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Implant Design Based on Imaging Technique Case Study: Skull Reconstruction

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Abstract

Whether brought on by specific diseases, inherited traits, or trauma like an accident, craniofacial surgery on the bones of the head or face is frequently necessary to manage these conditions. Sometimes it is necessary to remove a portion of the bone and replace it with implants, both for cosmetic and functional anatomical reasons. In addition to symmetrical (aesthetic) goals and functional maintenance, this missing bone reconstruction necessitates extra attention and is highly customized. This research intends to describe how imaging techniques can be utilized to assist in designing an implant in a case study of a patient with cancer, where skull restoration is the choice of treatment. Based on image processing with MIMICS software, a three-dimensional (3D) computed tomography (CT) picture was used and processed to reconstruct the skull. The outcome demonstrated that the planned implant, produced by mirroring the tissues and Boolean operations, could close the hole in the cancer-related skull defect. This technique satisfies the implant design's symmetrical and aesthetic goals. The outcome from this study can be used as input for future research on advanced biomechanical evaluation to ascertain mechanical behavior, including a study

on the characteristics of material before it can be manufactured and used for a patient's implantation. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2024.

Author keywords

Cranial reconstruction; CT scan; Imaging technique

Indexed keywords

Engineering controlled terms

Bone; Computerized tomography; Image reconstruction; Patient treatment

Engineering uncontrolled terms

Bone reconstruction; Boolean operations; Case-studies; Computed tomography scan; Condition; Cranial reconstruction; Craniofacial surgery; Images processing; Implant design; Three-dimensional (3D) computed tomography

Engineering main heading

Diseases

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