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Dysfunction of Basal Ganglia Circuitry in Patients with Obsessive-Compulsive Disorders: Subthalamic Neuronal Activity Correlates with Symptom Severity

Marie-Laure Welter ¹, Pierre Burbaud ², Sara Fernandez-Vidal ¹, Eric Bardinet ¹, Jerome Coste ³, Brigitte Piallat ⁴, Michel Borg ⁵, Stephane Besnard ⁶, Paul Sauleau ⁷, Bertrand Devaux ¹, Bernard Pidoux ¹, Patrick Chaynes ⁸, Sophie Tezenas Du Moncel ¹, Annette Bastian ¹, Nicolas Langbour ², Aude Teillant ¹, William Haynes ¹, Jérôme Yelnik ¹, Carine Karachi ¹, Luc Mallet ¹

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Objective: to characterize subthalamic neuronal activity in obsessive compulsive disorder (OCD) patients, in comparison to patients with Parkinson's disease (PD), and its relationship to the severity of obsessions and compulsions.

Background: modifications in the function and connectivity of the brain's cortico-striatal systems have been reported in patients with OCD. However changes in the basal ganglia neuronal activity in the relation of severity of OCD have never been adequately elucidated.

Design/Methods: twelve patients with OCD and 12 patients with PD operated for subthalamic stimulation were included. Resting-state subthalamic single unit neuronal activity was recorded during surgery. Recorded neurons were located with precision and mapped according to the motor, associative and limbic subdivisions of the subthalamic nucleus. Discharge frequency, pattern, bursting and oscillatory activities were characterized for each recorded neuron and compared between OCD and PD patients. Correlations with the severity of symptoms in OCD patients were explored.

Results: one hundred and thirty-seven subthalamic neurons were isolated and recorded in OCD patients and 173 subthalamic neurons in PD patients. Between groups, OCD patients had lower STN neuronal discharge frequency, with a similar fraction of subthalamic neurons exhibiting burst-type activity. Significant oscillatory activity was present in 46% and 68% of neurons in OCD and PD patients, respectively; predominantly in the low frequency band (1-8 Hz). In the OCD patients, abnormal neuronal activity was mainly observed in the associative-limbic part of the subthalamic nucleus. Additionally, OCD patients with more severe symptoms exhibited oscillatory activity.

Conclusions: heightened burst and low frequency oscillatory activities in the associative limbic subthalamic subdivision demonstrate its involvement in the pathophysiology of OCD.

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