Risk Factors for Reoperation in Patients Undergoing Craniotomy

Ian A DeAndrea-Lazarus BA; Keaton Piper; Hanna Algattas; Kristopher T. Kimmell MD; Howard J. Silberstein MD, FACS; Yan Michael Li MD, PhD; Kevin A. Walter MD; Edward Vates MD PhD
Department of Neurosurgery, University of Rochester Medical Center

Introduction

Unplanned reoperation after craniotomy is a trackable adverse event that may be avoidable by identifying associated risk factors.

Learning Objectives

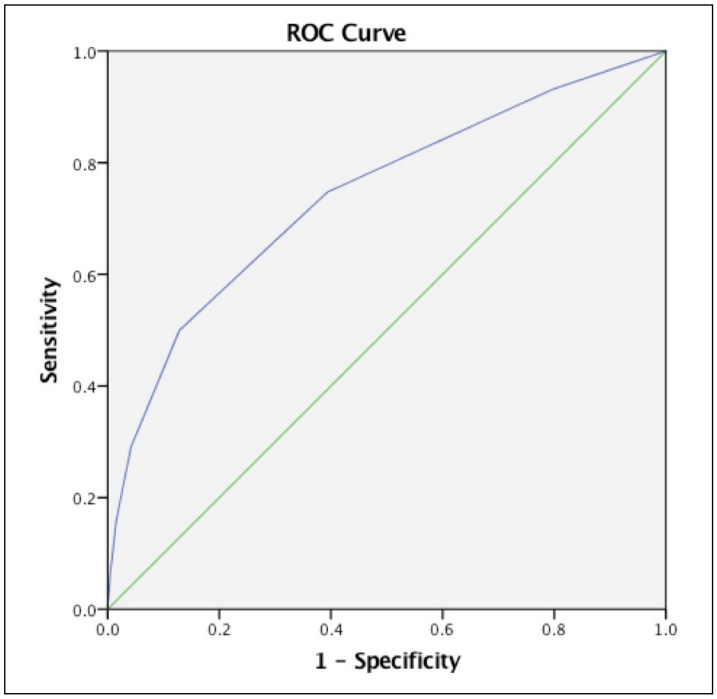
1. Understand the factors associated with reoperation in craniotomy patients.
2. Develop a risk scoring system using identified factors associated with an increased risk of reoperation in craniotomy patients.
3. Establish the effectiveness of the reoperation risk score model in craniotomy patients using previously analyzed data.

Methods

The rate of reoperation in craniotomy patients between 2012 and 2014 was calculated using the American College of Surgeons National Surgical Quality Improvement Project (ACS-NSQIP) database. Reoperation was defined as the unplanned return to the operating room within 30 days of the original craniotomy. Craniotomy patients were identified in ACS-NSQIP using Current Procedural Terminology (CPT) codes. Associated clinical factors were identified by multivariate logistic regression using SPSS 23.0.

Results

The ACS-NSQIP database identified 34,321 patients who underwent craniotomy between 2012 and 2014.



The rate of reoperation was 5.1%. Several factors were found to be significant after multivariate analysis. Preoperative factors included male gender, bleeding disorders, and an estimated probability of morbidity greater than 10%. Intraoperative and postoperative factors included an acute myocardial infarction, cerebrovascular accident or stroke, wound dehiscence, failure to wean from ventilator, total operative time more than 3 hours, bleeding requiring transfusion, DVT/thrombophlebitis, sepsis, unplanned intubation, superficial surgical site infection, length of stay > 30 days, urinary tract infection, and dirty/infected wound. A risk score was assigned to patients by identifying the presence of these factors.

Risk score	n	Reoperation	%
0	6740	120	1.78
1	13417	321	2.39
2	9023	431	4.78
3	3190	365	11.44
4	1095	233	21.28
5	483	156	32.30
6-10	283	117	41.34
TOTAL	**34231**	**1743**	**5.09**

A risk score > 5 conferred more than 20 times risk of reoperation compared to those with a risk score of 0. ROC curve demonstrated the risk score to be predictive of risk of reoperation in craniotomy patients (0.741, 95% CI = 0.728, 0.755).

Conclusions

The risk of reoperation after craniotomy is informed by demographics, preoperative conditions, and intraoperative/postoperative events. The effect of multiple risk factors is additive. Many risk factors are identifiable and modifiable. Surgical decision-making should be informed by these risks in order to reduce further patient complications and decrease healthcare costs.