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## Altered functional connectivity of the subthalamic nucleus in Parkinson's disease: focus on candidates for deep brain stimulation

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*Introduction:* It is not yet clear why the therapeutic benefits of deep brain stimulation (DBS) still vary among Parkinson's disease (PD) patients. To date, the idea that effectiveness of DBS is related to connectivity dysfunction of the site of the stimulation with other brain regions is raising.

*Objective:* To investigate the resting-state functional connectivity (RS-FC) of the subthalamic nucleus (STN), the most frequently used DBS target for PD, in different PD phenotypes.

*Methods:* Clinical data and resting-state fMRI were acquired from 60 PD patients and 60 age- and sex-matched healthy control subjects within an ongoing longitudinal project. PD patients were divided into two groups: 19 patients eligible for DBS (PD-DBS) and 41 not candidate for DBS (PD-noDBS). Bilateral STN were selected as regions of interest and a seed-based connectivity analysis was assessed in PD groups and healthy controls.

*Results:* PD-DBS showed a reduced connectivity between bilateral STN and bilateral sensorimotor areas relative to both controls and PD-noDBS patients. On the contrary, PD-DBS patients showed an increased connectivity between bilateral STN and globus pallidus, putamen and thalamus bilaterally compared to healthy controls. Similar patterns were found when PD-noDBS patients were compared to controls (albeit with lower connectivity levels than PD-DBS patients). We hypothesize that candidates for DBS showed an increased connectivity between STN and globus pallidus/thalamus, which in turn may provide a decreased connectivity with sensorimotor areas relative to patients not eligible for DBS.

*Conclusions:* Our results suggest that functional connectivity of deep nuclei changes among PD phenotypes and confirm an important role of functional MRI as tool for selection of candidates for DBS. The idea that STN-DBS works by modulating and restoring functional connectivity between basal ganglia and sensorimotor areas is further corroborated.

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