



SOUTH DENVER
NEUROSURGERY
A NEUROSURGERY ONE CORP

Patients can stay asleep for new two-step DBS

By David VanSickle, MD, PhD
Neurosurgeon, South Denver Neurosurgery

Deep brain stimulation (DBS) for patients with advanced Parkinson's disease, essential tremor, and dystonia is a complex and expensive treatment traditionally involving three separate surgeries to place the fiducial markers, implant the leads, and insert the generator; two inpatient admissions; and patient trauma due to the lead insertion being performed under local anesthesia.

But a few neurosurgeons across the country, including myself, are using a new technique with new technology that reduces the number of surgeries to two; enables the patient to be fully anesthetized during lead implantation; and cuts in half the amount of time required for implantation.

This new procedure, now available at Littleton Adventist Hospital, uses a portable CT machine (CereTom®) to provide intraoperative images that can be overlaid on an earlier MRI. This enables lead placement planning to occur *during* the surgery, providing far greater precision. It also enables us to create a trajectory for lead insertion that avoids critical structures in the passage through the brain. In a recent surgery, we confirmed that the lead was placed within half a millimeter of the target — an unattainable goal with the standard three-step technique.

This new technique also promises better long-term outcomes because it reduces the potential for lead positioning errors that occur as the brain shifts due to:

- ▶ Loss of cerebrospinal fluid during the surgery
- ▶ Patient movement
- ▶ Changes in brain position between the presurgical MRI/CT scans and during the surgery itself

In comparison, even using the newest technology — multitrack microelectrode recording (MER) — results in less-than-ideal lead implantation, with one study of 108 cases finding that the radius of the volume with a 99% chance of including the physiologically defined optimal target was 4.5 millimeters, far larger than the estimated radius of the DBS effect, which is variously estimated to be 2 to 3.9 millimeters.¹ Our group typically gets a 1- to 2-millimeter radius, but our goal is to bring that down to less than 1 millimeter.

Since the patient is anesthetized during the procedure, we can place the metal fiducial markers during this same procedure, rather than performing a separate surgery. Plus, the ability to receive real-time imaging and its benefits in terms of precision also enables us to reduce the time required for the surgery from approximately 3.5 hours to 1.5 hours.

In addition, not only do patients prefer to be completely anesthetized during the procedure, but the anesthetization prevents any patient movement, thus further reducing the risk of placement errors.

Although there have been no long-term studies of the effectiveness of DBS performed under general anesthesia using the CereTom (the procedure is simply too new), a study evaluating DBS in patients under

» continued



Littleton Adventist Hospital's CereTom® intraoperative CT eliminates procedure to place fiducial markers in DBS.

Photo courtesy of CereTom.

For more information or to schedule an appointment, visit online at southdenverneurosurgery.org or call 720.638.7500

Deep brain stimulation

general anesthesia using current techniques found it was safe and effective with similar outcomes over seven years to DBS performed under local anesthesia.²

A recent economic analysis put the average cost of subthalamic nucleus DBS with microelectrode recording at \$26,765 for unilateral, \$33,481 for simultaneous bilateral, and \$53,530 for staged bilateral for the surgical procedures alone.³ Cutting the surgical time in half should result in substantial savings.

The literature already supports the cost-utility of DBS for advanced Parkinson's disease.⁴ The fact that we can eliminate an entire outpatient surgery as well as significantly reduce operating time for the most intensive surgery promises additional savings.

In fact, if we can effect reimbursement changes to allow us to implant the generator during the lead insertion surgery, we will have taken a three-step procedure down to one, saving additional thousands of dollars.

This is very important given the high initial cost of DBS, which puts it out of reach for many



patients and results in significant restrictions on its use by payers.⁵

References

1. Montgomery EB Jr. Microelectrode targeting of the subthalamic nucleus for deep brain stimulation surgery. *Movement Disorders*. 2012; 27(11): 1387-1391.
2. Harries AM, Kausar J, Roberts SA, et al. Deep brain stimulation of the subthalamic nucleus for advanced Parkinson disease using general anesthesia: Long-term results. *Journal of Neurosurgery*. 2012; 116(1): 107-113.
3. McClelland S. A cost analysis of intraoperative microelectrode recording during subthalamic stimulation for Parkinson's disease. *Movement Disorders*. 2011; 26(8): 1422-1427.
4. Valdeoriola F, Puig-Junoy J, Puig-Peiró R. Workgroup of the SCOPE study cost analysis of the treatments for patients with advanced Parkinson's disease: SCOPE study. *Journal of Medical Economics*. 2012; [Epub ahead of print].
5. Lad SP, Kalanithi PS, Patil CG, et al. Socioeconomic trends in deep brain stimulation (DBS) surgery. *Neuromodulation*. 2010; 13(3): 182-186.

In a recent surgery, we confirmed that the lead was placed within half a millimeter of the target — an unattainable goal with the standard three-step technique.

Meet our physicians



Ben Guiot, MD
Neurosurgeon,
 board-certified by the American Board of Neurological Surgeons and the Royal College of Physicians and Surgeons of Canada. Specializing in all aspects of spine care, including:

- ⌘ Minimally invasive spine surgery
- ⌘ Spinal deformity correction
- ⌘ Reconstruction of complex spinal disorders



J. Adair Prall, MD
Neurosurgeon,
 specializing in:

- ⌘ Trigeminal neuralgia
- ⌘ Spinal disorders
- ⌘ Neuro-oncology
- ⌘ Minimally invasive and motion-preserving spine surgery
- ⌘ Stereotactic radiosurgery (Gamma Knife® and CyberKnife®)



Mariel Szapiel, MD
Neurosurgeon,
 specializing in neuromodulation for chronic diseases, including:

- ⌘ Essential tremor
- ⌘ Dystonia
- ⌘ Parkinson's disease
- ⌘ Tourette's syndrome
- ⌘ Obsessive-compulsive disorder and other mood disorders
- ⌘ Chronic intractable headaches



David VanSickle, MD, PhD
Neurosurgeon, PhD
 in bioengineering, specializing in:

- ⌘ Deep brain stimulation (DBS) for Parkinson's and essential tremor
- ⌘ Epilepsy surgery
- ⌘ Neuro-oncology
- ⌘ Spinal cord stimulator implantation for pain
- ⌘ Transsphenoidal surgery (pituitary surgery)
- ⌘ Minimally invasive and motion-preserving spine surgery
- ⌘ Stereotactic radiosurgery (Gamma Knife® and CyberKnife®)

South Denver Neurosurgery provides state-of-the-art diagnostic and treatment programs for a wide range of brain and spinal disorders. We partner with our patients and their physician teams to make individualized decisions and treatment plans. Our physicians are some of the most experienced in the Rocky Mountain region, offering the latest, most up-to-date procedures and treatment options to patients.

Physicians desiring a consult, please call: 720.638.7500.

Littleton Adventist Hospital Campus
 Arapahoe Medical Plaza III
 7780 S. Broadway, Suite 350
 Littleton, CO 80122

Porter Adventist Hospital Campus
 Harvard Park Medical Plaza
 950 E. Harvard Ave.,
 Suite 570
 Denver, CO 80210