ICU
MANAGEMENT & PRACTICE

ALERT-TBI study supports new blood test for detecting brain injury

Detection of intracranial injuries relies on head CT, which is overused and resource intensive. Blood-based brain biomarkers hold the potential to predict absence of intracranial injury and thus reduce unnecessary head CT scanning. New research results show that a serum biomarker test, which detects two brain proteins that are present in the blood soon after a hit to the head, may help in detecting traumatic intracranial injury.

Researchers conducted a large, prospective, multicentre trial, entitled A Prospective Clinical Evaluation of Biomarkers of Traumatic Brain Injury (ALERT-TBI), aiming to validate the ability of a biomarker test combining ubiquitin C-terminal hydrolase-L1 (UCH-L1) and glial fibrillary acidic protein (GFAP), at predetermined cutoff values, to predict traumatic intracranial injuries on head CT scan within 12 hours following traumatic brain injury (TBI).

The results showed that this biomarker test had a sensitivity of 97.6 percent and negative predictive value (NPV) of 99.6 percent for the detection of acute intracranial injuries on head CT scan. These findings support "its potential clinical role for ruling out the need for a CT scan among patients with TBI presenting at emergency departments in whom a head CT is felt to be clinically indicated. Future studies to determine the value added by this biomarker test to head CT clinical decision rules could be warranted," according to the study published in The Lancet Neurology.

The ALERT-TBI study included 1,959 adults (≥18 years) presenting with suspected, non-penetrating TBI and a Glasgow Coma Scale score of 9–15, to 22 emergency departments in the U.S. and Europe. Patients were eligible if they had undergone head CT as part of standard emergency care and blood collection within 12 hours of injury.

UCH-L1 and GFAP were measured in serum and analysed using prespecified cutoff values of 327 pg/mL and 22 pg/mL, respectively. UCH-L1 and GFAP assay results were combined into a single test result that was compared with head CT results. The primary study outcomes were the sensitivity and the negative predictive value (NPV) of the test result for the detection of traumatic intracranial injury on head CT.

Of 1,959 patients, 125 (6%) had CT-detected intracranial injuries and eight (<1%) had neurosurgically manageable injuries. 1,288 (66%) patients had a positive UCH-L1 and GFAP test result and 671 (34%) had a negative test result. For detection of intracranial injury, the test had a sensitivity of 0.976 (95% CI 0.931–0.995) and an NPV of 0.996 (0.987–0.999). In three (<1%) of 1,959 patients, the CT scan was positive when the test was negative.

"Because of the large sample size and the methodological rigour used to conduct this study, we believe our estimates of the diagnostic accuracy of a combined GFAP and UCH-L1 biomarker test are precise with minimal bias," the researchers explained. "This methodological rigour was balanced by integrating elements of pragmatic clinical trials, which make our results broadly generalisable."

Results from this study were used to support a request to the U.S. FDA for commercialisation of this test, which was granted on 14 February 2018. Approved for use in individuals 18 years and older, the test has the potential to reduce CT scans and the radiation exposure that comes with them. They're commonly used to evaluate brain injuries, but research shows that less than 10 percent of head CTs show any injury. Limiting scans to patients with a positive blood test could eliminate needless radiation; allow people to get in and out of the emergency room faster; and lower healthcare costs.

"Many concussion patients don't seek medical care for their injury, a decision due in part to the perception that emergency departments have nothing to offer in terms of diagnosis," said lead study author Jeffrey J. Bazarian, MD, MPH, professor of Emergency Medicine at the University of Rochester Medical Center. "The results of this study show that we now have something to offer – a brain biomarker blood test. The ability of this test to predict traumatic injuries on head CT scan will soon allow emergency physicians to provide patients with an unbiased report on the status of their brain."

Dr. Bazarian notes that UCH-L1 and GFAP are useful markers because they aren't elevated when someone gets hit outside the head, such as the shoulder or abdomen.

Source: The Lancet Neurology
Image Credit: University of Rochester Medical Center

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