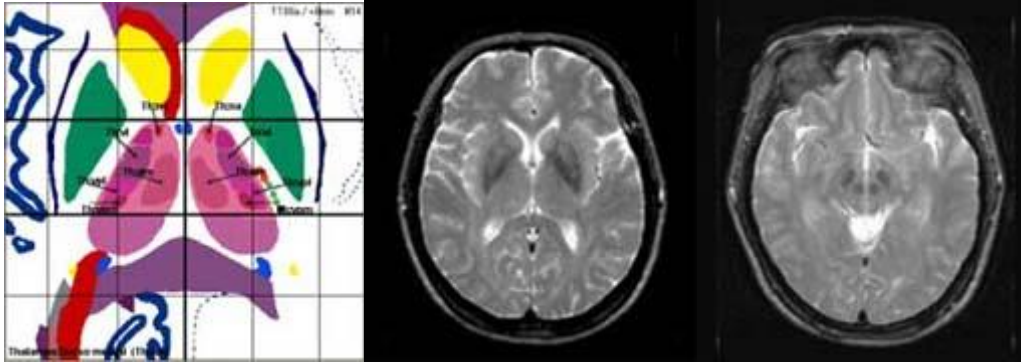


Surgery for Parkinson's Disease (PD)

PD is a degenerative disorder involving body movements. Millions of people are affected world wide. It is caused by degeneration of nerve cells in a special area of the brain called substantia nigra. These cells produce a neurotransmitter called dopamine. Excessive dopamine activity leads to misfiring in the brain circuitry at the deep part of the brain called basal ganglia. The basal ganglia consists of the caudate, putamen, globus pallidum, and subthalamic nuclei.



Recent evidence suggests hyperactivity of the **subthalamic nuclei** (STN) leads to the classical symptoms of PD. The STN is now the most favoured target in surgical treatment of PD.

Classical Manifestations of PD: tremor, rigidity, bradykinesia (slowness of movement), freezing episodes, gait difficulty, and postural instability. These symptoms can occur either in isolation (tremor alone) or various combinations.

Medical Therapy: Most PD should respond favourably to medical therapy. The main stay of treatment is L-dopa (Sinemet) in various forms. However, PD is a progressive illness which worsens over the course of time. Medical treatment will fail in ~10% of PD patients who either show poor response to drugs, or exhibit serious side effects (dyskinesia: involuntary movements) from long term usage of L-dopa.

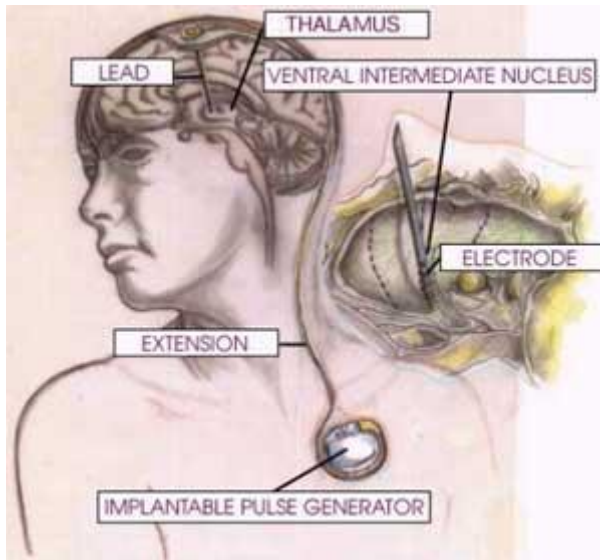
Surgical Therapy

1. Lesioning

Destroying a specific target such as VIM of the thalamus (for tremor alone) - VIM thalamotomy, or GPI of the pallidum for other symptoms- pallidotomy. Lesioning is performed by radiofrequency (heat) or **Gamma Knife** (radiation). The latter is non-invasive and may be the only surgical option for patients who are medically unfit. For bilateral symptoms, deep brain stimulation is preferred because bilateral lesioning produces severe speech or cognitive disturbances.

2. Deep Brain Stimulation (DBS)

Deep Brain Stimulation surgery for Parkinson's disease was first performed in the eighties in Grenoble, France by Dr. A. Benabid, a pioneer in neurosurgery for movement disorders. It is now FDA approved and well accepted as a surgical technique.



DBS of the VIM nucleus relieves tremor for PD and also patients suffering from essential tremor. **DBS of one or both STN nuclei provides excellent control of all PD symptoms, including L-dopa related dyskinesia.**

The Procedure

1. Stereotactic frame placement under local anaesthesia.
2. MR targetting.
3. Calculation of co-ordinates of the target.
4. Burr-hole under local anaesthesia.
5. Insertion of electrode to the target, guided by macro-stimulation and or micro-electrode recordings. The patient stays awake and interacts continuously with the neurologist and neurosurgeon to find the best location (within 1 or 2 mm) to achieve maximum benefit.
6. Under general anaesthesia, the electrode is connected to the programmable pulse generator placed under the skin of the chest wall.
7. The movement disorder team will activate the generators and determine the correct settings to obtain the maximum clinical benefit with minimal side effects. Once the optimal settings have been determined, the patients can turn stimulation on and off with a small magnet. For example, some patients may turn the generator off at bedtime.

Risks of DBS is small in experienced hands for suitably selected patients. There is a 2% risk of serious bleeding inside the brain, and a small chance of infection plus other possible remote risks of burr-hole and anaesthesia.