Study reveals potential for more precise diagnosis and treatment of TBI

April 30 2018

Patients who've suffered from traumatic brain injuries (TBIs) have changes in tiny blood vessels in their brains that researchers believe are linked to a range of cognitive symptoms, according to new findings presented at the 2018 American Academy of Neurology (AAN) Annual Meeting. The findings may help doctors pinpoint specific types of TBIs and tailor personalized therapies.

The study was led by Ramon Diaz-Arrastia, MD, Ph.D., director of the Traumatic Brain Injury Clinical Research Center at the Perelman School of Medicine at University of Pennsylvania, and presented by Sarah Woodson, MD, a neurology resident at Walter Reed National Military Medical Center (Abstract #S49.001).

"The relationship between microvascular and structural injury in chronic TBI has been recognized for years, but underappreciated," Diaz-Arrastia said. "This research adds another layer to our understanding of TBI and ways to better treat patients, who in some cases have had TBI symptoms for years."

The research examined whether microvascular injury had a role in some of the cognitive and psychological problems that are common in TBI patients by assessing the correlation between blood flow and cerebral reactivity—a change in blood flow in the brain in response to a stimulus—in TBI patients. Using functional MRI-Blood-Oxygen Level dependent (BOLD) and Diffusion Tensor Imaging (DTI)—which together makes it possible to see inside the brain in great detail—the

team assessed the strength and function of small blood vessels in the brains of 27 chronic TBI patients and 14 healthy subjects.

In addition to imaging, subjects underwent seven neuropsychological tests. Study participants were also assessed for post-concussive symptoms using the Brief Symptom Inventory-Somatic and Rivermead Post-Concussion Questionnaire, which evaluates severity of cognitive and emotional symptoms such as headaches and depression.

The findings revealed differences in multiple regions of the brain, which could mean new opportunities for tailored TBI therapies. The results showed deficits in cerebrovascular reactivity with TBI patients. While vascular reactivity is decreased in chronic TBI, the study showed that increased cerebrovascular reactivity in subcortical regions of the brain (hippocampus, amygdala, thalamus, caudate, putamen) is associated with more post-concussive symptoms.

"These findings underscore the importance for precise diagnosis with TBIs, to ensure the right therapies are identified for patients," Diaz-Arrastia said. "By nature, TBI injuries always vary—the brain damage is not the same in any two patients. If we have a therapy that could target the specific lesion that's unique for each patient, then we can treat patients with better, more appropriate therapies. Overall, our vision for the future is that patients with TBI, and perhaps even other disorders, can have their microvascular function assessed as part of a routine neurological evaluation to help find the right treatment for each patient."

Provided by Perelman School of Medicine at the University of Pennsylvania

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