MedicalXpress

Blood test predicts prognosis for traumatic brain injuries

July 30 2015

A new blood test could help emergency room doctors quickly diagnose traumatic brain injury and determine its severity. The findings, published July 10 in the *Journal of Neurotrauma*, could help identify patients who might benefit from extra therapy or experimental treatments.

"Compared to other proteins that have been measured in traumatic brain injury, BDNF does a much better job of predicting outcomes," says Frederick Korley, M.D., Ph.D., an assistant professor of emergency medicine at the Johns Hopkins University School of Medicine and first author of the new paper.

After a hit to the head or rapid whiplash, whether from a car crash, athletic event or other accident, millions of Americans develop traumatic brain injuries (TBIs) each year. TBIs can range from mild concussions—causing only a headache or temporary blurred vision—to much more severe injuries—causing seizures, confusion, memory and attention problems, muscle weakness, or coma for many months. These symptoms, whether mild or more severe, are generally caused by damaged brain cells.

Until now, most physicians have relied on CT scans and patients' symptoms to determine whether to send them home and have them resume their usual activities or take extra precautions. However, CT scans can only detect bleeding in the brain, not damage to brain cells, which can happen without bleeding.

"A typical situation is that someone comes to the emergency department with a suspected TBI, we get a CT scan, and if the scan shows no bleeding, we send the patient home," says Korley. "However, these patients go home and continue having headaches, difficulty concentrating and memory problems, and they can't figure out why they are having these symptoms after doctors told them everything was fine."

Korley and collaborators around the country wanted to know if a blood test could better predict which patients would have ongoing brain injury-related problems, to provide better treatment for them. So they measured the levels of three proteins that they suspected play a role in brain cell activity in more than 300 patients with a TBI and 150 patients without brain injuries. Then, they followed those with a TBI for the next six months.

Levels of one protein, called brain-derived neurotrophic factor (BDNF), taken within 24 hours of someone's head injury, could predict the severity of a TBI and how a patient would fare, they found. While healthy people averaged 60 nanograms per milliliter of BDNF in their bloodstreams, patients with brain injuries had less than one-third of that amount, averaging less than 20 nanograms per milliliter, and those with the most severe TBIs had even lower levels, around 4 nanograms per milliliter. Moreover, patients with high levels of BDNF had mostly recovered from their injuries six months later. But in patients with the lowest levels of BDNF, symptoms still lingered at follow-up. The results suggest that a test for BDNF levels, administered in the emergency room, could help stratify patients.

"The advantage of being able to predict prognosis early on is that you can advise patients on what to do, recommend whether they need to take time off work or school, and decide whether they need to follow up with a rehab doctor or neurologist," Korley says. In addition, it could help decide which patients to enroll in clinical trials for new drugs or

therapies targeting severe TBIs.

Korley would like to follow up with more research on why, at a molecular level, brain injuries lower levels of BDNF in the blood and whether things known to increase BDNF levels—including exercise and omega-3 fatty acids—could help treat TBIs. He also wants to know whether changes in BDNF levels over time can be a proxy for recovery and if they could be used to gauge the effectiveness of an intervention.

"We looked at that very first blood sample obtained within 24 hours of an injury," he says. "But for BDNF to be used as a surrogate outcome, we'll have to see what happens to BDNF blood levels down the line, at one, three or six months after the injury." He and his collaborators have already started collecting data for those prospective studies, he adds.

Provided by Johns Hopkins University School of Medicine