

Application of the CRASH Score When Using Intracranial Multimodality Monitoring

Syed O Shah MD, MBA; Artin Minaeian; Michael F. Stiefel MD PhD

Yin Hu MD; Corrado Marini MD Westchester Medical Center - Neuroscience Center

New York Medical College



Introduction

There have been several new advances in the treatment of traumatic brain injury (TBI) in recent years, including the use of intracranial multimodality monitoring. Our patients are treated with a 5-day protocol that includeds maintenance of normothermia with dry water immersion, brain O2 (PbO2) = 20 mm Hg, ICP = 20 mm Hg, cerebral perfusion pressure (CPP) = 60 mm Hg to keep tissue oxygensaturation (bi-frontal Near-Infrared Spectroscopy) = 60%, burst suppression as needed, nutritional support targeted to a Respiratory Quotient (RQ) of 0.83 by day 3, osmotherapy (OsmRx) and decompressive craniectomy (DC) when indicated. Currently, the use of the Predicting Outcome After Traumatic Brain Injury score (CRASH) has been used to obtain predictions of relevant outcomes in patients with TBI. The goal of this study is determine if the use of intracranial multimodality monitoring within TBI patients will reduce their predicted mortality.

Methods

A retrospective analysis of 33 patients with severe TBI that received intracranial multimodality monitoring from 2011-2012 were included in this study. Analysis of the charts were performed to determine the patients age, Glasgow coma scale, pupil reactivity, and the presence of major extracranial injury. The official report of the patient's computed tomography (CT) scans were also reviewed to determine the presence of petechial hemorrhages, obliteration of the third ventricle or basal cisterns, subarachnoid bleeding, midline shift and the presence of a nonevacuated hematoma.

Results

Using the CRASH predictive model, the 14-day predicted mortality was 55% (18/33) (ranging from 8% to 98%). With aggressive, goal directed therapy, the 14-day mortality at our institution was reduced to 33.3% (11/33) yielding a 39% reduction in mortality. The decrease in mortality ranged from 11.6% to 69.7%. 2 of 33 patients failed OsmRx requiring DC. In a subgroup analysis including only patients with a predicted mortality of 75% or greater (n = 10), our predicted mortality was 93%. Multimodality therapy reduced mortality to 60%.

Predicted Mortality	Number	Mean Percentile	Actual Mortality	Decrease
0-20	7	12.9 ± 4.5	0/7 (0%)	NA
21-50	8	40.4 ± 9.2	1/8 (12.5%)	69.7%
51-79	9	62.8 ± 6.7	5/9 (55.5%)	11.6%
80-100	9	92.2 ± 6.0	5/9 (55.5%)	39.8 %

Conclusions

Although there continues to be no consensus regarding the use of intracranial multimodality monitoring in TBI patients, our patients demonstrated a clear benefit in the reduction of 14-day mortality risk when applying the CRASH predictive model. Although there was no statistical significance in this limited study, there was a clear trend for benefit. Given these results, a propesctive trial of multimodality monitoring therapy in TBI patients is warranted.

Learning Objectives

By the end of this session, participants will understand that the advances provided by intracranial multimodality monitoring, along with strong neurocritical care practices allows for a reduction in predicted mortality.