

ASSESSMENT OF TRAUMATIC BRAIN INJURY CHRONIC EFFECTS: UNCINATE FASCICULUS DIFFUSION TENSOR METRICS AND CORRELATION WITH VISUAL AND VERBAL EPISODIC MEMORY PERFORMANCE

Yiannakkaras C¹, Konstantinou N², Constantinidou F^{3,4}, Pettemeridou E^{3,4}, Eracleous E⁵, Papacostas SS⁶, Seimenis I¹

¹ Medical Physics Laboratory, Department of Medicine, School of Health Sciences, Democritus University of Thrace, Alexandroupolis, Greece

² Department of Rehabilitation Sciences, Faculty of Health Services, Cyprus University of Technology

³ Center for Applied Neuroscience, University of Cyprus, Nicosia, Cyprus

⁴ Department of Psychology, University of Cyprus, Nicosia, Cyprus

⁵ Medical Diagnostic Center "Ayios Therissos", Nicosia, Cyprus

⁶ Neurology Clinic B, Cyprus Institute of Neurology and Genetics and Cyprus School of Molecular Medicine, Nicosia, Cyprus

Abstract

OBJECTIVE: To investigate the hypothesis that the episodic visual and verbal memory impairment associated with chronic moderate to severe traumatic brain injury is related to changes in the diffusion tensor imaging (DTI) properties of the uncinate fasciculus (UF).

MATERIAL – METHOD: A group of 13 TBI male participants with chronic TBI (median post-injury period of 76 months) was subjected to comparable evaluation with a matched group of 14 neurologically-healthy controls. Fractional anisotropy, as well as mean, radial and axial diffusivity values were obtained. A battery of visual and verbal episodic memory recall and recognition tasks was administered as part of a lengthy neuropsychological battery.

RESULTS: As anticipated, healthy controls outperformed TBI participants in visual and verbal recall tasks. No group differences were recorded for recognition tasks. Verbal recognition performance scores of participants with TBI were correlated with mean ($r=-0.62$, $p=0.024$ at $\alpha=0.05$) and radial ($r=-0.52$, $p=0.068$ at $\alpha=0.05$) diffusivity of the right UF. Visual recall performance scores of participants with TBI were also correlated with mean ($r=-0.7$, $p=0.008$ at $\alpha=0.05$) and radial ($r=-0.64$, $p=0.017$ at $\alpha=0.05$) diffusivity of the right UF. No such correlations were established for healthy controls.

CONCLUSIONS: Moderate to severe traumatic brain injury survivors are experiencing deficits in recall tasks of visual and verbal episodic memory several years after injury. DTI metrics analysis indicated that TBI-induced microstructural changes at the right uncinate fascicle correlate with verbal recognition and visual recall performance.