ICU MANAGEMENT & PRACTICE

Value of Intracranial Pressure Monitoring in TBI Questioned

Treating ICU patients with severe traumatic brain injury (TBI) using guidelines-based management that relies on monitoring intracranial pressure (ICP) is not better than delivering care based on imaging and clinical exams, University of Washington research has shown.

The results of the trial published on 12 December in the *New England Journal of Medicine* question the cornerstone of care for patients with severe TBI, finding that care focused on monitoring and maintaining ICP at or below 20 mmHg, as guidelines recommend, in order to avoid poor outcome was not superior to care based on serial computed tomography (CT) and neurologic clinical examination.

Although ICP monitoring is widely recognised as the standard of care for patients with TBI, its use in guiding therapy has "incomplete acceptance," even in high-income countries, Dr. Chesnut and his team highlight in their paper. There are a number of guidelines that acknowledge that there is inadequate evidence of the efficacy of its use and call for randomised trials, while at the same time noting that there would be ethical issues in having a control group go without ICP monitoring. The identification of a group of intensivists in Latin America who routinely managed severe TBI without using available ICP monitors and who had a balanced view of the value of ICP monitoring eliminated the ethical constraints and led to the current trial now reported, they say.

A total of 324 patients with severe TBI treated in intensive care units (ICUs) in Bolivia or Ecuador were randomly assigned to management based on ICP monitoring or management based on serial CT imaging and clinical examination (ICE). Researchers chose intraparenchymal monitoring because of its accuracy, ease of insertion, safety profile, and low maintenance requirements.

The primary outcome was a composite of survival time, impaired consciousness, and functional status at three and six months and neuropsychological status at six months. This composite measure was based on performance across 21 measures of functional and cognitive status and was calculated as a percentile (with 0 indicating the worst and 100 the best performance).

According to the investigators, there was no significant between-group difference in the primary outcome, with a score of 56 in the ICP group and 53 in the ICE group (P=.49).

Mortality at six months was also similar: 39% in the ICP group and 41% in the ICE group (P=.60).

The median length of ICU stay was also similar in the two groups (P=.25), although the number of days of brain-specific treatments administered in the ICU (hyperosmolar fluids and hyperventilation) was lower in the ICP group than in the ICE group (3.4 versus 4.8; P=.002). The distribution of serious adverse events was similar in both groups.

These results, the investigators say, "do not support the superiority" of treatment based on ICP monitoring over treatment guided by neurologic testing and serial CT imaging in improving short-term and long-term recovery in the general population of patients with severe TBI. However, they say it's possible the specific ICE protocol used in the study provided superior control of ICP.

In a linked editorial, Dr. Allan H. Ropper, Department of Neurology, Brigham and Women's Hospital, Boston, Massachusetts, notes that physiologic measurements are "inherently more

appealing than clinical signs because they give the impression of precision and of proximity to disease."

"We are still likely to continue to doubt clinical signs, which indeed do not reflect global pressure inside the cranium," he writes, "but stupor, coma, posturing, and dilatation of the pupils indicate compression of the midbrain, and according to this study they are very suitable observations to use in directing treatment."

In his editorial, Dr. Ropper says several objections to the study are "easily anticipated," such as its locale, South America, which has ICU protocols that differ from those in North America and Europe.

The use of intraparenchymal monitors may be another reservation. These monitors, unlike the external ventricular drains used in many ICUs, do not allow drainage of spinal fluid to reduce pressure. "But this technical difference is not enough to negate the conclusions of the study, since the measurements produced by each method are reasonably close," Dr. Ropper writes.

Another reservation may be the composite end point in the trial, which was "contrived," he points out. However, he highlights that the finding of similar mortality at 14 and 30 days, whether ICP was monitored or not, supports the conclusion that measurement makes little difference in terms of reducing the early damage caused by elevated ICP

In their paper, Dr. Chesnut and colleagues emphasise that the value of knowing the precise ICP is not challenged by this study, nor is the value of aggressively treating severe TBI questioned. Rather the study data suggest that a reassessment of the role of manipulating monitored ICP as part of multimodality monitoring and targeted treatment of severe TBI is in order.

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