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Identifying Factors Contributing to Decompressive Hemicraniectomy for Traumatic Intracranial Hemorrhage

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Introduction

- Approximately 1.7 million people experience traumatic brain injury in the United States every year [1]. Within this population of 1.7 million people, traumatic brain injury results in 1.4 million emergency department visits, 275,000 hospitalizations, and 53,000 deaths [2].
- Severe intracranial hemorrhage is often treated surgically with decompressive hemicraniectomy to relieve increased intracranial pressure and prevent fatal herniation.
- Early identification of patients who are most likely to require extreme surgical intervention would help in determining which patients require early intervention.

Methods

- 2183 patients with acute traumatic intracranial hemorrhage were identified through our institution's trauma registry between 2005 and 2013.
- Performance of decompressive hemicraniectomy was was used as a dependent variable in a logistic regression to evaluate what factors might identify patients requiring surgical intervention.
- Independent variables that were controlled for included sex, age, systolic blood pressure, international normalized ratio, blood alcohol level, absolute platelet count, anticoagulation status, anti-platelet status, Glasgow Coma Scale (GCS), and Injury Severity Score (ISS).
- All possible logistic regressions were run and assigned Akaike Information Criterion scores. The logistic regression with the lowest corrected Akaike Information Criterion was selected.

Results

- Sex, international normalized ratio, blood alcohol level, and anti-platelet status, and absolute platelet count were excluded from the best model.
- Age and GCS were found to have significant positive associations with performance of craniectomy.
- Systolic blood pressure and ISS were found to have significant negative associations with performance of craniectomy.
- Anticoagulation status was found to have a negative association with performance of craniectomy that was not statistically significant.

Best prediction model by AIC

parameter	OR	95% CI	*p*-value
Sex[†]	0	-	-
Age (years)	1.013	[1.006, 1.0196]	4.316e-04
SBP (mmHg)	0.9922	[0.9868, 0.9977]	0.0057
APC (10^3/μL)	0	-	-
BAL (mg/dL)	0	-	-
INR	0	-	-
Anticoagulant use	0.6661	[0.4195, 1.058]	0.0851
Antiplatelet use	0	-	-
GCS (3-15)	1.066	[1.031, 1.103]	1.712e-04
ISS (0-75)	0.9611	[0.9466, 0.9758]	2.918e-07

[†]Male = 1.
AIC = Akaike Information Criterion, APC = absolute platelet count, BAL = blood alcohol level, CI = confidence interval, GCS = Glasgow Coma Scale, INR = international normalized ratio, ISS = Injury Severity Score, SBP = systolic blood pressure

Discussion

- This study provides evidence as to which factors have significant associations with future performance of decompressive hemicraniectomy. These factors can assist in identification of patients who might require surgery, allowing for early intervention.
- There is a dearth of literature attempting to predict which patients with require craniectomy after traumatic brain injury, though there has been some effort to predict outcomes in patients receiving decompressive craniectomy [3].
- Craniectomy has been established as an effective treatment for reducing mortality by reducing intracranial pressure in patients who have suffered traumatic brain injury [4]. However, several authors have asserted that craniectomy, while reducing mortality, may result in increasing numbers of survivors with severe disability [5].

References

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