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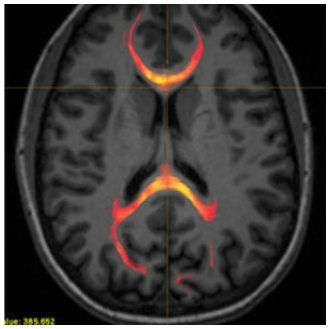
RSNA 2019: MRI Innovation in Concussion Analysis



New research from New York University (NYU) sheds light on how damage from mild traumatic brain injury, or concussion, affects your cognitive function.

Transmission of information between the brain's left and right hemispheres is via the corpus callosum, a bundle of nerve fibres that carries signals between the two sides. Concussions are harmful as they can compromise the brain's signal-carrying white matter, according to the research presented today at the annual meeting of the Radiological Society of North America (RSNA).

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Two innovative advances enabled researchers to compare the condition of the corpus callosum in 36 patients with recent concussion to that of 27 healthy controls. The first is diffusion MRI, which uses measures of water diffusion to provide a microscopic view of white matter fibres. This MRI technique allowed researchers to better understand the white matter microstructural injury that occurred due to a concussion.

MRI findings were then combined with results from a novel test, called Interhemispheric Speed of Processing Task (IHSPT), developed at NYU Langone Health in New York City that evaluates how well the two hemispheres in the brain communicate with each other.

For the IHSPT test, study participants were told to sit in a chair and focus their gaze on the letter X that was displayed on a screen directly in front of them. When three-letter words were flashed to the right or the left of the X, the participants must say those words as quickly as possible. This reaction time in both patients with concussion and healthy controls was analysed by the researchers, who noticed an interesting phenomenon.

"There is a definite and reproducible delay in reaction time to the words presented to the left of the X compared with words presented to the right visual field," said study co-author Melanie Wegener, MD, resident physician at NYU Langone. "This shows it takes time for information to cross the corpus callosum from one hemisphere to the other, which is measured by the difference in response time between words presented to different sides of our visual field."

The research team attributes the delay to the fact that language function is most often located in the brain's left hemisphere. This means that information presented to the left visual field is first transmitted to the right visual cortex in the brain and then has to cross over the corpus callosum to get to the left language centre. In contrast, words that are presented to the right visual field do not need to cross the corpus callosum.

IHSPT results correlated with brain findings on MRI. In the healthy controls, reaction time corresponded with several diffusion measures in the splenium, an area of the corpus callosum located between the right visual cortex and the left language centre. No such correlation was found in the concussion patients, suggesting microstructural changes relating to injury.

These findings, Dr Wegener noted, could ultimately help with treatment in patients who have mild traumatic brain injury. For instance, patients could undergo MRI immediately after a concussion to see if they experienced any clinically important white matter injury and thus may benefit

from early intervention.

Source: Radiological Society of North America

Image credit: Radiological Society of North America

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