



# MRI-Guided Asleep Deep Brain Stimulation

# Information on Deep Brain Stimulation

## What is Deep Brain Stimulation (DBS)?

Deep brain stimulation (DBS) is a type of brain surgery in which electrodes are implanted into specific targets in the brain. The targets are chosen according to the disorder we are treating. The primary goal of deep brain stimulation is to improve the patient's quality of life by managing symptoms, not to cure the disease or disorder.

It involves the placement of three device parts into the body. They are all implanted below the skin. The first part is the wires that go into the brain, which are called leads or electrodes. The second part is the battery pack, also called a generator, which is placed in the chest just below the collar bone. The third part is the wires that connect the leads to the generator.

Therapeutic stimulation does not occur until the device has been turned on. This usually occurs at least four weeks after surgery. Symptom relief can take several months to occur.

The effects of deep brain stimulation are reversible and do not permanently damage brain tissue. There is also the ability to adjust or program the stimulation to better relieve the symptoms.

## What Does it Treat?

### Parkinson's Disease

- It does not cure Parkinson's Disease
- It can help improve tremor, slowness (bradykinesia), stiffness (rigidity), dyskinesias, and dystonia, in most cases, but may not completely eliminate them
- It can help smooth out on and off times but does not completely eliminate off time
- It can decrease the need for Parkinson's medications in many patients, but not all

### Essential Tremor

- It does not cure Essential Tremor
- It can help improve tremors but may not completely eliminate them
- It can decrease the need for Essential Tremor medications, but not all

### Dystonia

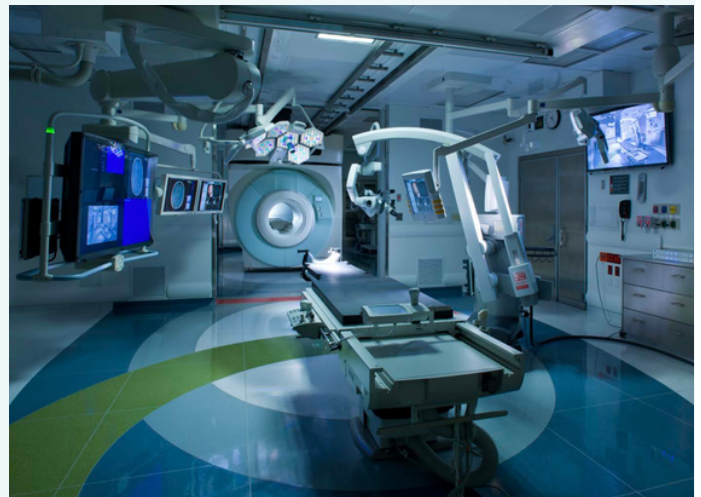
- It does not cure Dystonia
- It can help reduce symptoms of Dystonia in most cases but may not completely eliminate them
- It can decrease the need for Dystonia medications, but not all

# How is MRI-Guided Asleep Deep Brain Stimulation Surgery Completed?

The deep brain stimulation surgery is completed in two stages, while you are asleep with MRI guidance to allow for real time placement of the electrodes.

## Stage 1:

The deep brain stimulation electrodes are placed in the brain. This surgery is done asleep with anesthesia. The surgery generally lasts about 4 hours. It is performed using our most advanced brain imaging technologies, in the Advanced Multimodality Imaging Guided Operating (AMIGO) suite. The AMIGO suite is a state-of-the-art medical and surgical research environment that houses a complete array of advanced imaging equipment and interventional surgical systems. This first stage of the surgery involves an overnight stay.



## Stage 2:

One week later, the deep brain stimulator battery (an implantable pulse generator, IPG) is placed in your chest similar to cardiac pacemaker. It is then connected to the DBS electrodes. This procedure is done asleep. This is a day procedure, meaning you will go home the same day.

# Evaluation to Determine Your Candidacy

## How Candidacy is Determined for DBS

Before a patient is approved and undergoes the deep brain stimulation (DBS) procedure, the patient will first complete an evaluation with a Neurologist who will determine if you are a candidate to undergo formal evaluation in our multidisciplinary DBS Clinic.

### Step 1: Meeting with the DBS Clinic

Your meeting with the DBS clinic may involve all or some of these appointments. The DBS team will determine which appointments are necessary.

- Neurosurgery: Meet with the Neurosurgeon, who will perform your surgery
- Neurology: Meet with the Neurologist who turns on the stimulation and will target the stimulation to reduce your symptoms
- Neuropsychology: Meet with a Neuropsychologist who conducts an assessment of cognitive function
- Neuropsychiatry: Meet with a Psychiatrist who conducts an assessment of psychiatric symptoms
- Brain MRI
- On/Off Evaluation: If a patient is undergoing evaluation for the treatment of Parkinson disease motor symptoms, we conduct an evaluation assessment off your anti Parkinson medication and then on your medication

### Step 2: Case Discussion

Once the above evaluation has been completed, we will discuss it at a committee meeting to determine if the patient is an appropriate surgical candidate and if you will benefit from a deep brain stimulation procedure

### Step 3: Notification of Candidacy

You will be notified, along with your referring physician, of the committee results. If you are a candidate, we will begin surgical scheduling

# Surgery

## Before Surgery

Once you have your date, you can expect a letter that outlines the surgery's dates, times, locations, and pre- and post-operative appointments.

A preoperative evaluation will be scheduled in the Weiner Center. You will review your current medications and medical conditions to determine if anything will interfere with the anesthesia. They will guide you about what medications to take on the day of surgery and what medications need to be stopped. In addition to the guidance provided by the Weiner Center, please be aware of the following instructions about medications prior to surgery:

- Please discontinue the following medications 7 days before the surgery: Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) such as Advil, Motrin, Ibuprofen, Aleve, Naproxen, etc, and fish oil or vitamin E supplements of any kind.
- Please let us know **ASAP** if you are on **blood thinner medication** (Coumadin, Eliquis, Plavix) or have been prescribed **Aspirin** for a specific reason (ex. cardiac stent). The provider who prescribes this medication will need to provide a documented plan for stopping the blood thinner. Please contact that provider's office to obtain this information.
- If you are taking aspirin for general heart health, please discontinue 5 days before surgery

## When in the Hospital

On the day of surgery, you will not eat or drink as instructed by the Weiner Center. Pills may be taken with small sips of water.

Check-in will be at 75 Francis St Admitting Office after obtaining a screening pass at the main entrance. Family/Support members may accompany you into the hospital (please note this policy may change due to the ongoing nature of the pandemic).

When it is time for your surgery, you will be taken downstairs to the pre-operative area. You will change into a hospital gown and meet your pre-operative nurse, anesthesia team, and surgical team.

After the surgery is complete, for the electrode placement you will go to the Recovery Room and when ready, moved to the inpatient floor. Family may visit you there during hospital visiting hours. Most patients are discharged the next day after having been able to eat, urinate, move independently, and with surgical pain controlled by medication if needed.

After the battery placement, you will recover in the Day Surgery Recovery Room and be discharged from there once you are eating, urinating, and with pain under reasonable control. Patients are typically here for a total of 6 hours on this day from drop-off to discharge.

# Surgery

## Discharged from the Hospital

After each surgery you will have incisions that need to stay dry until the sutures are removed. If you are able to shower or bathe AND keep the incisions completely dry (with shower cap/Tegaderm dressing or hand held shower from abdomen down), you may. Any surgical bandages that are in place may be removed 3 days after your surgery. The incisions can stay open to air; no ointments or lotions please.

You will be seen in office for suture removal 7-10 days after the battery placement. If you live a distance away, a PCP office or visiting nurse can take the sutures out. Call the office with any concerns about the incisions. A CT scan will also be done on the day of the suture removal appointment. If your sutures are going to be removed at your PCP office or elsewhere, we will make other arrangements for getting the CT scan.

At this point, the DBS system is IN, BUT NOT ON. The DBS will not be turned on until your first programming session with the Neurology team. This is typically 4-6 weeks after surgery.

# First Programming Session

## What is the Programming Session

After your two-stage deep brain stimulation surgery has been completed and you are discharged home, the generator (battery) is not turned on. There is no active stimulation occurring with the device. The stimulation will remain off until you have your first programming appointment with your Neurologist, which generally occurs at least 4 weeks later. During this period, you will continue your regimen of medications you were taking for your neurological disorder prior to surgery.

During the first programming session, the length of the appointment can be 1-2 hours. At the initial programming session with your Neurologist, we will turn the stimulation on and begin the assessment of each of the different stimulation targets. This will help identify the locations of the target to stimulate and locations to avoid to maximize control of your motor symptoms. It can take 3 to 12 months to optimize your DBS settings.

## How to Prepare for the First Programming Session

### What to Do Before Going to the Appointment

- The night before the appointment, DO NOT take any medications overnight or any longer acting or extended-release medications that you take to treat your underlying movement disorder
- On the morning of the appointment, DO NOT take any medications that are used to treat your motor symptoms for your underlying movement disorder. However, bring them with you to the appointment
- Please bring your equipment with you to your first appointment. Please ensure the patient programmer that you bring has batteries in it.

# DBS Activities and Traveling

## How to Prepare for the Travel and What to Do for Physical Activities

### Security Devices & Traveling\*\*\*

- Security devices will NOT harm your DBS. Although this rarely occurs, it may cause stimulation to switch ON
- They may cause stimulation to switch ON or OFF and some patients may experience a momentary increase in perceived stimulation when passing through theft detectors and security screening devices
- Security personnel at most airports will conduct a “pat-down” security check instead of requiring the DBS patient to go through the security gate
- You may have to present your device identification card to airport security personnel prior to being screened
- Always bring your patient programmer with you when you travel

### Physical Activities\*\*\*

- After incisions have completely healed, it is ok to perform all physical activities, except for those that may result in repeated hard blows to the device, e.g., American football, ice hockey, and boxing
- Wear helmets for the activities you would normally have a helmet for, e.g., bicycling, skiing, snowboarding, and horseback riding
- Scuba diving is possible with certain devices. Please see your specific company's safety guidelines or reach out to your company representative for more information

**\*\*\*Disclaimer:** This is a partial list of safety concerns. Please refer to your specific device website for a more complete list of safety concerns. If you, your provider, your surgeon, or any other provider or technologist, etc. have specific questions about your DBS therapy, please contact your specific device representative.

# DBS Medical Safety Issues

## You Must Alert All of Your Healthcare Providers

You must alert all of your healthcare providers that you have a deep brain stimulation in place. When exposed to strong electrical fields, the deep brain stimulator can carry unintended electrical energy capable of causing brain injury even if the system is turned off.

It is important to always bring your patient programmer with you when you come into the hospital or clinic. If your medical provider has questions, please refer them to your device's technical support lines.

### Radiology\*\*\*

#### MRI

- It is now allowed on MOST DBS devices under specific protocols. If any MRI is required, it should be performed only at an imaging center that is able to perform the scans using the specified protocols
- Depending on the type of IPG (battery), there are specific protocols that must be followed that may require a temporary change to the programming settings during the MRI.

#### Regular X-rays, CT, diagnostic ultrasound, & DEXA Scans are allowed

- **For diagnostic ultrasound**, do not place the transducer directly over the DBS device. DBS may need to be turned OFF to limit interference
- **For mammograms**, the radiologist should be experienced with doing mammograms on cardiac pacemakers as the devices are similar. The pads should be positioned/ rotated so as not to pull/place pressure on the device or lead extenders (wires)
- **For CT**, radiation may increase stimulation during the procedure. If tolerated, turn OFF DBS during the procedure
- **For X-ray or DEXA scans**, no modifications are required

### Dentistry\*\*\*

- Prophylactic Antibiotics: We recommend 2 years of taking antibiotics prior to dental cleaning or work after initial DBS placement. We also ask you to wait 3 months after surgery before having a routine dental cleaning. If there is a concern for an infection or abscess, please see the dentist at any time. The antibiotics can come from your Neurosurgeon's office or the Dentist's office
- You may use electronic toothbrushes
- We recommend manual cleanings
- Do not allow any cords to drape over your DBS device

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# DBS Medical Safety Issues

## Surgery and Procedures\*\*\*

The device needs to be turned off for ALL surgeries. There are some older devices that may need to have voltage turned down to zero and also turned off for surgeries.

You should bring with you documentation of your settings in case your device resets during the surgery.

You should bring your patient programmer with you.

If you are planning for surgery that may potentially expose the hardware or wires, please let your surgeon know of the device prior to scheduling the surgery. Your surgeon can reach out to your device representatives for further assistance with the potential exposure.

Do not allow any electrical cords to be draped over your IPG (battery).

For the following list of procedures or exposures, there may be specific recommendations from your specific device company. Please refer to your device's website or contact the device representative.

- Electrocautery (used to stop bleeding in surgeries)
- ECG/ EKG (electrocardiogram) or EEG (electroencephalogram)
- Cardioversion
- Colonoscopy/Endoscopy
- Radiation therapy
- Radio-frequency or microwave ablation
- External defibrillators

For the following list, it is **NOT** recommended/allowed. If there are further questions or concerns by your provider, please reach out to your specific device representative.

- Lithotripsy (treatment for kidney stones)
- Diathermy(e.g., shortwave diathermy, microwave diathermy, or therapeutic ultrasound diathermy):  
Diathermy, a form of treatment that delivers heat to tissue using electrical energy, is **NOT ALLOWED!** Diathermy is used by a variety of healthcare professionals, including physical therapists, nurses, chiropractors, dentists, sports therapists, and others. Healthcare professionals may refer to diathermy using the term "deep heat" or similar terms. Diathermy's energy can be transferred through the implanted system (or any of the separate implanted components), which can cause neurostimulation system or tissue damage and can result in severe injury or death. These electrical devices (shortwave or therapeutic ultrasound diathermy) may cause damage even if no heat is created.
- TENS

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