JNS

CLINICAL ARTICLE

Impact of Glasgow Coma Scale score and pupil parameters on mortality rate and outcome in pediatric and adult severe traumatic brain injury: a retrospective, multicenter cohort study

***Pedram Emami, MD,[1] Patrick Czorlich, MD,[1] Friederike S. Fritzsche, MD,[1] Manfred Westphal, MD,[1] Johannes M. Rueger, MD,[2] Rolf Lefering, PhD,[3] and Michael Hoffmann, MD[2]**

Departments of [1]Neurosurgery and [2]Trauma, Hand, and Reconstructive Surgery, University Medical Center Hamburg-Eppendorf, Hamburg; and [3]Institute for Research in Operative Medicine, Witten/Herdecke University, Cologne, Germany

OBJECTIVE Prediction of death and functional outcome is essential for determining treatment strategies and allocation of resources for patients with severe traumatic brain injury (TBI). The aim of this study was to evaluate, by using pupillary status and Glasgow Coma Scale (GCS) score, if patients with severe TBI who are ≤ 15 years old have a lower mortality rate and better outcome than adults with severe TBI.

METHODS A retrospective cohort analysis of patients suffering from severe TBI registered in the Trauma Registry of the German Society for Trauma Surgery between 2002 and 2013 was undertaken. Severe TBI was defined as an Abbreviated Injury Scale of the head (AIS_{head}) score of ≥ 3 and an AIS score for any other part of the body that does not exceed the AIS_{head} score. Only patients with complete data (GCS score, age, and pupil parameters) were included. To assess the impact of GCS score and pupil parameters, the authors also used the recently introduced Eppendorf-Cologne Scale and divided the study population into 2 groups: children (0–15 years old) and adults (16–55 years old). Each patient's outcome was measured at discharge from the trauma center by using the Glasgow Outcome Scale.

RESULTS A total of 9959 patients fulfilled the study inclusion criteria; 888 (8.9%) patients were ≤ 15 years old (median 10 years). The overall mortality rate and the mortality rate for patients with a GCS of 3 and bilaterally fixed and dilated pupils (19.9% and 16.3%, respectively) were higher for the adults than for the pediatric patients (85% vs 80.9%, respectively), although cardiopulmonary resuscitation rates were significantly higher in the pediatric patients (5.6% vs 8.8%, respectively). In the multivariate logistic regression analysis, no motor response (OR 3.490, 95% CI 2.240–5.435) and fixed pupils (OR 4.197, 95% CI 3.271–5.386) and bilateral dilated pupils (OR 2.848, 95% CI 2.282–3.556) were associated with a higher mortality rate. Patients ≤ 15 years old had a statistically lower mortality rate (OR 0.536, 95% CI 0.421–0.814; p = 0.001). The rate of good functional outcomes (Glasgow Outcome Scale Score 4 or 5) was higher in pediatric patients than in the adults (72.2% vs 63.1%, respectively).

CONCLUSIONS This study found that severe TBI in children aged ≤ 15 years is associated with a lower mortality rate and superior functional outcome than in adults. Also, children admitted with a missing motor response or fixed and bilaterally dilated pupils also have a lower mortality rate and higher functional outcome than adults with the same initial presentation. Therefore, patients suffering from severe TBI, especially pediatric patients, could benefit from early and aggressive treatment.

http://thejns.org/doi/abs/10.3171/2016.1.JNS152385

KEY WORDS traumatic brain injury; mortality; outcome; pediatrics

ABBREVIATIONS AIS = Abbreviated Injury Scale; CPR = cardiopulmonary resuscitation; ECS = Eppendorf-Cologne Scale; GCS = Glasgow Coma Scale; GOS = Glasgow Outcome Scale; ICU = intensive care unit; ISS = Injury Severity Score; RISC II = Revised Injury Severity Classification II; TBI = traumatic brain injury; TR-DGU = TraumaRegister DGU of the German Trauma Society.

SUBMITTED October 15, 2015. **ACCEPTED** January 14, 2016.

INCLUDE WHEN CITING Published online April 1, 2016; DOI: 10.3171/2016.1.JNS152385.

* Drs. Emami and Czorlich contributed equally to this work.