Outcomes in Reconstruction of Composite Scalp and Calvarial Defects – Revisiting the Role of Alloplastic Cranioplasty in High Risk Patients

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INTRODUCTION: Advances in cranioplasty have enabled repair of increasingly complex defects.[1-4] This led to widespread use of alloplastic materials in high-risk patients, including those with previous history of osteomyelitis, radiation, frontal sinus involvement, and soft–tissue deficits. The long-term outcomes of these reconstructions have been largely understudied. The aim of this study was to evaluate the natural history of cranioplasty in high-risk patients with soft-tissue defects requiring flap coverage.

MATERIALS AND METHODS: A retrospective review of patients treated with 466 cranioplasties between 2002 and 2014 was performed.

RESULTS: Materials used for reconstructions included non-titanium alloplastic cranioplasty in 52% (n=243), titanium mesh in 38% (n=177), and autologous bone in 10% (n=46). Mean cranial defect size was 59±60cm^2. Sixteen percent (n=74) of the reconstructions included full-thickness scalp defect with a mean area of 22±74cm^2. Mean follow-up was 3.9±3.0 years. Cumulative revision rate was 22% (n=104) and the cumulative reconstructive failure rate (defined as removal of the cranioplasty) was 13% (n=60). When soft-tissue reconstruction was needed, 2-year failure rate for autologous bone was 14%, for non-titanium alloplastic cranioplasty 29%, and for titanium mesh 39%. At the end of follow-up, failure rate remained stable for autologous bone – 14%, and for non-titanium alloplastic cranioplasty – 37% ($p>0.05$). The failure rate for titanium mesh continued to increase over time to 53% ($p<0.05$).

CONCLUSION: Simultaneous scalp and calvarial reconstruction is associated with significantly worse outcomes than calvarial reconstruction alone. Composite reconstruction with a locoregional flap and alloplastic cranioplasty, in particular titanium mesh, is associated with surprisingly high failure rate of over 50% and should be either discouraged, or used as a temporary treatment until more permanent coverage option is available. We advocate the use of autogenous tissues in these scenarios to achieve more durable repairs. If this is not an option and alloplastic material needs to be utilized, scalp reconstruction with a free tissue transfer should be done early as it yields better results than a locoregional flap.

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