

POSTER PRESENTATION

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A novel prognostic marker in severe traumatic brain injury patients: pBtO₂/paO₂ ratio

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Introduction

Traumatic brain injury (TBI) is a common cause of morbidity and mortality worldwide. Neuromonitoring has evolved considerably in recent years in TBI patients. Utilization of brain tissue oxygenation (pBtO₂) is an important variable in the treatment of traumatic brain injury.

Objectives

The main goal is to examine whether clinical scales (Glasgow Coma Scale (GCS), Injury Severity Score (ISS), radiographic scales based on admission computed tomography (Marshall), pBtO₂ and pBtO₂/paO₂ ratio are associated with clinical outcome after severe TBI.

Methods

This is a prospective observational study with institutional review board approval. Patients TBI and a Glasgow Coma Scale score ≤ 8 were identified on admission. Glasgow Coma Scale (GCS), Injury Severity Score (ISS), radiographic scales based on admission computed tomography (Marshall), IntraCranial Pressure (ICP), pBtO₂ and pBtO₂/paO₂ during first 24 hours were recorded. Patient outcome was determined as favorable (patient had no, little, or moderate disability) or unfavorable (patient died, was in a vegetative state or had severe disability) using the Glasgow Outcome Scale by medical record review at 6 months after TBI. We considered an ordinal analysis with proportional odds methodology. A logistic regression model was used to calculate the 95% CI for the odds of unfavorable outcome.

Results

Over a 3-year period, 32 patients were entered into the study. The mean age was 37 ± 17.4 years, injury severity

score was 27.7 ± 10.7 , and Glasgow Coma Scale score was 5.2 ± 3.4 . At 6 months, 7 (21.8%) patients had died, and 20 (59.3%) had a favorable outcome. Favorable outcome consistently demonstrated higher pBtO₂/paO₂ ratio compared with nonsurvivors including age as a covariate ($p < 0.001$). Factors associated with unfavorable outcome (univariate analysis): ISS > 50 (OR 1.47, CI 1.22-1.68), Marshall ≥ 3 (OR 1.88, CI 1.44-2.20), ICP > 20 (OR 2.88, CI 2.52-3.24), GCS < 5 (OR 2.11, CI 1.94-2.30), PtiO₂ < 20 (OR 2.16, CI 2.05-2.27) and pBtO₂/paO₂ ratio < 0.2 (OR 3.88, CI 3.48-4.27).

Conclusions

The first 24 hours of pBtO₂/paO₂ ratio < 0.2 predicts mortality and outcome. When pBtO₂/paO₂ ratio remains below 0.2 in the first 24 hours of monitoring, mortality and unfavorable outcome is increased. This study challenges the brain oxygenation threshold of 20 mm Hg that has been used conventionally and delineates a time for monitoring pBtO₂/paO₂ ratio that is predictive of outcome.

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