Kinematic Optimization of Deep Brain Stimulation Across Multiple Motor Symptoms in Parkinson's Disease

Thomas Mera, MS, Jerrold L. Vitek, MD, Jay L. Alberts, PhD, and Joseph P. Giuffrida, PhD

Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms including tremor and bradykinesia (slowness of movement). Drug treatment, although capable of controlling these symptoms over a number of years, becomes less effective as the disease progresses and leads to motor complications such as drug-induced dyskinesia (involuntary abnormal movements). Deep brain stimulation (DBS) provides an alternative means of controlling motor symptoms in these patients, and while DBS has been effective in improving motor symptoms, these improvements are largely based on accurate placement of the lead and the ability of medical personnel to adequately program the DBS device following implantation. While guidelines exist for DBS programming, selection of stimulation parameters and patient outcome is greatly dependent on subjective clinical assessments and the experience of the medical personnel performing the programming. The aim of this project was to assess the feasibility of using a quantitative and objective approach to programming. Two subjects underwent standard procedures for DBS programming while wearing a small, compact motion sensor. Kinematic data were collected from subjects as they completed motor tasks to evaluate DBS efficacy. Quantitative variables characterizing tremor and bradykinesia were related to stimulation parameters. Results indicated different stimulation settings might be required for optimal improvement of different motor symptoms. A standardized method of programming DBS parameters utilizing motion analysis may provide an objective method of assessment that the programmer can use to better identify stimulation parameters to achieve optimal improvement across multiple motor symptoms.

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