DTI in TBI: An exploratory study into a method enabling detection of White Matter changes in individuals following TBI

Dr Laura Jane Hanley

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Supervisors:

Dr Martin Bunnage, North Bristol Trust
Professor Derek Jones, Cardiff University Brain Imaging Centre
Professor Huw Williams, Exeter University


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Abstract

Background: For Diffusion Tensor Imaging (DTI) to become a clinically useful tool in the detection of traumatic brain injury (TBI) and prediction of functional outcome, a reliable method enabling the identification of likely injury in individual patients needs to be developed.

Objective: To explore different methods of analysing DTI measures to determine if individual TBI patients can be differentiated from a group of non-brain injured controls and if so, how these differences are associated with cognitive function.

Method: 4 participants with TBI and 11 control participants were scanned using DTI and completed a battery of neuropsychological tests. The DTI measures of Fractional Anisotropy (FA) and Mean Diffusivity (MD) in the uncinate fasciculus were compared across individual TBI patients and a control group using 3 different methods of analysis.

Results: The comparison of mean FA/MD from individual TBI patients with the overall mean FA/MD of the control group revealed that some TBI patients had lower values of FA whilst others had increased MD. This difference in FA may be associated with deficits in measures of attention. The histogram curves and cumulative frequency plots for individual TBI patients and the controls revealed subtle yet potentially significant differences in the distribution of FA/MD. However at this stage these differences could not be associated with cognitive function.

Conclusion: Initial findings indicate that individual TBI patients can be differentiated from a control group using different methods with differing degrees of sensitivity. These differences may be related to cognitive function but further research is warranted before firm conclusions can be drawn.