. Web.
- Rosenthal, G., Ng, I., Moscovici, S., Lee, K. K., Lay, T., Martin, C., & Manley, G. T. (2014). Polyetheretherketone implants for the repair of large cranial defects: A 3-center experience. *Neurosurgery*, 75(5), 523-529. doi:http://dx.doi.org/10.1227/NEU.0000000000000477
- Yadla, Sanjay et al. "Effect of Early Surgery, Material, and Method of Flap Preservation on Cranioplasty Infections: A Systematic Review." *Neurosurgery* 68.4 (2011): 1124–1130. Web.