Longitudinal study explores white matter damage, cognition after traumatic axonal injury

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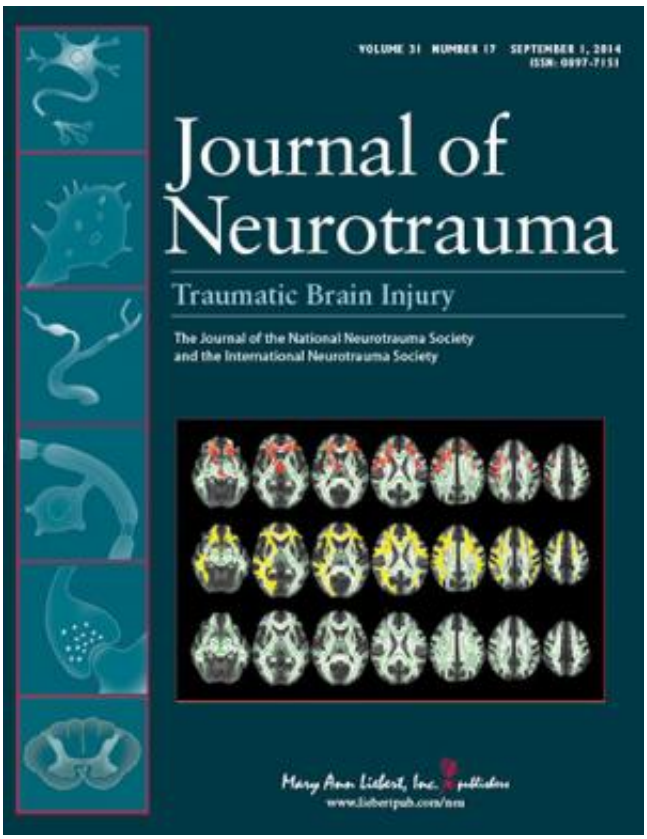

Traumatic Axonal Injury is a form of traumatic brain injury that can have detrimental effects on the integrity of the brain's white matter and lead to cognitive impairments. A new study from the Center for

BrainHealth at The University of Texas at Dallas investigated white matter damage in the acute and chronic stages of a traumatic axonal injury in an effort to better understand what long-term damage may result.

The study, published online July 21 in the *Journal of Neurotrauma*, looked at 13 patients ages 16 to 60 with mild to severe brain injuries from the intensive care unit at a Level I trauma center. This group was matched to a cohort of 10 healthy individuals resembling the age, gender, and ethnicity of the patients. White matter integrity was measured using diffusion tensor imaging (DTI) in the acute stage of injury, at day one, and again at the chronic stage, seven months post-injury. In addition, neuropsychological assessments measured cognitive performance including processing speed, attention, learning and memory at both stages after injury.

"We intended to determine whether DTI could not only identify early compromise to white matter, but also demonstrate an association with functional and neuropsychological outcomes months post-injury," said Carlos Marquez de la Plata, Ph.D., Assistant Director of Rehabilitation Research at Pate Rehabilitation in Dallas, Texas.

The study's findings suggest DTI may be used to detect meaningful changes in white matter as early as one day after a traumatic brain injury . White matter integrity measured at the chronic stage was also found to significantly correlate with cognitive processing speed.

"On the first day after the injury, we found white matter integrity was compromised due to swelling in the brain," said the study's lead author Alison Perez. "As the swelling subsided over time and the brain began to repair itself, we found that many of the damaged neurons that were unable to repair themselves began to die off, which appears to slow the speed of cognitive processing."

Interestingly, the degree of white matter compromise detected early after injury was associated with markers of injury severity such as the number of days in the intensive care unit and hospital, but not to outcomes months later.

At seven months post-injury, many of the patients' cognitive performance improved including processing speed, divided attention, and short and long-term memory. In addition, patients with better white matter integrity at the chronic stage had the fastest processing speed.

By studying the long-term effects of a traumatic axonal injury at both the acute and chronic stages, researchers hope to assist in the advancement of future assessment and treatment options after a traumatic brain injury.

More information: *Journal of Neurotrauma*, online.liebertpub.com/doi/full … 0.1089/neu.2013.3216

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