Early use of hypertonic fluids does not appear to improve outcomes for severe traumatic brain injury

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Patients with a severe traumatic brain injury (and not in shock because of blood loss) who received out-of-hospital administration of hypertonic fluids (a solution with increased concentration of certain electrolytes and thought to help reduce intracranial pressure) as initial resuscitation did not experience better 6-month neurologic outcomes or survival compared to patients who received a normal saline solution, according to a study in the October 6 issue of *JAMA*.

Traumatic brain injury (TBI) is the leading cause of death following blunt trauma, and survivors often sustain severe disability. The primary injury to the brain occurs at the time of impact; however, subsequent decreased cerebral blood flow can lead to a secondary brain injury. "Current therapy following severe TBI is focused on minimizing secondary injury by supporting systemic perfusion [blood flow] and reducing intracranial pressure (ICP). Intravenous fluid resuscitation currently begins in the out-of-hospital setting; however, therapy for management of cerebral edema [swelling] is often delayed until after hospital arrival," the authors write.

Hypertonic fluids, which can restore cerebral perfusion with reduced cerebral edema, have the potential to be of benefit in resuscitation of patients with severe TBI. "Previous trials have suggested that early administration of hypertonic fluids to patients with severe TBI may improve survival, but no large definitive trials have been reported and

the effects on neurologic outcome are not known," the researchers write.

Eileen M. Bulger, M.D., of UW Medicine's Harborview Medical Center, Seattle, and colleagues conducted a study to examine whether administration of hypertonic fluids as early as possible after severe TBI in patients without hemorrhagic shock would result in improved 6-month neurologic outcomes. The randomized, placebo-controlled clinical trial involved 114 North American emergency medical services agencies within the Resuscitation Outcomes Consortium. The study was conducted between May 2006 and May 2009 among patients 15 years or older with blunt trauma and a certain prehospital Glasgow Coma Scale score (a system used to assess the degree of brain impairment) who did not meet criteria for shock from blood loss (hypovolemia). Patients received either hypertonic saline/dextran (a water-soluble polymer of glucose), hypertonic saline, or normal saline, initiated in the out-of-hospital setting. After six months, neurologic outcome was measured with the Extended Glasgow Outcome Scale (GOSE; a scale that assesses the outcome of serious brain injuries).

There were no significant differences in characteristics of the patients at the beginning of the study, injury severity scores, and out-of-hospital care provided between treatment groups. Of the patients in the study, complete 6-month neurologic outcome data were available for 1,087 of 1,282 treated patients (85 percent). The researchers found that there was no difference in 6-month neurologic outcome among groups with regard to proportions of patients with severe TBI (GOSE score of 4 or less: severe disability, vegetative state, or death): hypertonic saline/dextran vs. normal saline: 53.7 percent vs. 51.5 percent; hypertonic saline vs. normal saline: 54.3 percent vs. 51.5 percent. "There were no statistically significant differences in distribution of GOSE category or Disability Rating Score by treatment group. Survival at 28 days was 74.3 percent with hypertonic saline/dextran, 75.7 percent with hypertonic saline, and 75.1 percent with normal saline," the authors write.

"In summary, in this randomized controlled trial, we were unable to demonstrate any improvement in 6-month neurologic outcome or survival for trauma patients with presumed severe TBI without evidence of hypovolemic shock, who received a single bolus [large dose] of hypertonic fluids compared with normal saline in the out-of-hospital setting. While this does not preclude a benefit from such treatment were it administered differently, at present there appears to be no compelling reason to adopt a practice of hypertonic fluid resuscitation for TBI in the out-of-hospital setting."

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