Poster 01:

The brain in Parkinson's Disease: Structural connectivity analysis in Freezing of Gait

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Parkinson's Disease (PD) presents significant challenges in motor function, with Freezing of Gait (FoG) being an important symptom associated with increased risk of falls and injuries. This study investigates the structural connectivity between the supplementary motor area (SMA) and the thalamus in PD patients, with and without FoG, using diffusion MRI (dMRI) data. The sample contains 77 patients from the Parkinson's Progression Marker Initiative (PPMI) database, including 20 patients with FoG and 57 controls.

Utilizing dMRI processing techniques, including fiber orientation distribution and anatomically constrained tractography, the study examined the structural connections of the SMA and thalamus. Multiple regression analysis was conducted, with FoG status, sex, and age as independent variables.

Results revealed significant differences in structural connectivity in the right hemisphere (RH) between FoG and non-FoG patients ($F(3, 73) = 4.40$, $p = .007$, $adj.\ R^2 = .118$). However, no significant differences were found in the left hemisphere (LH). Interestingly, male patients exhibited higher structural connectivity ($p = .010$) in the LH.

The discussion emphasizes the potential role of RH structural connectivity as a predictive marker for FoG, possibly indicating compensatory mechanisms in the PD brain. Follow-up studies are recommended to evaluate the longitudinal alterations in structural connectivity and its potential as a reliable predictor for FoG compared to traditional clinical assessments. This study contributes to a better understanding of the neural underpinnings of FoG in PD and underscores the importance of investigating structural connectivity as a potential biomarker for disease progression and symptom severity.