



What are the advantages of deep brain stimulation over other surgical treatments available for Parkinson's disease (DBS)?

Deep Brain Stimulation (DBS) has many advantages:

- DBS does not cause permanent damage in any part of the brain, unlike thalamotomy and pallidotomy, which surgically destroy tiny areas of the brain and therefore is permanent and not reversible.
- The electrical stimulation is adjustable and reversible as the person's disease changes or his or her response to medications change.
- Because DBS is reversible and causes no permanent brain damage, use of innovative not yet available treatment options may be possible. Thalamotomy and pallidotomy result in small, but permanent changes in brain tissue. A person's potential to benefit from future therapies may be reduced if undergoing these procedures.
- The stimulator can also be turned off at any time if DBS is causing excessive side effects without any long-term consequences.

Types of Hardware available Battery / Pulse Generator

- Non-rechargeable - Once implanted lasts for 3-4 years depending upon the stimulation settings programmed. It will need to be replaced when battery is exhausted.
- Rechargeable – This device needs to be recharged similar to a mobile phone. It lasts for 10-15 years.

Leads: Unidirectional Directional



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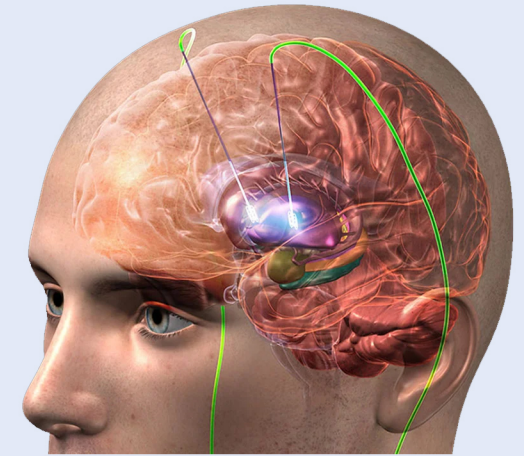
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DEEP BRAIN STIMULATION FOR PARKINSON'S DISEASE

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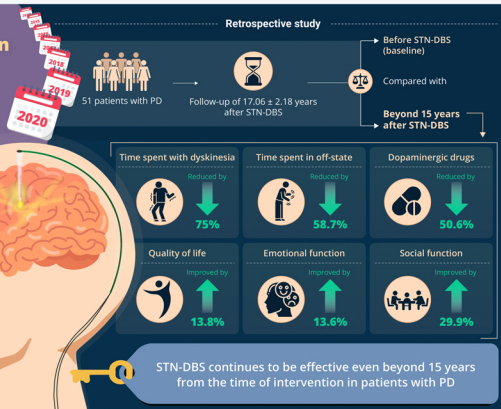
Long-term Effects of Deep Brain Stimulation in Parkinson Disease

Deep brain stimulation of the subthalamic nucleus (STN-DBS) is a recognized surgical treatment option in advanced Parkinson disease (PD).

STN-DBS is known to improve motor symptoms in patients with PD.

Study question

What are the effects of STN-DBS in patients with PD beyond 15 years after surgery?



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Neurology

Deep Brain Stimulation (DBS) is a treatment for symptoms of Parkinson's disease, including tremors, stiffness, and trouble walking. It can also treat side effects of Parkinson's medicines. It isn't a cure for Parkinson's and won't stop it from getting worse. But it may be an option if you've had the disease at least 5 years and don't get enough relief from medicine.

In deep brain stimulation, electrodes are placed in the targeted areas of the brain. The electrodes are connected by wires to a type of pacemaker device (called an implantable pulse generator) placed under the skin of the chest below the collarbone.

Once activated, the pulse generator sends continuous electrical pulses to the target areas in the brain, modifying the brain circuits in that area of the brain. The deep brain stimulation system operates much the same way as a pacemaker for the heart. In fact, deep brain stimulation is referred to as "the pacemaker for the brain."

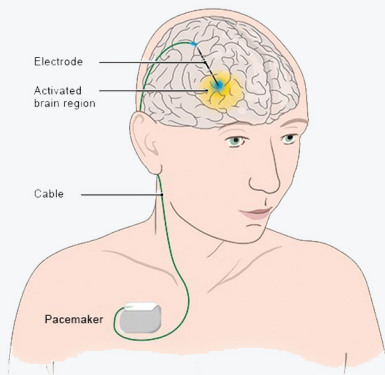
Who should consider Deep Brain Stimulation surgery?

When a PD patient still has a good benefit from medication but also bad OFF periods and/or troublesome dyskinesias, despite changes in the medication dosing and timing, then DBS may be an option. Good candidates also need good social support.

Patients who may not be good candidates include those with: Serious memory problems, hallucinations, severe depression and significant imbalance when walking even when ON.

What are the symptoms of advanced Parkinson's disease?

When patients first start taking their Parkinson's disease (PD) medicines, the benefits usually last throughout the whole day. However, as PD worsens, the patient may notice that the benefit from the medicine doesn't last until the next dose, this is called "wearing off". When the medicine wears off, PD symptoms such as tremor, slowness, and difficulty walking may reappear. When the medication is taken again the symptoms improve again and the good period is called an "ON" period while the bad period is called "OFF". Patients may also develop involuntary movements (twisting and turning) called dyskinesias usually as a side effect of these medications, which may be troublesome.



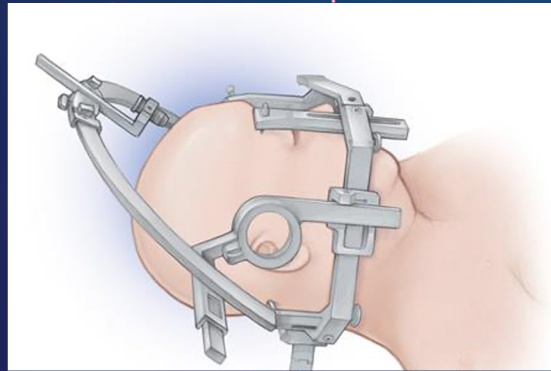
What symptoms are unlikely to benefit from DBS?

Deep brain stimulation is unlikely to improve any movement symptoms that levodopa does not improve. Some people with Parkinson's have balance problems and speech problems that do not respond to medication. These types of issues are referred to as 'treatment resistant symptoms' and deep brain stimulation can actually make them worse. Specialists will check carefully for these problems before considering surgery. Some people with Parkinson's have memory problems and other cognitive problems related to the condition. These types of issues might also get worse after deep brain stimulation, so it is important to exclude these problems before considering surgery.

How are patients chosen for DBS?

Once you are an eligible candidate for deep brain stimulation surgery, a few tests will be required to proceed further.

- An evaluation by a neurologist who specializes in treating PD
- A brain scan (MRI or CT) to be sure there are no brain changes that might prevent surgery
- A consultation with a neurosurgeon who performs the DBS surgery
- A thorough evaluation including memory and thinking



What is the procedure?

The DBS surgical procedure usually takes several hours. For most patients, one electrode is placed in each side of the brain. A frame holds your head (skull) during surgery so the electrode can be placed precisely. A small hole is drilled in each side of the skull so two thin, insulated wires (each with electrodes known as contacts) are inserted into the brain. The lead implanted in the left side of the brain controls symptoms affecting the right side of the body and the lead implanted in the right side of the brain controls symptoms on the left side of the body. Each of the two electrode wires is tunneled through the skin and connected to a pacemaker-like device (called a neurostimulator) that is placed under the skin in the chest.

Is surgery safe?

In general, DBS is a safe procedure. As with any surgery, there are some risks associated with it. Some of the risks of DBS include infection surrounding the device hardware and bleeding in the brain or implant site. Your neurosurgeon will discuss additional risks with you. Studies have shown that the risks are relatively small, but they should be kept in mind when considering DBS. Most side effects are mild and temporary, such as: Weight gain, difficulty finding words, decreased quality of speech and pacemakers or electrode infections.

- Surgical complications include brain hemorrhage, brain infection, wrong location (misplacement) of the DBS leads and less than the best location (suboptimal placement) of the leads.

- Hardware complications include movement of the leads, lead failure, failure of any part of the DBS system, pain over the pulse generator device, battery failure, infection around the device & the device breaking through the skin as the thickness of skin & fat layer change as one ages.

- Stimulation-related complications occur in all patients during the device programming stage. Common side effects are unintended movements (dyskinesia), freezing (feet feel like they are stuck to the floor), worsening of balance & gait, speech disturbance, involuntary muscle contractions, numbness & tingling (paresthesia), & double vision (diplopia). These side effects are reversible when the device is adjusted.

DEEP BRAIN STIMULATION FOR PARKINSON & DISEASE

What benefits can one expect after treatment?

- It may help control your movement symptoms for a longer period of time than medication alone. The motor symptoms that responded well to medication before surgery are the most likely to improve with deep brain stimulation.

- In particular, deep brain stimulation can be an effective treatment for severe Parkinson's tremor, even if the tremor does not respond well to medication.

- It may significantly improve motor fluctuations – where your mobility varies throughout the day. This can increase the number of hours you spend in an 'on' state each day, when your symptoms are well controlled.

- Parkinson's medication can be significantly reduced. This will reduce the risk of medication side effects, such as involuntary movements (dyskinesia).

- It may give you some relief from non-motor symptoms, such as sleep disturbance and pain.