Surgery for Deep Brain Stimulation for Movement Disorders

Steven Rogers, Vanderbilt DBS patient
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**WHAT IS DEEP BRAIN STIMULATION (DBS)?**

DBS is a surgical procedure where a surgeon implants electrodes in parts of the brain. The electrodes are wired to a small electrical generator, similar to a heart pacemaker, implanted under the skin of the chest.

The generator sends an electric current to the electrodes in the brain. This can help control abnormal activity without harming the brain. The generator can be adjusted and/or turned off if needed.

**WHERE ARE THE ELECTRODES PLACED?**

Because the right side of the brain controls the left side of the body and the left side of the brain controls the right side of the body, a stimulator will only help on the opposite side of the body. Some patients have symptoms on one side and need only one electrode. Most patients have symptoms on both sides and therefore need electrodes for both sides. This is why bilateral (both sides) implants are common.

The goal of DBS is to improve the control of movement. Depending on the type of movement disorder, this may result in loss of tremor, loss of rigidity (stiffness), loss of dyskinesia (excessive movement) or reduced dystonia. Your neurologist and neurosurgeon will discuss which symptoms DBS will improve.

**WHAT ARE THE RISKS?**

The most serious risk, though rare, is bleeding into the brain, which can cause a stroke. The effects of a stroke may range from headache to paralysis, coma or death. Other rare complications (less than 10%) include infection (which may require removal of the system), malfunction of the stimulator or electrode and movement of the electrode.

In most cases, we believe DBS is more safe and effective than other surgical techniques such as pallidotomy or thalamotomy, both of which destroy brain tissue.
I’M READY TO GET DBS. WHAT HAPPENS NEXT?

DBS is the standard of care for several conditions when medications fail. However, many insurance companies still require precertification, which can be difficult to get. This does not mean, however, that the treatment is experimental. Vanderbilt has been performing DBS since 1998 and we are consistently one of the top implanting centers in the U.S.

THE EVALUATION PROCESS

To start, call or have your doctor refer you to our program at (615) 322-0141 or (615) 875-5645.

Once we have your referral, we’ll schedule an appointment for you to meet with one of our neurologists. They will review your medical history with you, and if you’re a good candidate for DBS, you’ll take these tests:

- Physical therapy test: You’ll perform basic tasks such as writing and walking so that we can measure your symptoms. We may ask you to temporarily stop your medications for this test.

- Neuropsychological testing: We’ll test your memory and thinking by asking you questions and giving you certain memory tasks. You’ll also take these tests 6 months after surgery and yearly afterward so that we can measure how you’re progressing.

- Some patients may also have an evaluation with a psychiatrist. Several of the diseases treated with DBS have mood symptoms that should be addressed before the procedure. We’ll discuss this at your first neurology visit.

- Neurosurgical evaluation: The neurosurgeon who will perform your DBS procedure will talk with you about the process and answer your questions.

- Once you’ve finished the testing, if you’re a good candidate, we’ll contact your insurance company for precertification.
The Surgical Procedures

Stage 1: Bone Markers and Images

BEFORE THE PROCEDURE
Don’t eat or drink anything for at least 8 hours before your procedure. If you take blood pressure medicine, you should take these pills with a sip of water at your usual time. You may also take your anti-tremor/anti-Parkinson’s medications before Stage One. Your hair must be cut before this procedure using a Clipper Guide #1. You may do this yourself or have it done at your local salon 2-3 days before your procedure.

ARRIVAL AT THE HOSPITAL
The DBS coordinator will tell you where to go for placement of the bone markers and imaging. Most patients will go to the main lobby of the hospital and then the radiology department. Arrive 2 hours before your scheduled surgery time. Make sure you have someone to drive you home.

IN THE RADIOLOGY DEPARTMENT
You will have general anesthesia and 3 or 4 small screws (bone markers) will be placed into your skull on one or both sides of your head. They will stay buried beneath the scalp. While you are still under anesthesia, we will do a CT scan and MRI scan. The total time for placing the markers and doing the brain images will be about 2 to 4 hours. These bone markers will remain in place until you return for Stage 2.

After the scans are done, you’ll be taken to the Recovery Room for about 1 to 2 hours before going home.
AFTER STAGE 1

For the first 3 days after surgery, keep the incision sites clean, dry, and open to air. When you shower, wear a shower cap. You may wash your incisions on the 4th day. You can gently wipe your scalp with a damp washcloth for general cleaning. Don’t get your head soaking wet. If you shower, use a shower cap to keep the bone marker sites dry. For sleeping, you may find that a soft pillow helps to keep pressure off the marker sites.

Call our office at (615) 322-7417 if you develop a fever of 101.5 degrees or higher or if you have any more than slight redness, swelling or drainage from the bone marker insertion sites. Even though this is very unlikely, you must contact us if you feel that any of the bone markers may be loose or have moved.

Stage 2: Deep Brain Stimulator Electrode Implant

BEFORE THE PROCEDURE

Follow the instructions on your handout and stop your anti-Parkinson’s medications or those used for tremor or dystonia by 6 p.m. the evening before surgery. Do not eat or drink after midnight the night before your stage 2 procedure.

ARRIVAL AT THE HOSPITAL

The DBS coordinator will tell you where to report for your stage 2 procedure. Arrive 2 hours before your scheduled surgery time. Check in at the admitting office in the lobby of the hospital, where you will fill out forms. After that, you’ll go to the Pre-Surgery Unit.

The Pre-Surgery Unit team will help you get ready for surgery. An IV will be inserted into your arm to allow the anesthesiologist to give you medications. A Foley catheter (a tube that drains urine from your bladder into a bag) may be inserted.
IN THE OPERATING ROOM

We’ll help you get as comfortable as possible on the operating table. Most patients are awake throughout the procedure. We’ll use devices such as EKG leads to monitor your heart rate, a blood pressure cuff and a pulse oximeter on your finger to make sure you’re doing as well as possible during the surgery.

You’ll meet the surgical team who will help your surgeon and neurologist use the advanced technology available at Vanderbilt for DBS surgery.

Your head will be cleansed and draped with sterile sheets. A platform specially made for you from your CT and MRI scans will be fitted onto the bone markers. This platform will precisely align the electrodes for testing and implantation. Local anesthetic will numb your scalp, and a small, dime-sized hole will be made in the skull. The remaining procedure is not painful because brain tissue does not sense pain. Your neurosurgeon will insert a test electrode into the brain.

There are two types of test electrodes: one to record electrical activity and “listen” for the unique sounds of the brain cells to be treated; the other electrode is to “test stimulate” small areas of the brain. When the stimulator is turned on, the surgical team will watch closely to see if your symptoms improve or any side effects occur. Your team will ask you to do small things like bringing your fingers together or moving your wrist. We’ll also check your speech and your sense of touch.

The goal of these tests is to find the best possible location for the electrodes. Once we’ve done this, the test electrodes are traded out for the permanent electrode implant. The electrode implant will be secured and the incision closed. The bone markers will be removed unless you’re returning for a second electrode implant in the near future.
Some patients will have only one electrode implant; others will have two. The entire operating room procedure takes about 3-5 hours, so you may feel tired or become restless after staying in one place for so long. We’ll do our best to make you comfortable.

Once the surgery is complete, you’ll be taken to the recovery room, and your neurosurgeon will talk with your family about your surgery. You’ll be taken for a CT scan to document the electrode placement and check for any signs of bleeding or a stroke. After the scan, you’ll be taken to a room in the hospital and be discharged home the next morning.

**AFTER STAGE 2**

- Resume taking your anti-tremor or anti-Parkinson’s medications as before.
- For the first 3 days after surgery, do not get your incisions wet. On the fourth day after surgery, you may gently wash your incisions with mild soap and then pat them dry.
- It’s common to have swelling around the scalp and eyes for a few days after the surgery. Call our office at (615) 322-7417 if you have a fever of 101.5 degrees or higher; if you have any redness, swelling, or drainage from the incision; if you develop new weakness in the arms or legs; if family/friends have difficulty waking you from sleep; or for a lingering headache not relieved by medicine.
- Call your neurologist for any changes related to movement or questions about your medications, dosages, etc.
- You will be scheduled to return in 1 to 2 weeks for the generator implant.
- You will be given a prescription for pain medicine when you leave the hospital.

**Stage 3: DBS Generator (IPG) Implant and Wire Hook-Up**

**BEFORE THE PROCEDURE**

You may take your anti-Parkinson’s, tremor or dystonia medicines with a sip of water in the morning before this procedure if that is your scheduled medication time. Do not eat or drink after midnight the night before your stage 3 procedure.

**ARRIVAL AT THE HOSPITAL OR OUTPATIENT SURGERY CENTER**

The DBS coordinator will tell you where you should go for each stage of your surgery. Stage 3 procedures can be done in the main hospital or a small outpatient surgery center near the hospital. Arrive 2 hours before your scheduled surgery time.
As in Stage 2, you and one family member will be taken to the Pre-Surgery Unit. After your surgery is done, you will be taken to the Recovery Room, then discharged home 1 to 2 hours after your surgery.

**IN THE OPERATING ROOM**

For this operation, you will be given general anesthesia and be asleep. The surgery takes about 1 to 2 hours. Depending on what your neurologist and surgeon discussed with you, either one or two pulse generators will be implanted in your chest near your collarbone. An extension wire is then threaded under your skin from the top of your head to the pulse generator. The incision in your chest will be closed with stitches that dissolve. Your IPG implants will be left OFF; your neurologist will program them later.

**AFTER STAGE 3**

- For the first 3 days after surgery, do not get your incisions wet. On the fourth day after surgery, you may gently wash your incisions with mild soap and then pat them dry. Do not use ointments or creams on your incision. Do not peel of the dermabond or steristips. Some patients notice the new wires extending from the head to the generator may feel “tight” in the neck. We encourage patients to move their neck from side to side from time to time after this surgery to allow the wires to heal with less scarring.
- Call our office at (615) 322-7417 if you have a fever of 101.5 degrees or higher, or if you develop any redness that spreads out like a sunburn, swelling, or drainage from your incisions.
- You will have three appointments after Stage 3. These will include:
  1. Seeing the neurosurgeon or assistant
  2. Initial DBS programming by your neurologist and
  3. A post-operative CT scan.

All three appointments will be scheduled for one day. Medication orders before these visits will be included in your appointment information.
Stage 4: First Time Activation and Programming of Your DBS

This is when your DBS neurologist will program your device and teach you how to use the handheld controller.

Your neurologist won’t turn on your stimulator(s) for 4 to 6 weeks after Stage 2. This gives the brain a chance to heal and makes the programming of the DBS more dependable.

The initial visit to program your stimulators will last for 1 hour and will usually be scheduled in the morning with your DBS neurologist. If you need to change your appointment, call the DBS coordinators at (615) 322-0141 or (615) 875-5645.

Medication orders before this visit will be included in your appointment information. If you have questions about your DBS initial programming medications, call your DBS coordinators at (615) 322-0141 or (615) 875-5645.

Stage 5: Follow-Up

You’ll see your neurologist routinely to adjust your stimulation and medications. At 6 months after your implantation, you’ll have a more formal exam that includes the physical therapy test you did before surgery.

This will be done with your stimulator on and off (except for patients with dystonia). Your neuropsychological testing will be repeated, but in a shorter and more focused way. You can bring any family members to these visits.

You’ll continue these formal follow-up visits yearly until you and your neurologist decide otherwise.