

Cortico-striatal-thalamic network functional connectivity in hemiparkinsonism

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Target audience. Neurologists and neuroradiologists.

Purpose. In hemiparkinsonian patients, the cerebral hemisphere ipsilateral to the affected limbs can be considered “presymptomatic”. Resting state (RS) fMRI in mild/moderate stage of Parkinson’s disease (PD) revealed an altered connectivity of the cortico-striatal-thalamic network, which is likely to be modulated by levodopa (L-dopa) in both chronically treated (t-PD) and drug-naïve (n-PD) patients [1-3]. This study investigated functional connectivity of the cortico-striatal-thalamic networks in patients with early lateralized PD (hemiparkinsonism), and the effects of L-dopa on the brain networks at the earliest stage of PD.

Methods. RS fMRI was obtained from 69 patients with hemiparkinsonism (25 n-PD and 44 t-PD) and 27 healthy subjects. Functional connectivity analysis was performed using caudate, putamen, pallidus nucleus and thalamus bilaterally as seed regions of interest. The images of patients whose symptoms were on the left (L) side were left-right (R) flipped so that the hemisphere contralateral to the affected limbs was the L for all patients.

Results. Relative to controls, n-PD patients showed an increased basal ganglia reciprocal functional connectivity bilaterally, and a decreased connectivity of the affected caudate nucleus and thalamus with the ipsilateral prefrontal, frontomedial, orbitofrontal and insular cortices (Figure). Compared with both controls and n-PD patients, t-PD patients showed a decreased functional connectivity among the striatal and thalamic regions, and an increased functional connectivity between the striatum and the temporal cortex and

between the thalamus and several sensorimotor, parietal, temporal and occipital cortical regions. In both n-PD and t-PD groups, patients with more severe motor disability had an increased striatal/thalamic functional connectivity with temporal, parietal and occipital regions.

Discussion and conclusions. Cortico-striatal-thalamic functional abnormalities occur in patients with hemiparkinsonism, antecede the onset of motor symptoms on the opposite body side, and are modulated by L-dopa. L-dopa is likely to facilitate a compensation of PD functional abnormalities possibly through an increased thalamic outflow.

References. 1. Honey et al., Brain 2003:1767-81; 2. Buhmann et al., Brain 2003: 451-61.; 3. Esposito et al., Brain 2013:710-25.

