Combined thalamic and Subthalamic nucleus stimulation in Parkinson Disease

William Stafford¹, Fariha Zaheer², Julie Gurwell², Craig Van Horne¹,³

¹Department of Neurosurgery, ²Department of Neurology, ³Department of Anatomy & Neurobiology, University of Kentucky, Lexington, KY USA

Background
Deep brain stimulation (DBS) is an FDA approved therapy for the symptomatic treatment of movement disorders including essential tremor, Parkinson’s disease, and dystonia. Effective treatment depends upon patient selection, the appropriate selection of the target for stimulation, and post-operative programming. Typically, patients will have electrodes placed into a single unilateral target for unilateral symptoms and a single target bilaterally for bilateral symptoms. In this report, we present two PD patients who have been implanted with three electrodes representing a single unilateral target, the VIM of the thalamus to control tremor, and a single bilateral target, the subthalamic nucleus STN, to control the progressive parkinsonian symptoms.

Clinical Details
One patient with idiopathic PD initially had good response to unilateral tremor with a left VIM thalamic lead, subsequently developed severe left-sided dyskinesias and underwent right STN lead placement with good response. Ten years after his initial surgery the patient had progressive right sided dyskinetic side effects and motor fluctuations on his right and underwent left STN placement. Interestingly, the patient had significantly better symptom control with all three leads activated. A second PD patient underwent right VIM placement for tremor symptoms, followed by left STN placement for bradykinetic symptoms. She developed worsening left sided bradykinesia and rigidity and a right STN lead was added. Similarly, this patient’s symptoms have been well controlled with all three leads activated.

Technical difficulties…
• Accurate implantation in patients with ipsilateral existing, functional hardware
• Location/placement of multiple generators
• Tunneling/securing multiple lead extensions
• Goal should be to first not disrupt an existing, effective system

Conclusions
• Movement disorders involve the interaction of multiple independent circuits within the BG
• These cases demonstrate that dysfunction within these circuits may be effectively treated with DBS at different targets depending on the clinical presentation
• Stimulation of new targets does not necessarily replace effective stimulation at existing targets and can provide additional therapeutic improvements.

Future of multi-target DBS
• Hardware must evolve for ease of implantation in more complex cases
• Evaluation of role for multiple target implantation in younger patients earlier in disease course
• Continued basic science research into cellular mechanisms underlying effects of DBS

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