Deep Brain Stimulator Implantation Under General Anesthesia

John Lamm, MD[1] • Craig van Horne, MD, PhD[2] • George Quintero, PhD[3] • Greg Gerhardt, PhD[3] • Julie Gurwell, PhD[4] • Nessa Timoney, MD[2]

[1]Neurosurgery • [2]Neurosurgery, University of Kentucky • [3]Anatomy & Neurobiology, University of Kentucky

12a

Traditionally, deep brain stimulation (DBS) has been completed as a two stage procedure. The patient is asleep for one portion of the procedure which includes pulse generator implantation. The other stage of the operation is completed with the patient awake on a different day. During this portion of the procedure the electrodes are placed within the brain. The decision to place leads in awake patients allowed for observation of side effects and changes in symptoms during test stimulation. This provided intraoperative data to supplement earlier, less accurate stereotactic localization and microelectrode recording techniques, thus enhancing our ability to implant DBS leads successfully.

Recent technological advances and honing of older techniques now allow us to complete lead placement in patients under general anesthesia. Our research group is working to demonstrate safe and effective DBS lead placement in asleep patients with a combination of standard frame based localization and intraoperative microelectrode recording. Initial results are promising. Thus far, we have observed significant improvements in Unified Parkinson's Disease Rating Scale motor scores in study participants post-operatively (34.2% with stimulation off medications and 25.7% with stimulation and medications). Other institutions are currently working to demonstrate safe and effective placement in asleep patients using intraoperative imaging technology. These techniques allow functional neurosurgeons to offer DBS implantation to patients who would not normally be able to tolerate awake brain surgery due to their comorbidities or movement disorder symptoms.

The new ability to safely and effectively complete both the pulse generator implantation and electrode implantation stages of DBS surgery in patients under general anesthesia is cause for us to reexamine the need to complete this surgery in two stages. It is now feasible for the entire DBS system to be implanted during a single surgery, thus minimizing patient discomfort and conserving limited healthcare resources. Unfortunately, current Medicare reimbursement provides a disincentive to physicians and hospitals to complete DBS system implantation during a single surgery. Providers receive an average of about $22,500 to complete implantation of an entire system during a single procedure. This is not enough to recoup the cost of implanted hardware which approaches $30,000, let alone the perioperative care costs. However, hospitals receive nearly $40,000 for lead implantation and pulse generator implantation when completed as two separate procedures.

DBS system implantation for patients under general anesthesia is now possible using new technology and techniques. This will provide a more desirable option that is equally safe and effective for many patients with Parkinson’s disease. Total system implantation during a single surgery may be on the horizon but is currently discouraged by national reimbursement strategies.