



California Pacific
Medical Center

A Sutter Health Affiliate
With You. For Life.

Deep Brain Stimulation

CALIFORNIA PACIFIC NEUROSCIENCE INSTITUTE NEUROSURGERY SERVICES

At California Pacific Medical Center, neuroscience specialists bring new and advanced surgical options to the physicians we serve and the patients they care for. Working collaboratively, our neuroscience experts provide comprehensive patient care using leading-edge technology for treating the most complex neurological conditions. Through this procedure profile, our physicians illustrate surgical techniques for treating essential tremor and Parkinson's disease that cannot be controlled with medication alone.

At California Pacific Medical Center we go beyond medicine to treat the whole person, not just the illness. Our promise to our patients is to deliver the highest quality expert care with kindness and compassion. We believe that medicine can transform a body. Going beyond medicine can transform a life.

For patient referrals:

1-888-637-2762

www.cpmc.org/neuroscience

Beyond Medicine.

Deep brain stimulation (DBS) is a surgical treatment where a medical device, similar to a cardiac pacemaker, is implanted into the brain to manage the treatment-resistant movement disorders of essential tremor (ET) and Parkinson's disease (PD). Various aspects of these conditions can be controlled using DBS.

DBS received FDA approval in 1997 to control essential tremor and in 2002 for advanced Parkinson's disease and is used only when medications no longer adequately control the condition.

The DBS system consists of three components:

- 1. Implanted pulse generator (IPG) neurostimulator** – similar to a cardiac pacemaker, the small sealed device containing a battery and electronics, is implanted beneath the skin in the chest. The neurostimulator produces the electrical pulses emitted through the electrodes.
- 2. Lead** – an insulated coiled wire with four micro-thin electrodes is placed in one of three areas of the brain. Each wire ends in a 1.5 mm electrode at the tip to be implanted in the brain. The electrodes are positioned in the target site for stimulation. The Lead is connected to the IPG by the extension.
- 3. Extension** – a subcutaneous extension connector of insulated, coiled wire connects the DBS lead to the neurostimulator.

How does DBS Work?

Symptoms of tremor, rigidity, dyskinesia, and bradykinesia can be treated in PD. Targeting the brain's message relay centers, subthalamic nucleus (STN) or internal globus pallidus (Gpi), DBS works by stimulating the area that influences motor control. The system delivers electrical pulses that affect brain cell activity, blocking selected brain areas to alleviate movement problems. Micro-thin neurostimulator electrodes implanted in the brain deliver continuous stimulation. Most cases require bilateral implantations. Bilateral lead implantations can be managed by a single IPG or dual IPG systems.

Symptoms of tremor can be treated in ET. Targeting subregions of the thalamus, DBS works in ET by blocking areas that generate tremor activity.

How is DBS Implanted?

The surgery is divided into two parts:

- 1.) lead implant
- 2.) IPG and extension implant.



Image showing deep brain lead implants with extension wires.

Surgery is performed by a neurosurgeon with expertise in stereotactic techniques.

A stereotactic frame is placed on the patient's head and high-resolution images are obtained. The patient remains awake and an active participant while targeting the stimulation areas and during lead implantation. A hole for the lead is drilled into the cranium to reach the targeted area. The stereotactic system stabilizes the head during surgery and while the neurosurgeon maps the brain. Either MRI or CT imaging equipment is used to locate the targeted stimulation area. The neurosurgeon works with the patient in the operating room to test stimulation sites to ensure maximum effectiveness and minimum side effects. In many cases, temporary micro-electrodes are used to identify the exact stimulation target prior to permanent electrode implantation.

Once the lead site is selected to the satisfaction of the surgeon and the patient, the patient is fully anesthetized. The extension wire is passed under the skin of the scalp, neck and shoulder connecting the lead to the neurostimulator IPG which is implanted subcutaneously near the clavicle.

Patients use a hand-held magnet to turn the battery-operated neurostimulator on and off. Battery life varies depending on usage, stimulation setting and power requirements. The neurostimulator can be replaced in a simple outpatient procedure when the battery runs low.

Additionally, the surgery can be reversed or adjusted at any time by a neurologist or other health professional.

Who is a Candidate for DBS?

The American Academy of Neurology estimates that 10 to 20% of all PD patients are candidates for surgical intervention. At California Pacific we have an 85% surgical success rate and 60% of our patients have been able to reduce medications for PD. Candidates include movement disorder patients whose symptoms are inadequately controlled by medications and where the condition constitutes a significant functional disability. The most important predictor of success of DBS for PD is a history of initial excellent response to L-dopa (Sinemet).

Some Contraindications to DBS Implantation:

- ~ Heightened risk of intracranial hemorrhage
- ~ Pregnancy
- ~ Unsuccessful test stimulation
- ~ Coagulopathies
- ~ Dementia

What are the Risks and Potential Side Effects?

- ~ Tingling sensation (paresthesia)
- ~ Speech problems (dysarthria)
- ~ Lead malpositioning
- ~ Stimulation ineffective to control symptoms
- ~ Facial and limb muscle weakness or partial paralysis (paresis)
- ~ Intracranial hemorrhage
- ~ Infection
- ~ Pain at surgery site

California Pacific Medical Center DBS Implant Volume Data

2008	29
2007	12

Patient Referrals and Information

Patients need a physician referral prior to scheduling DBS evaluation and surgery. Medical records, pertinent laboratory reports, and imaging reports can be forwarded to the California Pacific neurosurgeon to determine referral indication appropriateness.

Regional Referral and Transfer Center

For patient referrals, transfers or more information about DBS surgery, please call the *Regional Referral and Transfer Center at 888-637-2762.*

Insurance Coverage

Medicare and many private insurance plans cover DBS surgery. In order to avoid unexpected medical expenses, patients should contact their insurance company prior to evaluation and treatment to confirm coverage and obtain prior authorization for this service.

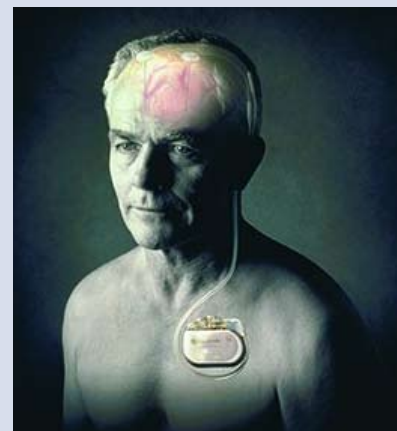


Image courtesy of Medtronic, Inc.