Cranioplasty Complications and Costs: A National Population-Level Analysis Using the MarketScan Longitudinal Database

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Introduction

Cranial reconstruction with cranioplasty is commonly performed. Current studies on cranioplasty outcomes are mostly limited to small, single-institution analyses. We sought to characterize cranioplasty outcomes at a population level using a longitudinal national claims database.

Methods

We identified patients who underwent cranioplasty between 2010 and 2012 in the MarketScan national database by Current Procedural Terminology coding. We analyzed the impact of age, autograft usage, and cranioplasty size on postoperative complications, mortality, and 30-day readmission rates. We further characterized the cost of care associated with cranioplasty.

Results

We identified 2,447 cranioplasty patients (mean age 43.6 ± 20.4 years, 47.7% male) consisting of 14.5% (N=355) children under 18 years, 74.9% (N=1,832) nonelderly adults between 18 and 64 years, and 10.6% (N=260) elderly adults age 65 years and over. The top indications for cranioplasty varied among the three age groups. We found an overall complication rate of 37.2%, mortality rate of 0.5%, and a 30-day readmission rate of 13.0%. Compared to pediatric and nonelderly adult patients, elderly adult patients showed a significantly higher rate of overall complications and mortality risk ($p<0.0001$ and $p=0.0001$, respectively). We found that large cranioplasties (greater than 5 cm) conferred a higher risk of overall complications than small cranioplasties (up to 5 cm, $p=0.04$). Cranioplasty size had no effect on mortality risk or 30-day readmissions. Regarding infection risk, only cranioplasty size influenced the rate of postoperative infections, with large cranioplasties having the higher risk ($p<0.0001$). Autograft usage did not significantly alter complication risk, mortality risk, or 30-day readmission rates. The total costs of care associated with cranioplasty were mainly driven by hospital payments, with physician payments comprising only a small amount.

Conclusions

We found a high complication rate associated with cranioplasty procedures in the United States. A stratification of our cohort by age, autograft usage, and size of the cranioplasty showed that elderly age and a larger cranioplasty size significantly increased overall complication risk. Autograft usage during the procedure did not affect outcomes after cranioplasty. The use of a longitudinal national database has allowed us valuable insight into the patient- and surgery-specific factors associated with cranioplasty outcomes.

Learning Objectives

A high complication rate is associated with cranioplasty procedures in the United States.

Elderly age significantly increased overall complication risk after cranioplasty compared to pediatric and nonelderly adult patients.

A larger cranioplasty size (>5 cm) significantly increased overall complication risk.

Autograft usage during cranioplasty did not affect outcomes.

The total costs of care associated with cranioplasty were mainly driven by hospital payments, with physician payments comprising only a small amount.

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