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TRAUMATIC BRAIN INJURY

Structural changes can progress for months after brain injury

Longitudinal MRI scans can reveal damage that manifests months to years after a traumatic brain injury (TBI), according to a new study. The results, published in *Neurorehabilitation and Neural Repair*, might provide justification for the use of MRI as an assessment tool and prognostic biomarker in patients with TBI.

"Despite being precipitated by an acute event, it is becoming clear that TBI is not a single insult with monophasic resolution, but a chronic disease with dynamic processes that remain active for years," explains Virginia Newcombe, lead author of the new study.

Newcombe and colleagues recruited 12 patients with TBI to undergo longitudinal brain scans using volumetric MRI and diffusion tensor imaging (DTI). The first scan took place a median time of 33 h after injury, and follow-up MRI was conducted at approximately 6 weeks and 1 year. The investigators also imaged 30 controls matched for age and sex, and obtained longitudinal scans from eight of these participants.

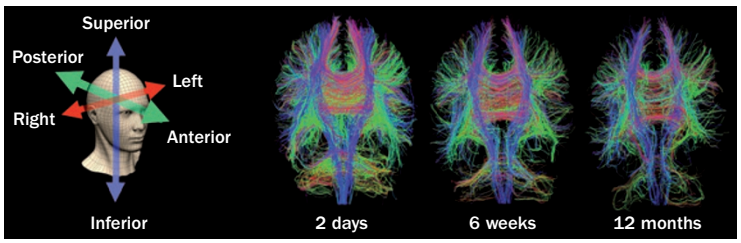
Over the course of the study, structural MRI revealed that patients with TBI demonstrated significantly higher rates of thalamic volume loss and ventricle expansion than did controls. Together, these results suggest that substantial brain atrophy occurs in the months and years after TBI.

In their first DTI scan, all patients had visible white matter abnormalities in the supratentorial compartment, cerebellum and brainstem. Changes in white matter were also recorded in the follow-up scans but varied between patients, with some demonstrating recovery on DTI measures and others showing continued deterioration. This heterogeneity was associated with cognitive outcomes: patients with sustained impairment showed progressive white matter loss, whereas good cognitive performance correlated with improved DTI measures.

"Intriguingly, our data suggest that DTI is able to provide a biomarker of both recovery and the progression of pathophysiology," concludes Newcombe. Further studies, including more patients and strictly timed follow-up scans, will be necessary to support this use of DTI.

Newcombe suggests that longitudinal PET scans of patients with TBI could complement the current study, for example, by revealing the possible deposition of amyloid or tau protein, or elucidating whether microglial activation plays a substantial part in TBI recovery. These data would not only shed further light on the late effects of TBI, but might also reveal new avenues for treatment.

Alex Chase



Whole-brain diffusion tensor tractography in one patient illustrates progressive deterioration of white matter in the weeks and months following traumatic brain injury. The lines are representative of white matter tracts, which are colour coded according to the directionality of their connections. Image courtesy of V. F. J. Newcombe.

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