Brain Edema After Head Trauma Tied to Poor Outcomes

A new analysis indicates edema itself may be significant enough to warrant aggressive treatment.

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WASHINGTON — The development of brain edema after traumatic brain injury was significantly associated with increased mortality in a small retrospective study, and the condition appears to be associated with subsequent declines in mental status and worse outcomes in the long term.

Along with other basic research and small clinical studies, the new analysis provides some evidence that edema itself may be significant enough to warrant an increased aggressiveness of treatment, said James Olson, Ph.D., after presenting the study findings at the annual meeting of the Society for Academic Emergency Medicine.

"Perhaps we should [address it] before mental status starts to deteriorate, or before pressure becomes so significant as to inhibit perfusion," noted Dr. Olson, professor of emergency medicine at Wright State University in Dayton, Ohio.

Dr. Olson and his associates examined data collected in a trauma registry at Miami Valley Hospital, a community hospital in Dayton with a level I trauma center.

They identified 107 patients over a 2-year period who presented to the emergency department with severe head trauma. The researchers then compared patients who had a decrease in their Glasgow Coma Score (the designated "study group") during their hospital stays with patients whose GCS was stable or increased during their stays (the "control group").

Patients were included in the comparison if they had a GCS score between 4 and 14 from the time of presentation until 6 hours after the injury, and were excluded if they had an initial GCS score of 3. (Patients with such a low score are often intubated or sedated, and are difficult to assess.)

Of the 42 patients who were included in the analysis, the 14 patients whose GCS scores decreased were approximately two times as likely to have shown evidence of edema on an initial CT scan of the head (a midline shift or effacement of the basal cistern) than were the 28 patients whose GCS score increased or did not change.

Evidence of a midline shift was recorded in 57% of the study group, compared with 25% of the control group. Effacement of the basal cistern was recorded in 71%, compared with 32%. The groups had a similar prevalence, however, of subarachnoid hemorrhage.

Dr. Olson and his coinvestigators reviewed patients' status at 3, 6, and 12 months after their hospital stays. They found that traumatic brain injury patients with evidence of brain edema were 23 times as likely to die prior to discharge from the hospital, and 28 times as likely to die within 6 months of injury.

When he and his coinvestigators looked not at mortality but at various degrees of recovery—which they termed "severe disability," "moderate disability," and "good recovery"—they found that the distribution of patients among the categories did not change significantly over time for patients with or without brain edema. The low number of patients was too small to detect significant differences, Dr. Olson explained.

They did, however, see trends that suggest that patients without edema had a better chance of significant recovery than did those with edema, he said. Such trends must be verified with a larger data set—something Dr. Olson and his associates are embarking upon now—and with a prospective study, he said.

For now, it is also interesting to note that while the distribution of initial GCS and Injury Severity Scores was similar for the two study groups (those whose GCS scores decreased and those whose scores increased or were stable), there was an age effect: Patients whose GCS scores decreased tended to be 10-15 years older, meaning "a younger age is associated with better outcome following traumatic brain injury," said Dr. Olson, also a professor in Wright State's department of neuroscience, cell biology, and physiology.

Surprisingly, he noted, patients whose GCS scores decreased were also less likely to have blood in their cerebral ventricles than were patients whose scores increased (43% v. 79%).

"It doesn't completely make sense, since [the absence of blood in the ventricles] would seem to be a good thing," Dr. Olson said.

"Perhaps patients with obvious damage to the brain, with blood in the ventricles on CT scans, will already have had more aggressive treatment than if there were only edema," he suggested. ■