

Sleep modulation in Parkinson's disease patients with deep brain stimulation: the role of frequency variations

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Introduction: Deep Brain Stimulation (DBS) is an effective treatment for motor symptom in Parkinson's disease (PD). Low frequencies stimulation of Subthalamic Nucleus (STN) probably improve gait disorders for an involvement of the Peduncolo-Pontine Nucleus (PPN). The aim of our study was to investigate the differences between low (60Hz) versus high (130hz) frequencies of STN DBS in PD patients (PD-DBS) in sleep parameters. We also explored differences in sleep parameters between PD-DBS and PD patients with only medical treatment (PD-MED) and healthy controls (HC).

Material and Methods: PD-DBS, PD-MED non demented patients and HC were recruited. All subjects underwent a full night laboratory polysomnography, while PD-DBS performed two recordings in different non consecutive days: a night with 60Hz frequency of stimulation, one night with 130Hz frequency of stimulation. Sleep conventional macrostructure and microstructure analysis was performed. Motor symptoms were evaluated with validated scale and with a wrist Actigraphy.

Results: In our study 10 PD-DBS patients, 10 PD-MED and 10 HC were enrolled. PD-DBS patients presented increased REM sleep during 60Hz stimulation compared to 130Hz. NREM sleep (macrostructure and microstructure) was not significantly modified in the two stimulation conditions. Tremor was significantly higher at 60Hz frequency of stimulation than 130Hz. When the three groups were compared PD-MED presented a significant lower number of REM periods and a trend towards significant of lower REM percentage than HC; PD-DBS patients when stimulated with 60Hz showed REM percentage and number of REM periods higher than PD-MED and with values similar than HC.

Conclusion: Low frequencies stimulation of STN could increase REM sleep, suggesting a possible involvement of PPN. STN stimulation at 60Hz seems to not cause modification of NREM sleep and microstructure of sleep, while DBS shows globally a modulation effect on sleep improving sleep parameters compared to PD-MED patients.