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Diffusion tensor tractography of memory-related white matter tracts in amyotrophic lateral sclerosis

Zoi A Giavri

Advantis Medical Imaging, Greece

Neuropathological studies support the presence of hippocampal alterations in patients with Amyotrophic Lateral Sclerosis (ALS), even when frank dementia is not present. These changes also involve Perforant Pathway Zone (PPZ), are more pronounced in later disease neuropathological stages and may partially explain the heterogeneity of patients' memory profile (traditionally related to frontal-related dysfunction). We aimed to investigate structural changes in vivo in memory-related white matter (WM) tracts [i.e. perforant pathway zone (PPZ); uncinate fasciculus (UF); fornix (Fx)] using diffusion tensor tractography (DTT) in non-demented patients with amyotrophic lateral sclerosis (ALS). Forty-two ALS patients and 25 healthy controls (HC) underwent a 30-directional diffusion-weighted imaging on a 3T MR scanner, followed by tractography of PPZ, UF and Fx and analysis of fractional anisotropy (FA), axial and radial diffusivity (Da, Dr). After correcting for multiple comparisons, DTT statistical analyses revealed significant between-group differences on Dr for left PPZ ($p=0.002$). Differences corresponding to medium effect sizes (and of nominal, Bonferroni-unadjusted significance) were detected on FA and Da for left PPZ, Da and Dr for left UF, Da for right UF and all Fx DTT metrics. Advanced neuroimaging techniques verified in this study previously reported neuropathological findings regarding PPZ degeneration in ALS.

Biography

Zoi A Giavri studied Electrical & Computer Engineering with an expertise in Computational Neuroscience at National Technical University of Athens and Neurobiology at Medical School of Athens. She is the CEO and one of the Founders of Advantis Medical Imaging, a Dutch company that develops highly advanced web-based software for the post-processing of brain MRI diffusion, perfusion and functional MRI exams

zoi@advantis.io

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