P184

White and gray matter alterations in de novo PD patients: which matter most?

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Background: Only one study has investigated white matter (WM) and gray matter (GM) alterations in the same sample of patients [1]. The sample size of patients studied in this paper was small, there was no correlation between motor and nonmotor features, and the results were not corrected for multiple comparisons. An evaluation of GM and WM abnormalities in the same sample of early PD patients may provide a better understanding of early brain damage.

Objectives: This paper aimed to identify WM and GM abnormalities in a sample of early PD patients, and their correlations with motor and non-motor symptom severity.

Methods: We enrolled 62 *de novo* PD patients and 31 healthy subjects. Disease severity and non-motor symptom burden were assessed by the UPDRS part III and the Non-Motor Symptoms Scale, respectively. Cognitive performance was assessed using MoCA and Frontal Assessment Battery. All subjects underwent a 3-Tesla MRI protocol. MRI analyses included tract-based spatial statistics, cortical thickness, and subcortical and cerebellar volumetry.

Results: In comparison to control subjects, PD patients exhibited lower fractional anisotropy and higher mean, axial, and radial diffusivity in most WM bundles, including corticospinal tracts, the internal and external capsule, the anterior and posterior thalamic radiations, the genu and body of the corpus callosum, cerebellar peduncles, and superior and inferior longitudinal and fronto-occipital fasciculi. Correlations between MoCA scores and fractional anisotropy values in the right posterior thalamic radiation, left superior corona radiata, right inferior-fronto-occipital fasciculus, left inferior longitudinal fasciculus, bilateral anterior thalamic radiations, and bilateral superior longitudinal fasciculi were found. Smaller cerebellar volumes in early PD patients in the left and right crus I were also found. No GM changes were present in subcortical or cortical regions.

Conclusions: The combined evaluation of WM and GM in the same patient sample demonstrates that WM microstructural abnormalities precede GM structural changes in early PD patients.

References:

[1] Lee E, Lee JE, Yoo K, et al (2014) Neural correlates of progressive reduction of bradykinesia in de novo Parkinson's disease. Parkinsonism Relat Disord 20:1376–1381. https://doi.org/10.1016/j.parkreldis.2014.09.027.