Reconstructive Approach to Hostile Cranioplasty: The University of Chicago Experience

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Abstract

Introduction: Reconstructive solutions to cranial defects complicated by hostile sites (prior radiation, failed cranioplasty, or scalp, cranium or CSF infection) are essential to improve cerebral hemodynamics, metabolism and minimize neurological and psychological sequelae secondary to exposure.[1,2] This study compares autologous non-vascularized reconstruction with vascularized approaches to cranioplasty at hostile sites performed at our institution between 2003-2012. An approach to decision-making for reconstructing hostile cranial defects is also presented.

Methods: This was an IRB approved retrospective chart review. Patients were segregated into three groups: 1) vascularized bone/free flap reconstructions (vascular group, n=14), 2) non-vascularized bone reconstructions (non-vascular group, n=13), and 3) non-vascularized bone/free-flap reconstructions (mixed group, n=8). Information was gathered on demographics (age, gender, reconstruction type, reconstruction size, co-morbidities, pre-operative infection, open wound, radiation), and outcomes (surgical/medical complications, reconstructive failures). Comparisons were performed using ANOVA and Fisher exact tests with $p<0.05$ considered significant.

Results: The vascular and mixed groups were more likely to be older ($p=0.01$), have greater history of open wound ($p<0.001$), and multiple failed cranioplasties ($p=0.003$) than the non-vascular group. The vascular and mixed groups had longer average hospital stays ($p=0.0002$) and more complications post-reconstruction ($p=0.01$) than the non-vascular group. The total flap failure rate was low, at 1, 1 and 0 respectively (p=NS).

Conclusions: The three groups showed comparable rates of total flap failure, reoperation and successful achievement of cranial coverage post-reconstruction. This suggests that surgeons selected appropriate repair approaches for the individual patients. We created the CRAnial Severity Score for Hostility (CRASSH) to assess operative site hostility by considering age, infection, defect size, tobacco use, pre-operative open wound, history of radiation, failed cranioplasty and/or CSF leak. We found a significant difference for high or low CRASSH in complication rate ($p=0.01$), surgical complication rate ($p=0.04$), a high correlation between high score and complication (0.46) and high score and surgical complication (0.54). Those with a high CRASSH were 7.8 times more likely to have complications (95% CI 1.56-38.8) and 12.8 times more likely to have surgical complications (95% CI 2.15-76.4), suggesting the need for more aggressive reconstructive approaches to maximally achieve long-term flap success.

References

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