Movement Disorders
CLINICAL PRACTICE
CASE SERIES

Functional Dyskinesias following Subthalamic Nucleus Deep Brain Stimulation in Parkinson's Disease: A Report of Three Cases

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Abstract: Background: Functional (psychogenic) dyskinesias in patients with Parkinson's disease (PD) are exceedingly rare.

Cases: Herein we report three patients with PD who presented with functional dyskinesias in the first 3 months after subthalamic nucleus deep brain stimulation (DBS). All patients presented with chorea mimicking levodopa or stimulation-induced dyskinesias in the first 24 hours following stimulation adjustment. Two patients had generalized chorea and one, hemichorea. In all patients the abnormal movements could be induced or resolved with placebo/nocebo changes to the stimulation parameters. Following the diagnosis of a functional movement disorder (FMD), all patients improved with appropriate management.

Conclusions: Functional chorea following DBS might mimic organic dyskinesias in PD but can be accurately diagnosed using suggestibility and placebo responses to sham stimulation adjustments. Recognizing the presence of FMD following DBS is important for proper management of these patients.

The comorbidity of functional (formerly known as psychogenic) disorders and other neurological disorders is increasingly recognized and functional movement disorders (FMDs) are not an exception. A recent study estimated that functional symptoms are present in 1.4% to 7.5% of patients with Parkinson's disease (PD).[1]

Dyskinesias in PD are a common complication of dopaminergic treatment and, less frequently, of subthalamic nucleus (STN) deep brain stimulation (DBS). Chorea is the main phenomenology of levodopa and DBS-induced dyskinesias, and can be focal or generalized.

Atypical paroxysmal ballistic movements, that may be misdiagnosed as levodopa-induced dyskinesias, are identified in about a quarter of the patients described in the aforementioned study.[1] However, given the retrospective chart-review nature of this study,[1] the accurate diagnosis of these purported incongruent movements remains speculative. In fact, the prevalence and clinical features of functional chorea is not well defined in the literature as the unpredictability and variability inherent to chorea challenge the diagnosis of a FMD according to established criteria.[2] For example, the usual clinical clues used for a positive diagnosis of FMDs might be misleading in patients incorporating their involuntary movements into purposeful acts in an effort to mask their chorea, a phenomenon called parakinesia. The presence of severe chorea might also lead to bizarre motor behaviors, which can be mislabeled as functional by the inexperienced examiner, as reported for dyskinetic gait in PD patients.[3]

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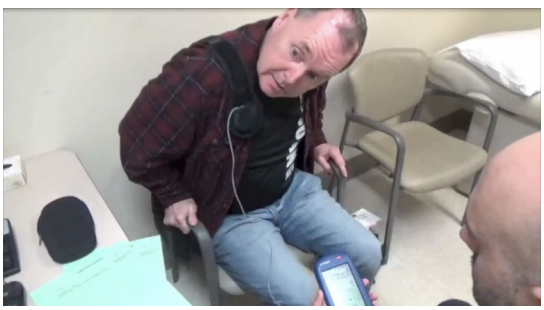
In patients who underwent DBS patients some of these challenges are mitigated by the observation of a clear placebo/nocebo response to stimulation adjustments, thus allowing an accurate diagnosis of functional dyskinesia. Herein, we describe three patients who presented with functional dyskinesias after a successful STN DBS, thus expanding the repertoire of post-DBS FMDs.[4]

Case Series

Patient 1

A 53-years-old man with longstanding untreated depressive symptoms and anxiety and a 5-year history PD, underwent bilateral STN DBS due to motor fluctuations. Psychiatric issues were mild and not deemed to affect DBS outcome. Wearing off with recurrent tremor and nocturnal akinesia were his most disabling symptoms prior to surgery. He also reported mild dyskinesias in 20% of the waking hours. Surgery was uneventful and the initial programming was performed after a 12 hours washout of medications eight weeks after surgery. At that time, during the monopolar review of contacts, he developed generalized dyskinetic movements with low amplitude stimulation in multiple contacts. These movements were inconsistent, distractible and had a variable body distribution. They could be reliably triggered or arrested by suggestion, either by pretending to increase or decrease stimulation amplitude. He also had a rest tremor affecting the right hand, which was distractible and entrainable. A diagnosis of functional dyskinesias and tremor was made (Video 1). No clear trigger could be identified except for DBS surgery.

Over the course of the following weeks, the patient reported episodes of generalized dyskinesias lasting for hours, unrelated to the intake of dopaminergic medications. These episodes were triggered by physical exertion or fatigue. He was readily informed about the etiology of these new manifestations and referred for psychiatric treatment with dramatic improvement.



Video 1. The video shows patient 1 who displays a bilateral rest tremor in the hands. This tremor is distractible with contralateral motor tasks, and there are also signs of entrainment with finger taps. In the second part of the video, generalized choreo-athetotic movements are induced and resolved after sham DBS stimulation changes.

Patient 2

A 54-year-old woman with a 12-year history of PD underwent STN DBS due to motor complications. Surgery was uneventful. She developed severe generalized dyskinesias 12 hours after stimulation was activated, two weeks after surgery, readily improved with stimulation reduction. Over the course of the following weeks, stimulation was slowly increased while dopaminergic medications were discontinued, with good control of motor symptoms. The patient reported, however, paroxysmal episodes of generalized dyskinesias at home. These episodes, described as ballism, could last for hours and cease spontaneously. They did not correspond to the timing of medications. Multiple stimulation adjustments were attempted but programming was limited by the absence of these involuntary movements during the assessments in clinic. A video of these movements recorded by the patient's family at home showed ballistic dyskinesias with sudden periods of movement arrest. Due to the inconsistent nature, lack of relationship to dopaminergic treatment or stimulation parameters, a diagnosis of functional dyskinesias was suspected. The patient endorsed having significant anxiety and family stressors. Her symptoms improved with psychotherapy alone.

Patient 3

A 56-year-old woman with a 12-year history of PD underwent STN DBS due to severe motor fluctuations and levodopa-induced dyskinesias. She also had a longstanding history of mild depression and anxiety, for which she was not taking any medication. Stimulation was started 5 weeks after surgery and slowly adjusted with good control of motor symptoms. She reported mild and transient dyskinesias of the left arm during the fourth programming visit. Levodopa was reduced with improvement. Seven months after surgery, she reported continuous left-sided dyskinesias unrelated to levodopa intake and triggered by a stimulation adjustment performed one week previously. She reported being dissatisfied with the overall benefit of surgery. Depressive symptoms were ongoing but stable. Examination at this time showed left-sided dyskinesia with parakinesia, predominantly in the upper limb. Hyperkinetic movements were sometimes stereotypical and distractible. Dyskinesia was demonstrated to acutely improve with sham stimulation reduction and could be triggered in a similar pattern by sham increase of stimulation while DBS was off. A diagnosis of stimulation-induced dyskinesias with functional co-occurrence was made (Video 2), which improved partially with stimulation changes. These movements resolved over time with no additional specific treatment.

Video 2. The video shows patient 3 having two episodes of severe paroxysmal generalized ballistic movements while at home. Phenomenology is incongruent with a medication- or stimulation-induced dyskinesia.

Additional clinical characteristics of patients are available on Table 1.

Discussion

FMDs arising after DBS have been recently described as a cause of poor surgical outcome.[4–6] DBS surgery and the postsurgical period are life changing events, while programming sessions are associated with significant anxiety and expectation, both of which might serve as triggers for the development of functional signs, in keeping with current understanding of FMD pathophysiology.[7] Additionally, increments in stimulation are often associated with sensory and motor phenomena that may be novel, unpleasant and stress-inducing to patients, and might serve as a physical trigger to the development of FMDs, similarly to how minor traumas have been recognized as common triggers in other functional disorders. Not surprisingly, all our patients developed FMD in the immediate period after the initial programming.

The suspected diagnosis of functional dyskinesia could be confirmed on the basis of clear suggestible responses to perceived changes in DBS stimulation. The nocebo response to sham stimulation was particularly useful in confirming the diagnosis, as in all patients dyskinesia could be induced in the off medication / off stimulation state. In certain circumstances, placebo responses are useful in the diagnosis of FMD and might also be integrated in their treatment conceptualization.[8] Indeed, in all of our cases, the use of placebo was disclosed to patients and served as an important tool for the explanation of the concept of functional symptoms and their pathophysiology, in an objective, open, and non-judgmental way.

The diagnosis of FMDs relies on clinical characteristics, as validated biomarkers are lacking. However, phenomenologically it might be difficult to characterize functional paroxysmal hyperkinesias, as they often involve a mixture of irregular, stereotypic, and sometimes bizarre movements. Illustrating this difficulty, they are often described in the literature with imprecise terminology such as "shaking spells", "flailing arms" or "undifferentiated movements".[9] Interestingly, Fekete and Jankovic have reported a case of well-defined functional chorea in a patient with a family history of Huntington's disease.[10] Taken together, these cases might support the hypothesis that a previous exposure to chorea (either personal or within the same family) might increase the likelihood of the expression of functional chorea, as hypothesized for other FMDs.

In conclusion, although functional chorea is rarely reported in the literature given the aforementioned difficulties, it is probably more common than currently suspected. We hope that our case series will raise awareness of its possibility among movement disorders experts.

Author Roles

(1) Research Project: A. Conception, B. Organization, C. Execution. (2) Statistical Analysis: A. Design, B. Execution, C. Review and Critique. (3) Manuscript: A. Writing of the first draft, B. Review and Critique.

R.M.: 1B, 1C, 3A
C.Z.: 1B, 1C, 3B
R.P.M: 3B
M.Z.: 3B
A.F.: 1A, 1B, 3B

Disclosures

Ethical Compliance Statement: This study was completed with University Health Network Research Ethics Board

TABLE 1 Clinical characteristics of patients

Pt	FU duration	H&Y pre-DBS	LEDD pre-DBS	LEDD at FMD diagnosis	Psychiatric comorbidities	Stimulation parameters at FMD diagnosis	Status at last FU
1	7 mo	2	1139	675.5	Depression and anxiety	R: C+ 5,6,7- 4 mA 60 ms 130 Hz L: C+ 10,11,12- 2 mA 60 ms 130 Hz[a]	Resolved
2	15 mo	2	850	0	None	R: C+ 2- 2 V 60 ms 185 Hz L: C+ 3- 2 V 60 ms 185 Hz[b]	Resolved
3	13 mo	2	1650	750	Depression and anxiety	R: C+ 1–0.5 V 60 ms 130 Hz L: C+ 9–0.5 V 60 ms 130 Hz[b]	Resolved

[a]Vercise Cartesia™ directional leads and Vercise Gevia™ pulse generator (Boston Scientific, Marlborough, MA, USA).
[b]Medtronic Activa PC™ (Medtronic, Minneapolis, MN, USA).
Abbreviations: Pt, patient; DBS, deep brain stimulation; LEDD, levodopa-equivalent dose (mg/day); FMD, functional movement disorder; H&Y, Hoehn & Yahr; FU, follow-up; mo, months.

approval (15-8777). The patients have given written and informed consent for online publication of their videos. We confirm that we have read and complied with the Journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines.

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