



ASK DR. JANKOVIC

Joseph Jankovic, M.D. is Professor of Neurology and Director of the Parkinson's Disease Center and Movement Disorders Clinic Department of Neurology, Baylor College of Medicine (www.jankovic.org).

Q: Which patients with Parkinson's disease (PD) are ideal candidates for deep brain stimulation (DBS)?

Advances in our understanding of the brain circuitry involved in normal motor control and in motor disorders such as PD, coupled with improvements in neuroimaging and surgical techniques, have led to a resurgence of surgery as a treatment of PD. While medications, such as levodopa, dopamine agonists, amantadine, COMT inhibitors and other drugs usually provide satisfactory control of PD symptoms, many patients continue to have troublesome or disabling problems that significantly impair their quality of life. When even the most optimal adjustment of medications is not sufficient to control symptoms of PD or levodopa-related complications (e. g. motor fluctuations and involuntary movements called dyskinesias) in patients who are cognitively intact and without any medical contraindications, surgical treatment may be considered as an option.

In the past, ablative procedures such as thalamotomy or pallidotomy in which a lesion (local damage) is made in the part of the brain thought to function abnormally, were used. Over the past decade, however, another surgical technique called deep brain stimulation (DBS) has emerged as the surgical treatment of choice because of its low risk of complications and the ability to tailor the stimulating parameters to the needs of the patients. The traditional ablative procedures involve an incision in the scalp and drilling a hole through the skull. Although effective in most cases, the ablative procedures carry a risk of stroke or hemorrhage resulting in weakness on the opposite side of the body, numbness, incoordination, speech disturbance and other complications. These potential risks are compounded when the procedure is performed bilaterally (on both sides).

In the late 1980's it was discovered that tremor associated with essential tremor or with PD can be relieved not only by a destructive lesion, but also by a high frequency DBS. In this procedure, the tip of the DBS lead, which actually contains four electrodes, is surgically inserted into the desired target in the brain and the electrode is fixed to the skull with a ring and cap. An extension wire passes from the scalp area under the skin to the chest and is connected to an implantable pulse generator (IPG), a pacemaker-like device. The IPG is surgically implanted under the skin in the upper chest area near the collar bone and is connected by thin wires to the brain electrode. Since the device and the connecting wires are under the skin, they are not visible; furthermore, the patient can continue usual activities such as taking showers, swimming, and participating in other sport or work related activities. The patient can check, activate or deactivate the DBS system by placing a magnet over the chest area or a newly approved small computer Access Review Device. The typical battery life of the IPG is approximately 5 years, but this may vary depending on the individual settings and hours of use per day. While the placement of the DBS device

ASK DR. JANKOVIC CONTINUED

takes several hours in the operating room, followed by one to two days of observation in the hospital, replacing the IPG involves minor, outpatient, surgery.

During the past several years, clinicians from around the world, including those at Baylor College of Medicine, began to explore different brain targets to control not only tremor but also other symptoms of PD and complications associated with chronic levodopa therapy. We and others found that DBS of subthalamic nucleus (STN) and globus pallidus (GPi) improves various aspects of PD, including levodopa-related motor fluctuations and dyskinesias.

The major advantage of DBS over the traditional ablative procedures is that the stimulating electrodes and parameters (frequency of stimulation, pulse width, and voltage) can be adjusted and "customized" to the needs of the individual patients. Potential risks, such as hemorrhage, stroke or infection, are rare, but should be considered when making a final decision about this treatment option. Side effects, if they occur, are usually reversible, but may include weakness, speech and swallowing difficulties, and abnormal sensations. In a multicenter study (including Baylor), recently published in the New England Journal of Medicine (N Engl J Med 2001;345:956-963), 134 patients with advanced PD were studied after they received bilateral DBS of STN or GPi. The motor scores improved by 49% and 37% respectively in comparison to the non-stimulated state. Furthermore, 6 months following implantation as compared to baseline the percent time "on" without dyskinesias increased from 27 to 74 and from 28 to 64 with STN and GPi DBS respectively. Adverse events included intracranial hemorrhage in seven and lead explantation in two. While the levodopa dosage remained unchanged in the GPi group, the daily levodopa dose equivalents were reduced by 37% in the STN DBS group. Although a short-term study, subsequent experience from various centers including Baylor suggests that DBS is well tolerated over long periods of time. Occasional fracture of the lead and skin erosion requiring revision have occurred in less than 5% of our patients after chronic DBS. Recently, the Houston Veterans Administration Hospital has been selected as one of six centers in the U. S. to conduct a study designed to compare STN and GPi DBS in patients with PD as part of the Parkinson's Disease Research, Education, and Clinic Center (PADRECC) initiative.

On January 14, 2002, the Food and Drug Administration (FDA) approved bilateral STN or GPi DBS (Medtronic Activa Parkinson's Control Therapy) as "an adjunctive therapy in reducing some of the symptoms of advanced, levodopa-responsive PD that are not adequately controlled with medication". Although about 200 DBS devices have been already implanted at Baylor, the FDA approval should lead to more coverage by Medicare and other insurance carriers and thus make this treatment available to those who in the past could not afford it. The experience at Baylor and other centers around the world with DBS and other surgical treatments has been reviewed in a recent publication [Krauss JK, Jankovic J, Grossman RG, eds. Surgery for Parkinson's Disease and Movement Disorders, Lippincott Williams & Wilkins, Philadelphia, PA, 2001, pages 1-449]. For further information about DBS and other treatments for PD, log on to www.jankovic.org.