

Hydroxyapatite Cranioplasty: Retrospective Analysis of Osteointegration

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Introduction

Cranial reconstruction with autologous bone is still the gold standard although several biomaterials are available to re-establish the integrity of the cranial vault. Due to their biological and morphological characteristics, hydroxyapatite implants show promising results in animal tests and also in small clinical cohort studies. Its biocompatibility and osteoconductivity should allow the formation of osseous bridging at the skull-prosthesis interface. We examined if these claims are reproducible in our patient group and tried to quantify the degree of osteointegration.

Methods

A retrospective study of patients with a hydroxyapatite cranial reconstruction from 2010 to 2014 at our neurosurgical department was conducted. Demographic, surgical and radiological data were studied. Patients were invited for follow-up CT imaging at the time of the study. Osteointegration was defined as the disappearance of the radiolucent lining at the bone-prosthesis interface. A senior neuroradiologist, a staff member neurosurgeon, and a resident neurosurgeon independently performed the radiological evaluation. A new software analysis technique was developed to objectively quantify the degree of osteointegration.

Results

17 implants were evaluated. Average patient age was 39 years. Indications for cranioplasty were: trauma (5), tumour (2), congenital defect (1), autograft infection (3) or resorption (6). Osseous bridging was deemed higher than 50% in six prostheses and in half of them it was judged higher than 75%. In five patients no osteointegration could be seen. The remaining patients exhibited sparse signs of osteointegration, estimated about 10-50%. Software analysis showed an average osteointegration ratio in our patient group of 37,4% with a 400HU filter and 27,3% with a 700HU filter. Mean follow up was 155 weeks.

Conclusions

Hydroxyapatite cranioplasty can lead to osteointegration. In this small retrospective study, osteointegration of more than 50% of the fusion surface occurred in 1/3 of the patients. Software analysis of osteointegration presents an added value for evaluation of osteointegration.

Learning Objectives

By the conclusion of this session, participants should be able to: 1/ describe the importance of choice of material for cranioplasty; 2/ discuss, in small groups, the possible/probable added value of hydroxyapatite; 3/ Identify the optimal artificial cranioplasty material in order to choose the most appropriate material for one specific patient.