

Deep Brain Stimulation (DBS)

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What is Deep Brain Stimulation?

Deep Brain Stimulation is an operation where an electrode is implanted in the brain and used to modulate the region of the brain causing unwanted symptoms. There are three parts of the system:

- a. An electrode (or lead) in the desired brain region
- b. An implantable neural stimulator (INS or pacemaker) placed usually in the chest to power the DBS
- c. An extension (or wire) connecting the lead to the pacemaker

Indications for Surgery

1. Thalamic DBS for:
 - a. Essential (Familial) tremor
 - b. Parkinson's tremor
 - c. Multiple sclerosis (MS) tremor
2. Globus Pallidum DBS for:
 - a. Dystonia.
 - b. Parkinson's Disease with dyskinesia.
3. Subthalamic Nucleus DBS for Parkinson's disease with fluctuating symptoms (i.e. medications produce good movement but wear off before the next dosage 'kicks in').
4. Other targets are used for:
 - a. Pain
 - b. Depression
 - c. Epilepsy
 - d. Headache

Risks

There is a rare chance (<1%) of death or stroke causing severe disability (e.g. paralysis, dementia or coma), and a low chance (5%) of infection or malfunction. Specific risks are unique to each target and must be reviewed with your neurosurgeon.

Preparing for Surgery

Before Admission

1. Medications

Anticoagulants and other medications that thin your blood such as Aspirin, Coumadin (Warfarin), Lovenox (Enoxaparin), Ticlid (Ticlopidine), Plavix (Clopidogrel) and Ginkgo must be discontinued 2 weeks before your surgery. Pradaxa (Dabigatran), Xarelto (Rivaroxaban) and Eliquis (Apixaban) must be discontinued 5 days before your surgery.

2. MRI Scan

Inform your neurosurgeon if you have any metal fragments in your body, are claustrophobic or have a pacemaker. These conditions will not permit you to undergo a MRI scan, which is used to localize the target for your surgery. Your neurosurgeon will order a CT scan if an MRI is contraindicated.

3. Music

You can bring your favourite music to the operation on a CD. Please leave it with us for future patients.

4. Hair

Do not shave your head before surgery.

Admission to Hospital

For Subthalamic Nucleus Deep Brain Stimulation:

Your surgeon's office will contact you the day before your scheduled surgery to confirm the time to report to the Jim Pattison Pavilion Admitting Department the afternoon before the day of surgery. If you are being admitted on a Monday or a Tuesday following a long weekend, please call the Admitting Department of Vancouver Hospital at 604-875-4937 after 10:00 a.m. on the day before your operation to find out when you are to come to the hospital on the day of surgery.

For Thalamic Deep Brain Stimulation: (Pre-Admission Clinic)

You will be admitted to hospital on the day of your operation. Your preparation will take place in the Pre-Admission Clinic before the day of surgery. The Clinic will contact you to arrange your appointment. Your surgeon's office will contact you the day before your scheduled surgery to confirm the time to report to the Jim Pattison Pavilion Admitting Department on the morning of surgery. If you are being admitted on a Monday or a Tuesday following a long weekend, please call the Admitting Department of Vancouver Hospital at 604-875-4937 after 10:00 a.m. on the day before your operation to find out when you are to come to the hospital on the day of surgery.

For Pallidum Deep Brain Stimulation:

Ask your surgeon's office if you will be admitted the day before or on the day of surgery and follow instructions above.

The Night Before Surgery

Whether you are in the hospital or at home, your preparation for surgery the night before is the same. Before going to bed, shower and shampoo with a medicated soap (from pharmacy) that will help prevent infection.

Do not eat food or drink alcohol after midnight the night before your surgery. Although you may drink clear fluids after midnight you should not have anything by mouth for the 3 hours before your arrival at the hospital. Clear fluids include apple juice, clear coffee and tea (no cream or sugar), water, jello. Do not drink citrus juice such as orange juice.

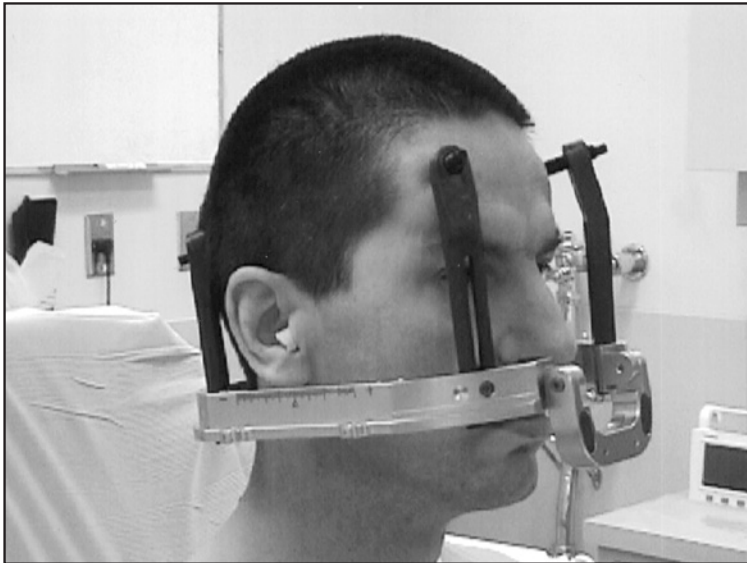
The Morning of Surgery

You will have an intravenous (IV) line started in your arm. This IV line will provide you with fluids that you would normally get from drinking. You will be given all your medications (e.g. blood pressure pills) with a sip of water. You must NOT take your Parkinson's Disease medication after midnight if you are having STN or Pallidum DBS.

The X-Ray Department

When it is time for your surgery, hospital escort will take you on a stretcher to the x-ray department where your neurosurgeon will attach a frame securely to your head. The head frame (see photograph) is a metal ring with four posts attached. The purpose of the head frame is to hold your head still and to help the neurosurgeon precisely localize the brain target.

Your scalp will be cleaned at four points and injected with a local anaesthetic (freezing). You will feel a pinprick. Once the freezing takes effect, the frame is placed around your head. Four pins will be placed to anchor the head frame to the bone of your head where you were given the freezing. Patients usually feel a tight squeeze for a minute or two and then do not feel the frame. The small pins only go a short distance into the head bone. The lightweight ring will form a circle around your head. You will wear this frame until the end of your surgery. Once the frame is secured, you will have a MRI or CT scan. Following the scan you will be taken to the operating Room.



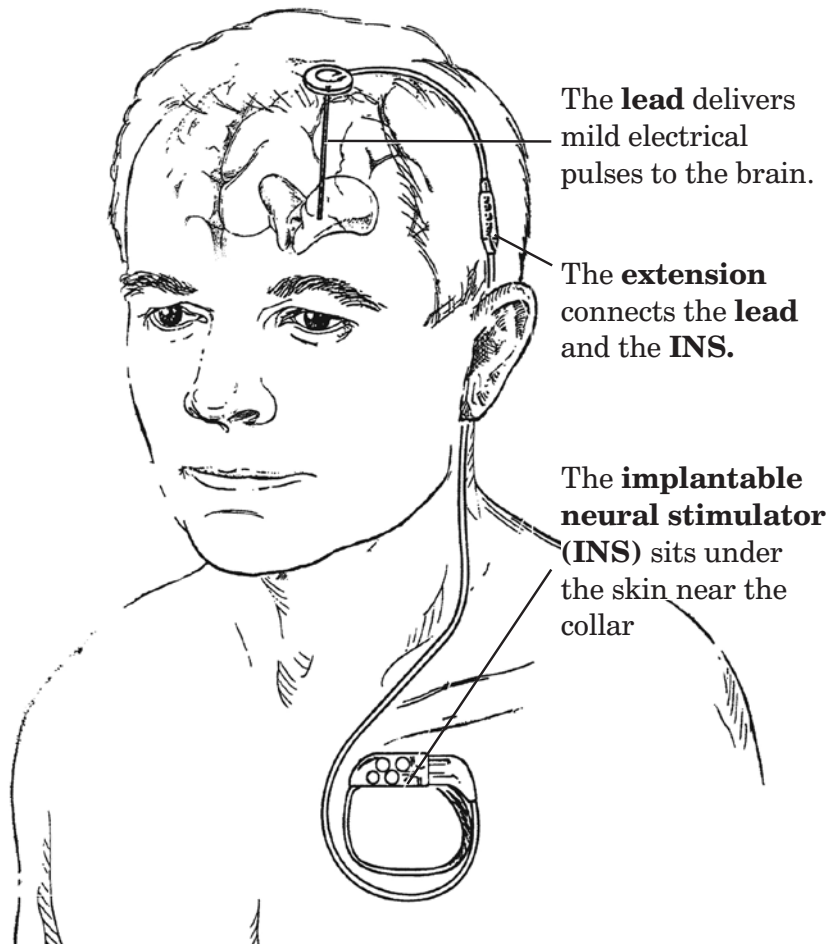
The Operating Room

Hospital escort will take you to the Perioperative Care Centre (PCC). A nurse will admit you and you will wait there on the stretcher until the operating room is ready. A family member or friend may wait with you in the PCC. The nurse who will care for you during your operation will take you to the operating room.

Your operation will be performed by a neurosurgical Team. This will be Dr. Honey together with one or more Neurosurgical Fellows (qualified neurosurgeons receiving additional training in this type of surgery). You will lie comfortably on the table with your head secured to prevent any movement during surgery. A small patch of hair will be shaved and the area cleansed with antiseptic. Your neurosurgeon will inject local anaesthetic (freezing) into your scalp. Once the freezing has taken effect, a small incision will be made in your scalp and a tiny hole drilled in the bone. You will hear the sound of the drill but you will not experience any pain. Most patients find the drilling stressful (but painless) and it lasts a minute or two. Your neurosurgeon will then lower an electrode down to the target site. You cannot feel this. In order to be certain he is in the precise target location, small pulses of electricity will be sent out of the tip of the electrode. He will then assess the effects of the stimulation, e.g. does the tremor stop or “do you see flashing lights?” or “can you feel tingling or tightness in your face?” Once the target is confirmed, the DBS electrode will be implanted in the target site.

Implanting the Neural Stimulator

The implantable neural stimulator (INS) will be implanted after placement of the DBS electrode during the second stage of the procedure. You will be given a general anaesthetic and will be deeply asleep. A small pocket under the skin below the collarbone will be made for the INS and a wire from the DBS electrode will be tunneled under the skin of the neck and connected to it.



DBS implanted in left side of brain to control symptoms on right side of body.

The Recovery Room

After your operation, you will be taken to the Recovery Room. You will stay there for an average of 1–2 hours. Your blood pressure (BP), pulse, level of consciousness, and motor strength will be monitored. Your nurses will be assessing your motor strength by asking you to do certain tasks such as wiggling your toes, pushing down and pulling back with your feet, and squeezing the nurse's fingers with your hands.

Your nurses will check your level of consciousness by asking such questions as: your name, the date, the year, and where you are. They will also check your eyes with a small flashlight to see what size your pupils are and if they react to light.

The Nursing Unit

From the Recovery Room, you will be taken to the Nursing Unit. Your nurse will admit you and continue to assess you regularly just as in the Recovery Room.

Discharge

Your neurosurgeon will discharge you within 1–2 days of your surgery. You should not do any strenuous activities for 6 weeks. Swelling of your eyelid on the side of your surgery several days after surgery is common. You will have one or two bandages on the top of your head, one behind your ear and one on your chest.

Stitches: DON'T TOUCH THEM. Please make an appointment with your family doctor to have the stitches removed 10 days after your surgery. You may wash your hair and bathe or shower the day after the stitches are removed.

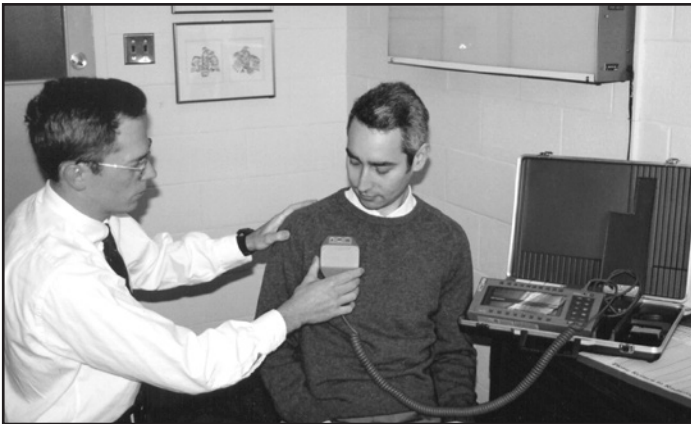
If you experience fever, chills, sweats or notice any redness, swelling or discharge from your incisions, please call your neurosurgeon's office immediately.

Follow Up Appointment

Your office visit 6–8 weeks after surgery will be coordinated by the DBS Clinic Nurse. Call the DBS Clinic for an appointment at 604-875-4111 ext. 69584.

Turning on the Stimulator

The stimulator is usually turned on 6–8 weeks after surgery once all the swelling from the operation has resolved. Adjustments to the stimulator can be made as necessary to improve control of your symptoms. The timing of the adjustments varies between patients. It may take a few weeks or up to 6 months until the stimulator is fully adjusted. Turning on the stimulator and adjustments to the settings will take place in the DBS Clinic.



Patient Programmer

Your stimulator is turned on and off with a remote control device. You will be given the device as well as an information booklet and instructions on how to use it at your first DBS Clinic visit after the surgery.

Commonly Asked Questions

- 1. Do neurosurgeons routinely perform this operation?**
Vancouver General Hospital is the only centre in B.C. performing this surgery. The Neurosurgery Team has performed over 500 cases (as of 2016).
- 2. Do I stop my medication before surgery?**
 - a) Anticoagulants and other medications that thin your blood such as Aspirin, Coumadin (Warfarin), Lovenox (Enoxaparin), Ticlid (Ticlopidine), Plavix (Clopidogrel) and Ginkgo must be discontinued 2 weeks before your surgery. Pradaxa (Dabigatran), Xarelto (Rivaroxaban) and Eliquis (Apixaban) must be discontinued 5 days before your surgery.
 - b) Anticoagulants and blood thinners can be restarted two weeks after surgery.
 - c) Parkinson's medication may be stopped the night before surgery.
 - d) Most others medications (e.g. blood pressure) should be continued.
- 3. Is the procedure painful?**
No. The scalp is frozen with local anesthetic and the small hole in the skull should be painless.
- 4. Will I be awake for the procedure?**
Yes. During placement of the electrode you will be awake to help the neurosurgeon find exactly the right target. During stage two, placement of the INS, you will be asleep.
- 5. Is the operation a cure?**
No. It is designed to control specific symptoms.
- 6. Does everyone get better?**
In our last survey of 50 consecutive patients, 90% of patients reported the operation was a success.

7. Will the surgery interfere with other treatments?
No, it should not. You must NOT have a MRI after surgery without telling your doctor and the MRI technician.

8. How does the hole(s) in my head heal?
They are small, the size of a dime. The hole is filled with a plastic cap to hold the electrode in place.

9. When can I wash or dye my hair?
The day after the stitches come out.

10. How big is the Implantable Neural Stimulator?
About the size of a pocket watch. The INS for two sided procedures (left and right brain) is bigger.

11. How are the adjustments made to the stimulator?
In the DBS Clinic, the nurse or doctor can change the settings through your shirt with a telemetry device.

12. How long will the benefits last?
That depends on how fast your disease is changing. The battery will last 2–4 years on average depending on how strong a current is needed to control your symptoms.

13. What about airport security?
Tell security you have a ‘pacemaker’. They will screen you separately (like the heart pacemaker patients).

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