

Parkinson's Disease Information Sheet 1.5

Surgery for Parkinson's Disease

Idiopathic Parkinson's disease (Pd) is a progressive neurological condition which is characterised by motor (movement) and non-motor symptoms. The gold standard treatment for Pd continues to be levodopa therapy. As the disease progresses and levodopa associated side effects such as dyskinesia (involuntary movements) develop some people with Parkinson's (PWP) may be considered candidates for surgical intervention.

Parkinson's related surgery is available in most states in Australia and has been considered a major breakthrough in the management of appropriately selected patients with Pd. There is no place for surgery in the management of early Pd.

Stereotactic neurosurgery for Pd is not a modern technique but dates back to the 1950s. At that time the procedure known as thalamotomy targeted the thalamus to provide relief from tremor. Later in order to address dyskinesia and to a lesser degree bradykinesia (slowness of movement), the globus pallidus was targeted (pallidotomy). Morbidity and mortality were high and with the discovery of levodopa, surgery became less relevant as a treatment option.

Less than a decade following the discovery of levodopa it became clear that the drug had limitations and subsequently the revival of neurosurgery in Pd occurred in the early 1980s. By this time advances in stereotactic procedures had reduced complication rates and enhanced accurate targeting.

These procedures consisted of permanent destruction (lesioning) of a targeted part of the brain but bilateral lesioning resulted in unacceptable problems such as speech, swallowing and cognitive changes.

More recently deep brain stimulation (DBS) has become a widely practised and accepted form of management for complex Pd with an estimated 40,000 patients having undergone the procedure worldwide. Improvements in understanding

basal ganglia dysfunction in Pd resulted in a third target, the subthalamic nucleus (STN). STN DBS is now the most widely performed surgical procedure for Pd. DBS can be safely performed bilaterally.

Indications

Patient selection is decided by a movement disorder specialist with DBS expertise. Suitable patients must:

- Demonstrate symptoms responsive to levodopa
- Experience motor fluctuations and/or dyskinesia or disabling drug resistant tremor

Patients who are not suitable for DBS are those affected by dementia, active psychosis and non-response to levodopa. Older patients may not be suitable candidates due to a greater risk of haemorrhage and worsening cognition.

Procedure

The surgery is performed while the patient is awake in order to monitor the response to the stimulation. This requires full co-operation and a certain amount of mental resolve on the part of the patient. Targeting requires a combination of MRI, CT, test stimulation and microelectrode recording of cell firing patterns.

The second stage of the surgery is performed under general anaesthetic and involves the implantation of the pulse generator. Subsequently, over a period of time, the settings are adjusted to optimise the effects and minimise side effects. Battery life is currently four to five years.

Long-term studies indicate motor symptom benefits last approximately five years post surgery. Quality of life improvements are recorded at least two years post surgery.

Adverse Effects

Stimulation related adverse effects include facial contraction, tingling and/or speech changes.

Hardware related effects include infection, broken leads and/or device failure.

Medication related effects are due to either excessive or a reduction in Pd medication.

Each DBS site will have varying side effects. Both the site and the patient selection process are individualised and carefully assessed.

DBS does not impact on disease progression. It is not curative or neuro-protective. Generally, DBS will not provide any improvement greater than the best effect or 'on' achieved from levodopa. It can be used to address the disabling dyskinesia resulting from levodopa. DBS does not improve major non-motor symptoms such as cognition, poor balance or autonomic dysfunction.

DBS remains a reversible treatment for complex Pd and currently new targets such as pedunculo pontine nucleus (PPN) are being trialed and evaluated as an alternative site which may improve postural instability and gait disorders.

Reference

Rodrigues, J. (2008). *Parkinson's Disease A General Practice Approach* (2nd ed.) Perth, Australia: Parkinson's Australia.

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