Programming deep brain stimulation in the globus pallidus internus for treatment of idiopathic Parkinson's disease: experience at the University of KY

J.A. Gurwell [1] • J. E. Quintero [2] • J.R. Lamm [3] • J.T. Slevin [1] • G.A. Gerhardt [2] • C.G. van Horne [3]

[1]Neurology, University of Kentucky • [2]Neuroscience, University of Kentucky • [3]Neurosurgery, University of Kentucky

Objective: To report deep brain stimulation (DBS) programming parameters and experiences in patients with idiopathic Parkinson's disease (PD) implanted with globus pallidus internus (GPi) leads.

Background: The FDA has approved treatment of PD with DBS leads implanted into either the STN (subthalamic nucleus) or GPi. Although both targets are considered effective for treating bradykinesia, rigidity, tremor, and motor fluctuations, the majority of DBS centers target the STN. Advantages to implanting the GPi include potential reduction in cognitive and behavioral adverse events compared to the STN. Additionally, the GPi is amenable to electrode targeting and placement while patients are under general anesthesia, thus offering them a more comfortable experience. We have implanted bilateral GPi in >100 patients with PD.

Methods: Data were acquired from retrospective chart reviews. Patients underwent DBS surgery in two stages. Stage I involves placement of burr holes, pulse generator, and lead extensions under general anesthesia. Stage II surgery approximately 7 days later under general anesthesia consists of lead implantation and testing. DBS therapy was initiated the day of lead implants. Electrode configuration, voltage, pulse width and frequency were compared between the initial programming day of implant and post-operatively. Reported DBS side effects and battery longevity data were collected.

Results: Bipolar and unipolar electrode configurations with a single electrode activated, amplitudes between 2.5-3.5 V, and 60 or 90 μs pulse widths were commonly effective the day of implant. Electrode #s 2, 3, 10, and 11 were most beneficial. These parameters were modified in subsequent outpatient visits. DBS pulse frequency was the least modified parameter over time, usually maintained at 180 – 185 Hz. Bradykinesia and rigidity responded more readily than resting tremor. There were infrequent side effects including facial drawing, gait disturbance, and nausea. Battery replacement occurred between 9-29 months (19.7 ± 5.9).

Conclusions: DBS in the GPi is an effective and well-tolerated treatment for PD; side effects are infrequent. Optimal lead placement can be made in the GPi while patients are under general anesthesia. A disadvantage of GPi DBS has been limited pulse generator longevity.