

Aseptic bone resorption following cranioplasty: A systematic review of overall incidence and risk factors

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INTRODUCTION

Delayed cranioplasty after decompressive craniectomy is a common neurosurgical procedure. The most frequent complications of autologous bone grafts are infection, which has been well-reviewed in the literature, and aseptic bone resorption. The purpose of this study was to perform a systematic review of the literature identifying incidence and risk factors for bone resorption in cranioplasty.

METHODS

A systematic PubMed search adherent to PRISMA guidelines was searched for relevant articles reporting delayed autologous cranioplasty following decompressive craniectomy in humans with at minimum 3 month follow-up between 2005-2015. Demographic, clinical and follow-up data were abstracted. Where possible, data was pooled using a fixed-effects model.

RESULTS

Twenty-five of 98 articles were eligible for study inclusion with a total of 2062 patients [1-25]. The overall incidence of resorption was 14.9% (range 3-60%, n=307/2062), ranging from asymptomatic cortical thinning to focal or global resorption requiring reoperation. Risk factors included in this report are patient age and storage of bone flap (frozen or subcutaneous).

Age was a significant risk factor for resorption in many studies looking at all ages [1,2,3,4]. In studies including only pediatric cases, the combined resorption incidence was 50% (n=55/111) [5,6,7,8]. Odds ratios for pediatric versus adult resorption ranged from 3.32 in one study to 11.99 (p=0.00004) in a pooled calculation from two other studies [3,1,2].

Cryopreservation of bone flaps was also associated with thinner cortical width and overall higher rate of resorption compared to abdominal storage, although the rates were not directly comparable [9,10,11].

CONCLUSIONS

The overall incidence of aseptic resorption after delayed autologous bone cranioplasty was 14.9%, with younger age and cryopreserved bone as risk factors. Cranioplasty material and preservation technique may need to be individualized for age. Prospective studies are needed.

LEARNING OBJECTIVES

By the conclusion of this study, readers should (1) be aware of the overall incidence of resorption and (2) consider synthetic bone replacements in pediatric patients.

KEYWORDS

- cranioplasty
- craniectomy
- bone resorption
- pediatrics

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How will your research improve patient care?

This study calls attention to the growing body of evidence that for cranioplasty in children one should consider using synthetic materials instead of autologous bone graft. Further, given the established shift in practice from subcutaneous storage to cryopreservation, this study raises the possibility that we should continue exploring approaches to improve the viability of bone graft during preservation.