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Case Report

Titanium hardware extrusion following pediatric cranioplasty

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A B S T R A C T

Aging pediatric cranioplasty patients with titanium implants are a population at risk for scalp breakdown and implant extrusion. Complications from titanium use in adult cranioplasty patients are well documented in the medical literature. Reports of complications focused on pediatric populations are sparse. In this case series, we report two examples of negative sequelae associated with titanium utilization in infant cranioplasty and discuss our treatment strategy for each case.

1. Introduction

Cranioplasty is the surgical re-contouring of the cranium. Indications for cranioplasty include congenital defects and traumatic injury. Autologous bone is the preferred medium for the reconstruction of large calvarial defects; alternatively, biomaterials are an option [1]. Patient age, limited donor site availability, defect size, history of bone graft resorption and/or site infection influence whether autologous bone or biomaterials are used [1]. When biomaterials are elected, titanium is a frequently used alloplastic material in adult cranioplasty [1–3].

Complications from titanium use in adult patients undergoing cranioplasty are well documented in the medical literature, the most severe of which necessitate explantation of hardware [4–6]. While the literature on the long-term outcomes in the pediatric population is sparse; authors do suggest that titanium is safe for use in pediatric and infant cranioplasty [7]. In this series, we report two cases of negative sequelae associated with titanium-based cranioplasty performed in infancy. Treatment strategies for each case are described. Each case presented with device extrusion necessitating hardware explantation.

2. Cases

2.1. Case 1

Patient 1 is a five-year-old male who presented with complaints of headaches and tenderness over several areas of the skull. Past history was significant for bilateral coronal craniosynostosis and anterior cranial vault remodeling in infancy. Postoperatively, the patient developed a wound infection that resulted in loss of the bone flap, which gave rise to a large right frontoparietal skull defect. This defect was covered with titanium mesh.

On examination, the hardware was palpable beneath the sites of reported tenderness. Computed tomography (CT) of the head revealed titanium mesh (Fig. 1) with very thin scalp over its margins consistent with those areas of tenderness clinically. As he demonstrated no diploe on CT, a split calvarial graft was not an option for reconstruction. It was therefore decided to use a patient specific polyether ether ketone (PEEK) implant to obtain skull continuity after explantation of the titanium mesh. Via the previous bicoronal incision, the titanium hardware was explanted (Fig. 2) and the defect was filled with the custom PEEK implant (Fig. 3). He recovered without incident. He is two years post procedure and has since done well with resolution of headaches and scalp tenderness.

2.2. Case 2

Patient 2 is a 23-year-old male with a past medical history significant for hypothalamic pilocytic astrocytoma diagnosed at age 15. The tumor was initially excised via a frontal craniotomy. He recovered but suffered significant neurologic impairment post-procedure. His postoperative course was complicated by frontal bone loss with a resultant anterior calvarial defect that was covered by titanium mesh. He received a six-week regimen of radiotherapy, resulting in remission. At age 17, the tumor recurred, and aggressive chemotherapy was initiated. Imaging revealed cavitation and cyst formation within the mass, and he

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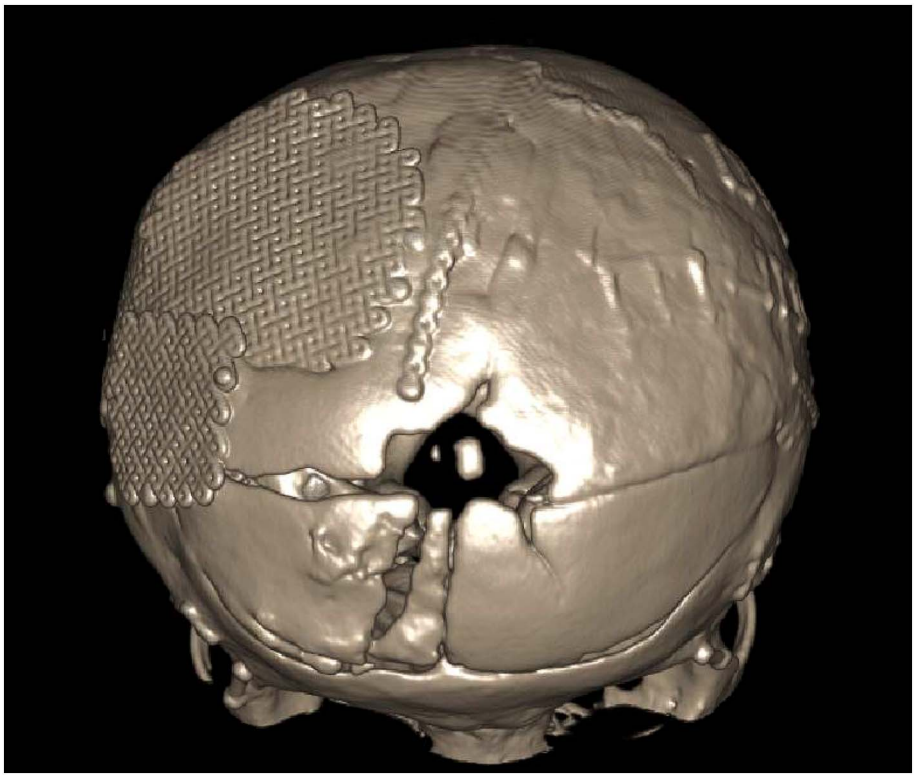

Fig. 1. Patient 1–3 dimensional CT scan reconstruction demonstrating titanium implant coverage.

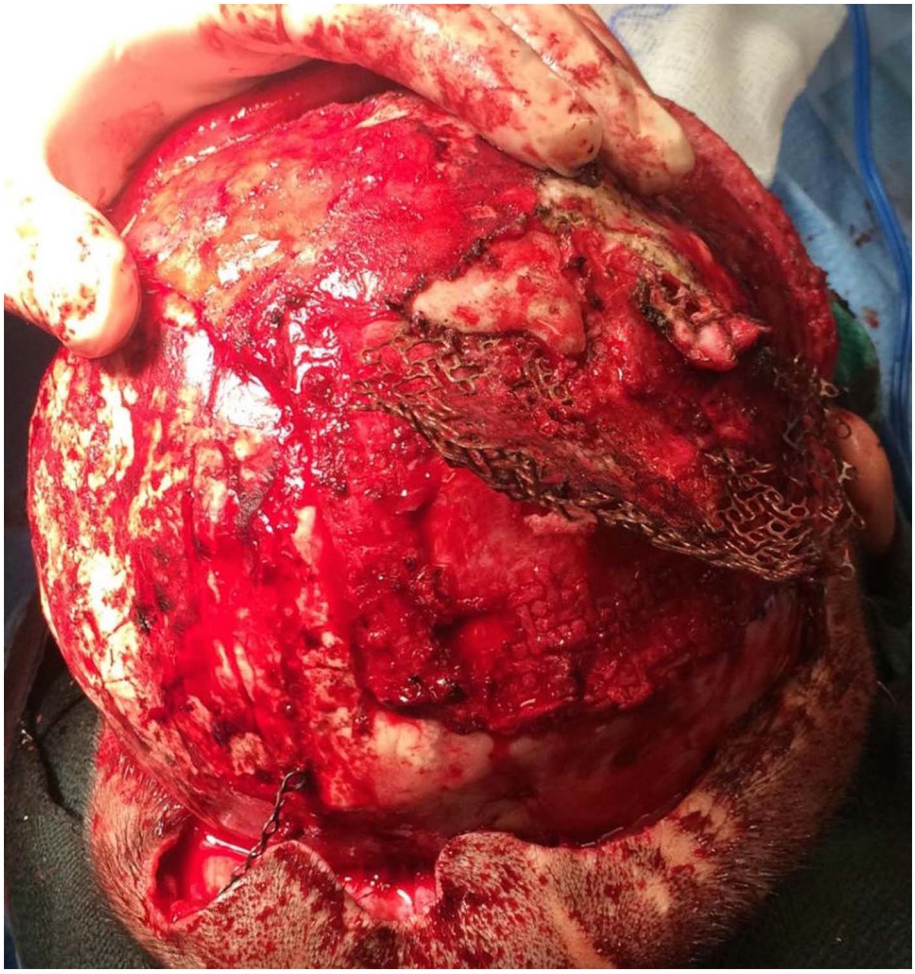

Fig. 2. Patient 1- Right frontoparietal skull defect covered with layers of titanium mesh.