DIFFUSION TENSOR IMAGING IN THE THALAMUS - A NEW APPROACH TO UNDERSTANDING PARKINSON’S DISEASE

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Introduction: Thalamic integrity may be especially relevant for cognitive change in PD, because it mediates multiple functional networks. Preliminary evidence suggests thalamic volume loss and decreases in posterior thalamic grey matter in PD with dementia. Standard MRI techniques have shown a relationship between progressive volume loss and cognitive decline, so more subtle changes can be expected prior to the dementia onset. Diffusion tensor imaging (DTI) measures microstructural integrity and can detect subtle changes in subcortical structures like the thalamus.

Aims: To determine the integrity of the thalamus across the spectrum of cognitive changes in PD, from relatively spared cognition, through mild cognitive impairment (MCI) and dementia.

Methods: Ninety-eight PD patients and 25 healthy controls received DTI and T1 imaging. Neuropsychological testing examined executive function, attention and working memory, learning and memory, and visuoperceptual function. Bilateral thalamus was defined using an automated programme (FIRST) and mean diffusivity (MD) and fractional anisotropy (FA) of whole thalamus extracted from DTI images.

Results: Thalamic volume was not significantly changed. FA values were not related to cognitive status. Progressive increase in thalamic MD values, reflecting reduced cellular integrity, was associated with worsening cognition (β=-0.27, p< 0.01) but not motor status (β=0.19, n.s.) in PD, after inclusion of age, sex, education, duration and depression symptoms.

Discussion: Subtle decrease in thalamic integrity tracks declining cognitive status in PD. The findings are contrary to that found in Alzheimer’s disease (AD), where volumetric reduction and decreases in FA, but less so MD, are found.