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Acute Kidney Injury in Traumatic Brain Injury Patients: Results From the Collaborative European NeuroTrauma Effectiveness Research in Traumatic Brain Injury Study

Chiara Robba ¹, Erika Banzato ^{2 3}, Paola Rebori ², Carolina Iaquaniello ², Chao-Yuan Huang ⁴,
Eveline J A Wieggers ⁵, Geert Meyfroidt ⁴, Giuseppe Citerio ^{2 6},Collaborative European NeuroTrauma Effectiveness Research in Traumatic Brain Injury (CENTER-TBI)
ICU Participants and Investigators

Collaborators, Affiliations

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Abstract

Objectives: Acute kidney injury is frequent in polytrauma patients, and it is associated with increased mortality and extended hospital length of stay. However, the specific prevalence of acute kidney injury after traumatic brain injury is less recognized. The present study aims to describe the occurrence rate, risk factors, timing, and association with outcome of acute kidney injury in a large cohort of traumatic brain injury patients.

Design: The Collaborative European NeuroTrauma Effectiveness Research in Traumatic Brain Injury is a multicenter, prospective observational, longitudinal, cohort study.

Setting: Sixty-five ICUs across Europe.

Patients: For the present study, we selected 4,509 traumatic brain injury patients with an ICU length of stay greater than 72 hours and with at least two serum creatinine values during the first 7 days of ICU stay.

Measurements and main results: We classified acute kidney injury in three stages according to the Kidney Disease Improving Global Outcome criteria: acute kidney injury stage 1 equals to serum creatinine \times 1.5-1.9 times from baseline or an increase greater than or equal to 0.3 mg/dL in 48 hours; acute kidney injury stage 2 equals to serum creatinine \times 2-2.9 times baseline; acute kidney injury stage 3 equals to serum creatinine \times three times baseline or greater than or equal to 4 mg/dL or need for renal replacement therapy. Standard reporting techniques were used to report incidences. A multivariable Cox regression analysis was performed to model the cause-specific hazard of acute kidney injury and its association with the long-term outcome. We included a total of 1,262 patients. The occurrence rate of acute kidney injury during the first week was as follows: acute kidney injury stage 1 equals to 8% (n = 100), acute kidney injury stage 2 equals to 1% (n = 14), and acute kidney injury stage 3 equals to 3% (n = 36). Acute kidney injury occurred early after ICU admission, with a median of 2 days (interquartile range 1-4 d). Renal history (hazard ratio = 2.48; 95% CI, 1.39-4.43; p = 0.002), insulin-dependent diabetes (hazard ratio = 2.52; 95% CI, 1.22-5.197; p = 0.012), hypernatremia (hazard ratio = 1.88; 95% CI, 1.31-2.71; p = 0.001), and osmotic therapy administration (hazard ratio = 2.08; 95% CI, 1.45-2.99; p < 0.001) were significantly associated with the risk of developing acute kidney injury. Acute kidney injury was also associated with an increased ICU length of stay and with a higher probability of 6 months unfavorable Extended Glasgow Outcome Scale and mortality.

Conclusions: Acute kidney injury after traumatic brain injury is an early phenomenon, affecting about one in 10 patients. Its occurrence negatively impacts mortality and neurologic outcome at 6 months. Osmotic therapy use during ICU stay could be a modifiable risk factor.

Trial registration: ClinicalTrials.gov [NCT02210221](https://clinicaltrials.gov/ct2/show/study/NCT02210221).

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