

Comparative Study of Titanium and Polyetheretherketone Cranial Implant Using Finite Element Model

Authors : Khaja Moiduddin, Sherif Mohammed Elseufy, Hisham Alkhalefah

Abstract : Recent advances in three-dimensional (3D) printing, medical imaging, and implant design may alter how craniomaxillofacial surgeons construct individualized treatments using patient data. By utilizing medical image data, medical professionals can obtain detailed information about a patient's injuries, enabling them to conduct a thorough preoperative assessment while ensuring the implant's accuracy. However, selecting the right implant material requires careful consideration of various mechanical properties. This study aims to compare the two commonly used implant material for cranial reconstruction which includes titanium (Ti6Al4V) and Polyetheretherketone (PEEK). Biomechanical analysis was performed to study the implant behavior, by keeping the implant design and fixation constant in both cases. A finite element model was created and analyzed under loading conditions. The finite element analysis proves that although Ti6Al4V is stronger than PEEK but, its mechanical strength is adequate to bear the loads of the adjacent bone tissue.

Keywords : cranial reconstruction, titanium implants, PEEK, finite element model

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