

Menstrual-related fluctuations in an early-onset Parkinson's disease patient treated with STN-DBS: correlation with local field potentials

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Introduction: It is known that sex hormones may influence motor function in Parkinson's disease (PD) patients, even though contradictory findings have been reported [1].

Objective: To describe the case of a PD patient who reported menstrual-related fluctuations of her motor symptoms and provide a correlation between objective evaluation and spectral analysis of local field potentials (LFPs).

Methods: This 21-years-old lady, harboring a homozygous mutation c.G859A in the *Parkin* gene, was treated with deep brain stimulation of bilateral subthalamic nucleus (STN-DBS) at age 20 reporting global clinical benefit after surgery. Nonetheless, she described troublesome changes in motor function in different phases of the menstrual cycle. She was thus enrolled in a study involving weekly examinations for a whole month. Serum levels of estradiol, progesterone, FSH, and LH were obtained. Objective evaluation was performed through the MDS-UPDRS III in different conditions (stim-off/med-off, stim-on/med-off, stim-on/med-on) and LFP spectral analysis was conducted using a sensing-enabled neurostimulator.

Results: In the late follicular phase (17 β -estradiol=231 pg/mL) and in the luteal phase (17 β -estradiol=155 pg/mL, progesterone=11.36 ng/mL), the clinical improvement in stim-on/med-off compared to stim-off/med-off reached its lowest values (10% and 7% respectively, highest benefit=48%). Decreased improvement in stim-on/med-on compared to stim-off/med-off (45% and 34%, highest benefit=70%) was observed as well. The suppression of beta activity was similarly affected by hormonal changes, as in the luteal phase both the stimulation alone and the combined effect of stimulation and dopaminergic therapy decreased beta activity respectively by 23% (highest suppression=42%) and 18% (highest suppression=44%). The percentage of beta activity reduction in stim-on/med-on from stim-off/med-off was predicted by serum levels of FSH (beta=0.994, P=0.006) and progesterone (beta= - 0.992, P=0.008), but not estradiol.

Conclusions: This study provides novel insights into the role of sex hormones in motor fluctuations of PD patients and their effect on the modulation of LFP activity.

References:

[1] Kompoliti K (2003) Estrogen and Parkinson's disease. *Front Biosci* 8:s391-400. <https://doi.org/10.2741/1070>.