Deep Brain Stimulation (DBS)

What is deep brain stimulation?

Deep brain stimulation (DBS) uses electrical stimulation to treat neurological conditions. These include Parkinson disease (PD), tremors, and dystonia. DBS can help with movement problems. Stiffness, trouble walking, and slowed movement are examples. While it does not cure these conditions, DBS can ease symptoms. It may also decrease the amount of medicine you need. It may also help treat depression. Research is ongoing to find out how well it works.

Movement-related symptoms of PD and other neurological conditions are caused by faulty electrical signals in the parts of the brain that control movement. DBS does not damage brain tissue. Instead, it blocks the faulty signals that cause tremors and other movement symptoms.

DBS is done by placing an electrode inside the brain. The electrode is connected to a very small neurostimulator (electrical generator) put in your chest or abdomen. Electric current is sent from the neurostimulator to the electrode in the targeted part of brain tissue involved in the symptoms.

Why might I need DBS?

DBS may be a choice for certain people with neurological problems when medicines don't work as well. Or when side effects of the medicines interfere with daily activities.

One of the main uses of DBS is to treat symptoms of PD. It can help when medicines don't work well anymore, or when movement problems or side effects worsen. DBS does not stop PD from getting worse with time though.

DBS may also be used to treat:

- **Essential tremor.** This health problem causes a rhythmic trembling of the hands, head, voice, legs, or trunk.
- **Intractable pain.** This pain can’t be eased by usual medical or surgical treatment.
- **Dystonia.** This is a movement disorder in which muscles contract involuntarily.
- **Epilepsy.** This is a long-term (chronic) disease that causes seizures. The seizures can happen without warning and can happen again and again.
- **Mental health (psychiatric) conditions, such as obsessive-compulsive disorder, anxiety and depression.** When these conditions don’t respond to medicine or other treatments.

Your healthcare provider may have other reasons to advise DBS.

Not all people with these health problems are good candidates for DBS. Talk with a neurologist who specializes in movement disorders to see if DBS may be right for you.

What are the risks of DBS?

As with any procedure, complications can occur. They may include:

- Reactions to anesthesia
- Bleeding in the brain
- Leaking of cerebrospinal fluid (the clear fluid around the brain and spinal cord)
- Infection
- Stroke

- Pain or swelling at the surgery site
- Movement of the electrode from the original place
- Allergic reaction to parts of the implanted device
- Device wire becomes disconnected or does not work correctly
- Neurostimulator or wires that come out through the skin

Side effects that may occur after the surgery include:

- Temporary tingling in the face and limbs
- Slight paralysis
- Problems with speech or vision
- Jolting or shocking sensation
- Dizziness or loss of balance
- Reduced coordination
- Trouble with concentration
- Tiredness or fatigue
- Depression
- Forgetfulness and issues finding the right words for a situation.

There may be other risks, depending on your specific health condition. Talk about any concerns with your healthcare provider before the procedure.

How do I get ready for DBS?

DBS needs a commitment to participate in evaluations, procedures, and consultations before and after the procedure. DBS is usually only available in large medical centers. If you don't live close to a medical center that offers DBS, you may need to spend a lot of time traveling. The procedure and appointments can be costly. It's also important for you to have realistic expectations. Although DBS can improve symptoms, it will not cure the condition.

Before DBS, you will have assessments to determine whether this is a good choice for you. You will need tests to check memory and thinking. You may see a psychiatrist to determine if you have a condition, such as depression or anxiety that needs to be treated before DBS.

Ask your healthcare provider about what you might need to do in the days and weeks before DBS, such as changing your diet or stopping certain medicines.

What happens during DBS?

Implanting a DBS lead generally needs a hospital stay of a day or longer. Procedures may vary based on your condition and your healthcare provider’s practices. The lead and neurostimulator may be put in at the same time. Or the neurostimulator may be placed in a separate procedure after the lead is put in. Talk with your healthcare provider about what to expect.

Generally, surgery for DBS goes like this:

Implantation of lead

1. Numbing medicine will be injected into your scalp. A head frame will be placed to keep your head in the right position for the procedure. A computed tomography (CT) scan or magnetic resonance imaging (MRI) scan will be taken to find the target site in the brain for the electrode.
2. You will be awake during the surgery. You will be asked to move certain parts of your body as the lead is being placed.
3. After more numbing medicine is injected into your scalp, the neurosurgeon will drill a small hole in the skull to insert the lead.
4. Recordings will be taken as the lead is moved through the brain tissue. This helps pinpoint the exact place for the lead. You may be asked to move your face, arm, or leg at certain times while the recordings are being taken.
5. Once the precise location for the lead has been found, it will be attached to an external neurostimulator. Electrical stimulation will be given through the lead for a short time to see if symptoms improve. Your surgeon may cause side effects on purpose with electrical stimulation to make sure the lead is in the right place.
6. The lead will be attached after it's in the right place. A wire to connect the lead to an extension to the neurostimulator will be placed under the scalp.
7. The hole in the skull will be closed with a plastic cap and stitches.

Placement of the neurostimulator

This may or may not be done at the same time the electrode is placed.

1. You will receive general anesthesia so that you are asleep during the procedure.
2. The neurostimulator will be inserted into a “pocket” under the outer layers of skin tissue. This is often just under the collarbone, or in the chest or abdomen.
3. An extension wire will be attached to the neurostimulator and to the brain lead.
4. After the neurostimulator is implanted, it's programmed to send an electrical signal. Programming is often done a few weeks after the neurostimulator is put in.

Programming the neurostimulator

Programming the neurostimulator is a process that occurs over time. You will likely go back several times for adjustments to the settings. Your medicines may also be adjusted. The goal is to control your symptoms with the most appropriate amount of electrical stimulation and medicine.

Once your “best” settings have been determined, you will need to go back from time to time for checkups. Your healthcare provider will plan your follow-up schedule based on your particular situation.

The neurostimulator is about the size of a stopwatch. It's powered by a long-lasting battery that generally lasts 3 to 5 years. When the battery starts to wear out, the neurostimulator will be replaced with a new one in an outpatient procedure.

What happens after DBS?

In the hospital

You will be watched for complications, such as seizures. In general, the hospital stay after a DBS procedure is 24 hours. But you may stay longer if problems develop. Before you are discharged from the hospital, arrangements will be made for a follow-up visit with your healthcare provider. They will also give you instructions for home care.

At home

Once you are home, it’s important to keep the incisions clean and dry. Your healthcare provider will give you specific bathing instructions. If stitches were used, they will be removed during a follow-up office visit. If adhesive strips are used, they should be kept dry. They generally will fall off within a few days.

Living with a DBS neurostimulator

Consider these precautions. Talk about them with your healthcare provider:

- Always carry an ID card that states you have a DBS neurostimulator. You may also want to wear a medical ID bracelet.
- Let airport security screeners know you have a neurostimulator before going through the airport detectors. In general, airport detectors are safe. But the small amount of metal in the neurostimulator may set off the alarm. If you are chosen for more screening by handheld detector devices, politely tell the screener that the detector wand should not be held over your neurostimulator for longer than a few seconds. These devices contain magnets. They may affect the function or programming of your neurostimulator. You may want to bring a note from your healthcare provider about your implanted device.
- You may not have certain MRI procedures. That's because these machines use large magnets for imaging.
- You should stay away from places with large magnetic fields, such as power generators and automobile junkyards that use large magnets.
- Don't use heat in physical therapy to treat muscles.
- Stay away from high-voltage or radar machinery, such as radio or TV transmitters, electric arc welders, high-tension wires, radar installations, or smelting furnaces.
- If you are scheduled for surgery, tell your surgeon that you have a neurostimulator long before the operation. Also ask your healthcare provider’s advice on whether anything special should be done before and during the surgery. The electrocautery device that controls bleeding may interfere with the neurostimulator.
- When doing physical, recreational, or sporting activities, protect yourself from harming the neurostimulator. A blow to the chest near the neurostimulator can affect how it works. If you are hit in that area, you should contact your healthcare provider right away to have it checked.

Long-term effects of DBS

DBS can help improve symptoms of tremors, stiffness, slowness, and movement problems. It can also help with medicine therapy by decreasing the dose needed. Decreasing the dose of medicine can ease side effects of long-term medicine use. Many people see their symptoms improve for several years after the procedure. They are able to do basic activities, such as eating, toileting, and dressing. Memory, thinking, and mood may or may not be affected. Many neurological conditions are progressive. So later problems can develop. If they do, the gains gotten from DBS may eventually be lost.

Next steps

Before you agree to the test or procedure make sure you know:

- The name of the test or procedure
- The reason you are having the test or procedure

- What results to expect and what they mean
- The risks and benefits of the test or procedure
- What the possible side effects or complications are
- When and where you are to have the test or procedure
- Who will do the test or procedure and what that person’s qualifications are
- What would happen if you did not have the test or procedure
- Any alternative tests or procedures to think about
- When and how you will get the results
- Who to call after the test or procedure if you have questions or problems
- How much you will have to pay for the test or procedure