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New reconstructive technologies of defective skull after frontal decompressive craniectomy in traumatic brain injury: The role of three-dimensional titanium mesh

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Introduction: Patients with frontal intracranial hematomas due to traumatic brain injury (TBI) tend to deteriorate due to a lack of lateralizing signs and vague clinical presentations. Decompressive craniectomy (DC) is an effective treatment strategy for reducing the intracranial pressure experienced by these patients. Advancements in the development of biomaterials have now made three-dimensional (3-D) titanium mesh a new option for the repair of skull defects after DC. Unfortunately, very few reports addressing the reconstruction of frontal skull defects using titanium mesh have been published. The purpose of this study was to review aesthetic, surgical outcomes and complications of patients who had frontal skull defects repaired with 3-D titanium mesh.

Methods: The records of 7 adult patients 32-60 years of age who underwent a computer-assisted designed titanium mesh implant at a University Hospital from January 2011 to June 2012 were retrospectively reviewed. Aesthetic outcomes, the function of cranial nerves V and VII, and complications (hardware extrusions, meningitis, osteomyelitis, brain abscess and Pneumo cephalus) were evaluated.

Results: An algorithm capable of accounting for bifrontal skull defects and median bone ridges was developed to improve computer-assisted design/manufacturing (CAD/CAM) of one-piece 3-D titanium mesh implants, thereby making it possible to repair bifrontal skull defects in a single operation. Following the procedure, aesthetic and functional outcomes were excellent and implants appeared to be stable in all patients. However, two patients had delayed wound healing and subsequent subclinical wound infections, which resolved after treatment with antibiotics for 2 weeks. No patients had trigeminal or facial dysfunction.

Conclusions: Frontal skull reconstruction with 3-D titanium mesh results in excellent forehead contour and cosmesis and subsequently a better quality of life with few complications. For patients with bifrontal skull defects, the use of one-piece implants in a single operation provides numerous advantages over conventional staged surgeries. This application is particularly beneficial for elderly patients and those requiring bifrontal cranioplasties.

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