Deep Brain Stimulation for Parkinson's Disease: The Importance of Accurate Diagnosis

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Introduction

Parkinson's disease is a progressive neurological disorder that causes the degradation and eventual loss of dopamine producing brain cells neurons in the area of the midbrain that produces dopamine and helps regulate movement, the substantia nigra (Rocha et al., 2025). This disease is characterized by tremor, muscle stiffness, bradykinesia (unusually slow movement), and postural instability (difficulty maintaining balance) (Rocha et al., 2025). Medications that imitate dopamine, such as Levodopa, are often used to relieve motor symptoms in the early stages of Parkinson's, but many patients eventually develop motor fluctuations and dyskinesias, involuntary and uncontrolled movements, that become increasingly difficult to manage with solely medication (Dallapiazza et al., 2018; National Institute of Neurological Disorders and Stroke (NINDS), n.d).

Deep brain stimulation (DBS), surgical treatment, addresses this issue by stimulating targeted areas of the brain with high-frequency electrical impulses (NINDS, n.d.). DBS can dramatically improve tremors, dyskinesias, and stiffness, allowing for a decrease in medication reliance and an increase in quality of life (American Parkinson Disease Association (APDA), n.d.; NINDS, n.d.). However, these benefits are not guaranteed for every patient (Dallapiazza et al., 2018). Successful outcomes largely depend on accurate diagnosis and careful patient selection, and a necessary consideration of the potential risks associated with surgery and long-term device management is imperative (Dallapiazza et al., 2018). DBS is generally considered for patients with Parkinson's disease whose motor symptoms are no longer adequately controlled with medication or who experience disabling medication-related side effects despite optimized medical therapy (Dallapiazza et al., 2018; NINDS, n.d).

A proper understanding of most likely beneficiaries of DBS is just as important as a procedural understanding. Appropriate diagnosis and patient selection help maximize treatment outcomes while preventing patient harm.

Deep Brain Stimulation

Parkinson's disease develops due to the gradual degeneration of dopamine-producing neurons in the substantia nigra, thus disrupting communication within the basal ganglia, which includes a group of connected structures involved in starting, stopping, and coordinating movement (Rocha et al., 2025). As dopamine levels decline, activity within the basal ganglia networks becomes irregular (Rocha et al., 2025). DBS helps to regulate these abnormal signalings with a system consisting of three main components: thin electrodes implanted into specific areas of the brain, extension wires that connect the electrodes to an implantable pulse generator (IPG), and battery-powered pulse generators, which are typically placed beneath the skin near the collarbone (NINDS, n.d.). The IPG creates electrical pulses that travel through the extension wires and to the lead in the brain (NINDS, n.d.). This electrical stimulation helps restore more normal communication within the networks of connected brain cells responsible for movement. Unlike older lesioning procedures that reduce symptoms by permanently damaging a targeted brain region, DBS is adjustable after implantation and does not permanently destroy brain tissue, allowing for modification of stimulation settings as a patient's symptoms change (NINDS, n.d.).

The stimulation target is dependent on the severity and type of patient symptoms, as well as treatment goals. Directing the impulses at the subthalamic nucleus improves primary motor symptoms, while allowing patients to reduce their dependence on dopaminergic medication (Dallapiazza et al., 2018; Mehanna et al., 2017). Another common target is the globus pallidus internus, for which DBS effectively reduces levodopa-induced dyskinesias, a side effect of sustained reliance on medication such as levodopa (Dallapiazza et al., 2018; Mehanna et al., 2017). For patients who suffer from severe, medication-resistant tremors, targeting the ventral intermediate nucleus of the thalamus can help with reduction of these symptoms, although it has little effect on rigidity and bradykinesia (Dallapiazza et al., 2018; Mehanna et al., 2017). When appropriately selected, patients can experience substantial improvements in tremor, bradykinesia, rigidity, motor fluctuations, and dyskinesias with DBS. These improvements frequently lead to greater mobility, increased independence in daily activities, and an overall improvement in quality of life. However, DBS does not cure Parkinson's or improve every symptom. While DBS effectively manages motor symptoms, it does not affect the true progression of the disease (Almeida et al., 2026; NINDS, n.d.).

Patient Selection

Successful outcomes for DBS necessitates scrupulous patient selection. Patients with idiopathic Parkinson's disease are the ideal candidates, especially those who see symptom relief at first with medication, but continue to experience pervasive motor symptoms, medication-induced dyskinesias, or medication-resistant tremor (Dallapiazza et al., 2018; NINDS, n.d.). Pre-existing cognitive impairment, a common result of Parkinson's, increases the risk of further cognitive decline post-DBS, underscoring the importance of minimal cognitive impairment in patient selection (Almeida et al., 2026; Mehanna et al., 2017). Patients with disorders that resemble Parkinson's disease but have different causes and progression, such as multiple system atrophy or progressive supranuclear palsy, are not recommended for DBS for a variety of reasons, spanning from lack of expert consensus to suspicion of increasing cognitive impairments (Dallapiazza et al., 2018). Dementia and additional psychiatric conditions can make surgery unsafe or inappropriate, rendering these patients poor candidates due to lack of benefit or poor toleration. Additionally, symptoms that do not improve with levodopa are unlikely to respond to DBS, highlighting the importance of an accurate diagnosis before treatment.

Candidate selection requires a multidisciplinary evaluation involving a movement disorder neurologist, neurosurgeon, and neuropsychologist. In conjunction, these providers assess diagnosis, cognitive health, surgical risk, and functionality to determine whether DBS is an optimal treatment likely to provide meaningful benefit, while prioritizing minimization of potential complications.

Importance of Accurate Diagnoses

Several disorders can closely resemble Parkinson's disease, thus increasing the importance of accurate diagnosis before considering DBS. Conditions such as essential tremor, multiple system atrophy, progressive supranuclear palsy, and corticobasal degeneration often share similar early symptoms, making diagnosis challenging (Dallapiazza et al., 2018). Since Parkinson's disease is diagnosed primarily through clinical evaluation rather than a definitive laboratory or imaging test, distinguishing it from these conditions requires careful assessment by a movement disorder specialist. Although imaging can support the process of determining the disease, it cannot definitively confirm Parkinson's (NINDS, n.d.).

Mismedicine, a concept developed by and coined by Dr. Pooya Beigi and the Misdiagnosis Association and Research Institution (MARI), refers to a broad range of errors, omissions, and systemic failures that arise throughout healthcare application. It includes mistakes in diagnosis, treatment, and medication, as well as more broad topics such as lack of standardized care and quality of collaboration across disciplines (Beigi., n.d.). Mismedience focuses on the inherent interconnectivity of these issues and how addressing them as a whole can reinforce the structure of our healthcare systems (Beigi., n.d.). One way this concept applies to DBS is the importance of patient diagnosis and selection prior to surgery. Patients without idiopathic Parkinson's disease are unlikely to benefit from the procedure and may undergo unnecessary brain surgery, exposing them to surgical risks, financial burden, emotional distress, and delays in receiving treatment for their actual condition (Dallapiazza et al., 2018; Mehanna et al., 2017). Conversely, delayed diagnosis of Parkinson's disease may prevent patients from receiving DBS at the most appropriate stage of their disease, potentially leading to greater disability such as dementia for which DBS is not recommended due to risk of falling, thus reducing patient quality of life (Almeida et al., 2026; Dallapiazza et al., 2018). Reducing these errors in diagnosis and selection requires comprehensive evaluations, multidisciplinary assessment, careful patient selection, and ongoing postoperative monitoring to ensure patients receive the most appropriate care.

Conclusion

Parkinson's treatment has been transformed by the establishment and advancements of DBS, allowing for significant improvements in motor symptoms and quality of life in appropriately selected patients. The effectiveness of DBS highly depends on an amalgamation of diagnosis, patient selection, and multidisciplinary evaluation. Mismedicine exposes patients to unnecessary risks and may prevent them from receiving timely treatment. As diagnostic methods and DBS technology continue to advance, they have the potential to reduce mismedicine, thus improving patient safety and optimizing long-term outcomes.

References

American Parkinson Disease Association. (n.d.). Adaptive deep brain stimulation (DBS). https://www.apdaparkinson.org/article/adaptive-deep-brain-stimulation-dbs/

Beigi, P. (n.d.). Mismedicine. Misdiagnosis Association and Research Institute (MARI). https://mariresearch.com/

Dallapiazza, R. F., Lee, D. J., De Vloo, P., Fomenko, A., Hamani, C., Hodaie, M., Kalia, S. K., Fasano, A., & Lozano, A. M. (2018). Considerations for patient and target selection in deep brain stimulation surgery for Parkinson's disease. In M. Stoker & J. M. Greenland (Eds.), Parkinson's disease: Pathogenesis and clinical aspects. Codon Publications. https://www.ncbi.nlm.nih.gov/books/NBK536714/

Mehanna, R., Bajwa, J. A., Fernandez, H. H., & Wagle Shukla, A. (2017). Cognitive impact of deep brain stimulation on Parkinson's disease patients. Parkinson's Disease, 2017, 3085140. https://doi.org/10.1155/2017/3085140

National Institute of Neurological Disorders and Stroke. (n.d.). Deep brain stimulation (DBS). https://www.ninds.nih.gov/health-information/disorders/deep-brain-stimulation-dbs

Rocha, E. M., De Miranda, B. R., & Sanders, L. H. (2025). Neurodegeneration in Parkinson's disease: Are we looking at the right spot? Molecular Brain, 18, Article 35. https://doi.org/10.1186/s13041-025-01245-7

Viviane Almeida, Damian M. Herz, Jenny Blech, Matthias Hulser, Joachim Oertel, Daniel Martens, Gabriel Gonzalez-Escamilla, & Sergiu Groppa. (2026). Cognitive trajectories in Parkinson's disease patients after deep brain stimulation: A longitudinal study. Translational Psychiatry, 16, Article 121. https://doi.org/10.1038/s41398-026-03368-5

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