

Grey matter loss is associated with freezing-of-gait in Parkinson's disease

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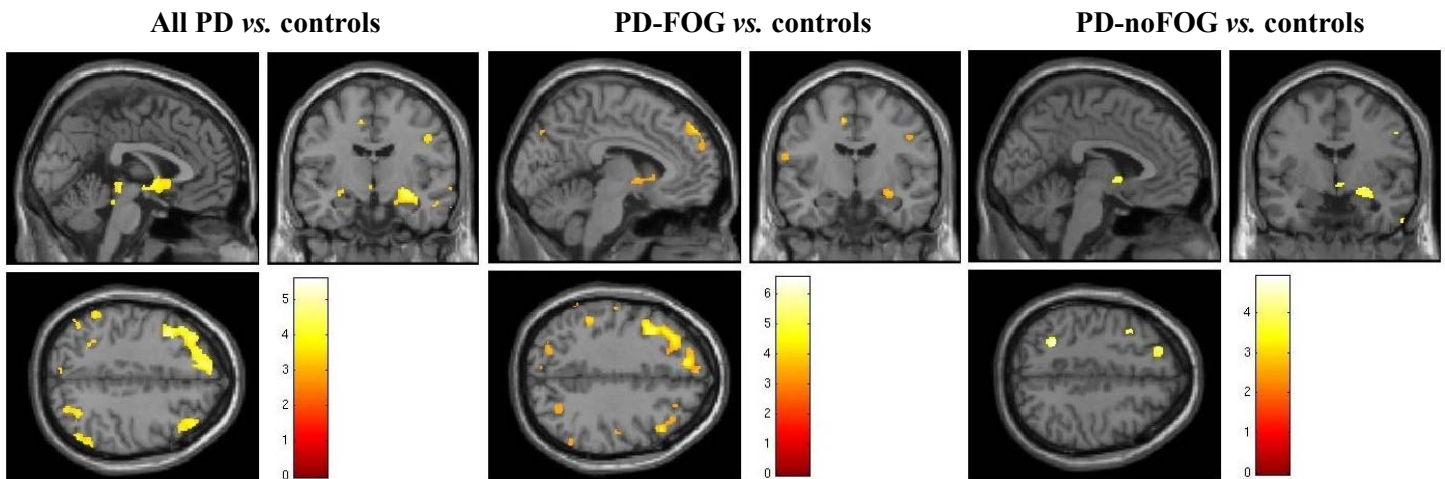
Introduction. Despite an increasing evidence for a role of a functional brain impairment in the genesis of freezing of gait (FOG) in Parkinson's disease (PD) [1], the relationship between selective regional brain volume loss and this phenomenon has not been fully investigated yet.

Objectives. To investigate whether a specific pattern of gray matter (GM) loss is associated with FOG in patients with idiopathic PD.

Methods. Thirty-eight PD patients and 34 healthy controls were studied. Patients were classified as PD-FOG patients (n=18), if they had both a score >1 on item 3 of the FOG Questionnaire and observation of FOG by the examiners. Patient groups were matched for age, disease duration and Hoehn and Yahr stage. Patients were also administered the Unified Parkinson's Disease Rating Scale III (UPDRS III), Hamilton Depression and Anxiety Rating Scales, and a neuropsychological battery. GM atrophy was assessed using voxel-based morphometry [2] and the DARTEL registration method [3], as implemented in Statistical Parametric Mapping (SPM8).

Results. PD patients *vs.* HC showed GM atrophy in the bilateral dorsolateral prefrontal cortex, medial and lateral temporal lobe, inferior parietal lobule, middle occipital gyrus, and left middle cingulate cortex. The pattern of GM atrophy was similarly widespread when considering PD-FOG patients only *vs.* HC. On the contrary, patients without FOG (PD-noFOG, n=20) *vs.* HC showed only small regions of GM atrophy in the frontal and temporal cortex, with left predominance.

Figure. Patterns of GM atrophy in all PD, PD-FOG, and PD-noFOG *vs.* healthy controls ($p < 0.001$, uncorrected)



Significant GM atrophy of the left frontal cortex was found in PD-FOG *vs.* PD-noFOG patients. In all PD patients, FOG score was significantly associated with GM atrophy in the left frontal cortex. This association was independent of UPDRS III, and MMSE, executive functioning, depression, and anxiety scores.

Conclusions. FOG in PD patients is associated with GM frontal atrophy. Such a relationship is independent of executive deficits. This finding suggests that the frontostriatal system may be involved in the pathophysiology of FOG in PD.

References. [1] Bartels AL, Leenders KL. *Mov Disord* 2008;23 Suppl 2:S461-7. [2] Ashburner J, Friston KJ. *NeuroImage* 2005; 26:839-851. [3] Ashburner J. *NeuroImage* 2007; 38:95-113.