Deep Brain Stimulation Programming Based on Local Field Potentials Detection in Parkinson Disease: A Single Center Experience

WSSFN 2025 Interim Meeting. Abstract 0128

Adriana Lucia Lopez Rios,[1] William Duncan Hutchison,[2] Carlos Anibal Restrepo Bravo,[3] Daniel Henao Lopez,[4] Manuela Pelaez Soto,[1] Luis Fernando Botero Posada,[1] Carlos Ignacio Velez Arango,[1] Juan Sebastian Saavedra Moreno.[1]

[1] Hospital San Vicente Fundación Rionegro. Colombia.
[2] Toronto Western Hospital, Universtiy Health Network. Canada.
[3] Universidad CES. Facultad De Medicina. Colombia.
[4] University of Toronto. Canada.

Corresponding author: Adriana Lucia Lopez Rios email: adrilori@yahoo.com

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Abstract

Introduction: Subthalamic nucleus DBS (STN-DBS) is an established effective therapy for refractory symptoms in Parkinson's disease (PD). Perceptive devices that detect local field potentials (LFPs) in the vicinity of the stimulating electrodes allow identification and use of physiological biomarkers that help determining the best contact to stimulate,[1] and allow chronic detection of signals for follow-up and further therapy adjustments. The investigator's interest is to describe our center's experience, Hospital San Vicente Fundacion Rionegro in the use of LFP-detecting devices in the programming of patients implanted with perceptive devices for STN-DBS in PD,[2] the signals found in the first session and their stability over time, stimulation parameters used chronically and outcomes in terms of levodopa-equivalent daily dose (LEDDs) reduction post-operatively in the last visit.

Method: Cross-sectional descriptive study involving patients with PD and STN-DBS. All patients implanted from March 2024 through June 2025 were included, LFPs were measured in the off-medication state. Variables measured included demographic, clinical (diagnosis, age at onset, disease duration, LEDDs, MDS-UPDRS-III scale) and physiological (frequency of interest FOI for sensing at first post-operative programming session, band and stimulation parameters). Data was collected on an Excel database, analyzed in JASP software 0.19.3v. Numeric variables are presented as mean (SD) and qualitative variables in absolute and relative frequencies.

Results: 25 patients (50 electrodes) were included in the analysis. Mean age at implant was 63.7 (8.1) y, mean duration of disease was 10.8 (5.1) y. All patients were implanted bilaterally at the STN. 15 (60%) patients had right-sided predominant symptoms whereas 10 (40%) had left-sided predominance. Mean FOIs were 15.8 (7.7) Hz for right-STN electrodes and 17.5 (4.4) for left-STN electrodes. All electrodes in left hemispheres showed beta band activity on the off state whereas only 2 electrodes on right hemispheres showed different FOIs (7.8 Hz on a patient with left-predominant tremor and 36 Hz on a patient with left-sided biphasic dyskinesia). No significant LFP activity was found on two patients (8%). First programming was on average on day 19 (13) post-implant. Last follow-up was done 151(120) days post-operatively. Mean LEEDs reduction was 557 (369.6) mg.

Discussion: From our knowledge, this is the first report on real world data of LFP-based programming in Latin America, with up to 1.3 years of follow-up. Our data align with previous works, with most patients exhibiting high beta-band activity in the STN related to the off state.[3] Theta activity in the contralateral STN to refractory arm tremor was found in one patient and low gamma correlated with biphasic dyskinesia in other. Parameters remained stable and no change in contact stimulated was required. High-power beta oscillations helped in selection of contact for chronic stimulation in most patients.[4]

Conclusions: LFP-based programming is a useful and efficient tool for chronic programming of STN-DBS in patients with PD. FOIs are usually within the low beta range but should be determined individually based on clinical features.

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