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NEWS

RSNA Press Release

Imaging Shows Some Brains Compensate after Traumatic Injury

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At A Glance

- Researchers have identified a biomarker that may predict patient prognosis after a concussion.
- A special MRI technique called diffusion tensor imaging measures movement of water molecules in the brain to identify abnormalities and changes after brain injury.
- Concussion accounts for at least 75 percent of all traumatic brain injuries.

CHICAGO—Using a special magnetic resonance imaging (MRI) technique to image patients with mild traumatic brain injury (MTBI), researchers have identified a biomarker that may predict which patients will do well over the long term, according to a study presented today at the annual meeting of the Radiological Society of North America (RSNA).

The results of the study showed that in some patients the brain may have changed to compensate for the damage caused by the injury.

Michael Lipton, M.D., Ph.D.

"This finding has huge potential implications for preventing and repairing the damage that accompanies traumatic brain injury," said Michael Lipton, M.D., Ph.D., associate director of the Gruss Magnetic Resonance Research Center at the Albert Einstein College of Medicine and medical director of MRI at the Montefiore Medical Center, Bronx, N.Y.

According to the Centers for Disease Control and Prevention, each year in the U.S. 1.7 million people sustain traumatic brain injuries. MTBI, or concussion, accounts for at least 75 percent of all traumatic brain injuries. Following a concussion, some patients experience a brief loss of consciousness. Other symptoms include headache, dizziness, memory loss, attention deficit, depression and anxiety. Some of these conditions may persist for months or even years in as many as 30 percent of patients.

Dr. Lipton and colleagues set out to determine the post-concussion symptoms and health-related quality of life for a group of patients with MTBI one year post-injury. The researchers recruited 17 patients with MTBI from the Emergency Department of Montefiore Medical Center. Within two weeks of their injury, the patients underwent diffusion tensor

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imaging (DTI), which measures the direction of movement of water molecules within and along axons, which comprise the bundles of nerve fibers in the brain's white matter.

"In a traumatic brain injury, it's not one specific area that is affected but multiple areas of the brain connected with axons," Dr. Lipton said.

Using DTI, the researchers measured the uniformity of water flow (called fractional anisotropy or FA) throughout the brain, pinpointing areas with low FA, which are indicative of axonal injury, and areas with abnormally high FA, as compared to healthy brains.

"Abnormally low FA within white matter has been associated with cognitive impairment in patients with TBI," Dr. Lipton said. "We believe that high FA is evidence not of axonal injury, but of brain changes that are occurring in response to the trauma."

One year after their brain injury, the patients completed two standard questionnaires to assess their post-concussion symptoms and evaluate their health status and quality of life.

Comparing the DTI data to the patient questionnaires, the researchers found that the presence of abnormally high FA was a predictor of fewer post-concussion symptoms and higher functioning.

The results suggest that in patients who exhibit areas of high FA on DTI, the brain may be actively compensating for its injuries.

"These results offer us a new opportunity for treatment by finding ways to enhance the brain's compensatory mechanisms." Dr. Lipton said.

Coauthors are Sara B. Rosenbaum, B.A., Namhee Kim, Ph.D., Tova M. Gardin, B.A., Richard B. Lipton, M.D., and Molly E. Zimmerman, Ph.D.

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