URMC leads push for new approaches to brain injury

May 5 2011

In the race to more accurately diagnose the severity of head injuries quickly and without a CT scan, a University of Rochester Medical Center expert has a leading role in two nationwide studies that are launching this spring.

The first project involves testing a small, hand-held instrument that assesses the brain's electrical activity and other functional data after a concussion. The device is designed to triage head injury severity in three minutes, in a setting such as the URMC Emergency Medicine Department, although it was originally designed for the military to use in the field.

In the second project, researchers will begin collecting blood and other baseline brain function data from two diverse cohorts: healthy university athletes and brain-injured patients receiving intensive care treatment. Having a broad spectrum of data will provide URMC scientists and other researchers across the country the infrastructure to test or validate emerging laboratory findings. For example, the URMC blood samples could be used to quickly confirm whether a newly identified protein is clinically useful in terms of diagnosing head trauma.

"This is clinical-translational research at its best," said Jeffery Bazarian, M.D., M.P.H., the principal investigator on both projects and a URMC associate professor of Emergency Medicine, Neurology, Neurosurgery, and Community and Preventive Medicine. "The problem today with traumatic brain injury research is that we make an interesting finding in

the lab but we have no easy way to proceed to the next step. So, by setting up the infrastructure first, we are taking a faster, more rational approach to move the findings into the clinic and improve the care of our patients."

Head injuries are a common and growing problem in the United States. Researchers estimate that more than 1.6 million sports-related head injuries alone occur each year, yet many of them are dismissed or misdiagnosed as a mild concussion, until further damage occurs or symptoms become worse.

Unless the injury is severe enough that a physician suspects bleeding inside the brain, diagnosis is very difficult. Physicians routinely use a CT scan to rule out bleeding, but recent studies suggest the radiation doses in CT scans, particularly in children, might have future negative consequences that outweigh the benefits. Currently there is no other technology widely available to objectively assess brain injury.

The National Institutes of Health recently awarded Bazarian more than $870,000 to build the database. He will conduct the second study in collaboration with BrainScope Company, Inc., a private firm that develops portable, non-invasive devices to triage head trauma patients at the initial point of care. BrainScope recently added the URMC as one of 10 clinical sites to test its system.

The BrainScope instrument has a band that wraps around a patient's head and collects brainwave recordings. Adults and children who seek care in the URMC emergency room and volunteer to enroll in the BrainScope study will receive standard care, but will also be asked to agree to an assessment with the investigational instrument. Today BrainScope announced that it had reached concurrence with the U.S. Food and Drug Administration on key study design elements.

Public awareness of the possibility of long-term problems due to head injuries is increasing. Recently, for example, scientists confirmed that the brain of NFL player Dave Duerson was irreparably damaged due to multiple hits during a lifetime on the football field. Duerson committed suicide in February 2011 and asked that his brain be studied, postmortem, at Boston University.

The military is also looking for better ways to protect soldiers from explosions and the subsequent blast-induced head trauma that has become a signature injury among Iraq and Afghan troops. In 2007 Bazarian served on the Institute of Medicine Committee on Gulf War and Health: Brain Injury in Veterans and Long Term Health Outcomes. The panel recommended more careful studies to confirm latent effects of the exposure of blasts and other head trauma suffered in combat.

The key to better diagnosis and treatment is investigating and appreciating the medical nuances associated with traumatic brain injury, Bazarian said.

“If a test comes back negative for a brain injury, does it really mean that no injury exists? On the other hand, if it’s positive, we still need to find out how severe the injury is and determine the best way to treat and follow the patient,” Bazarian said. “And further complicating the picture is that people seek medical help at different times after the injury, sometimes even a couple days later.”

Both studies will attempt to address these issues. When blood samples are collected from the UR athletes and the ICU patients, for example, researchers will also assess baseline cognitive function using computer and balance tests. If any of the healthy athletes end up with a concussion during their four years at the UR, they will be asked to repeat all of the cognitive tests at different intervals: within six hours of the injury, and at 24, 48, and 72 hours.

Having the information at key intervals will allow researchers to analyze whether particular brain proteins are released into the bloodstream at certain times after an injury and thus provide another way to assess damage.

Provided by University of Rochester Medical Center