Deep Brain Stimulation (DBS) of patients with Parkinson’s disease (PD).
Scandinavia Movement Disorder Society
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Background
Patients with Parkinson’s disease, who no longer can be improved by optimising the oral medical treatment, have shown significant benefits from treatment with DBS. DBS has been shown to improve motor function, reduce tremor, motor fluctuations and dyskinesias, decrease use of medication and increase Quality of Life (see reference 1. and references herein). There is a tendency to operate patients at an earlier time of disease than before.

Criteria for referral to a specialised Movement Disorder Centre for possible DBS
Patients with levodopa responsive Parkinson’s disease
Preferably with a duration of Parkinson’s disease > 5 years
**Moderate to severe on-off motor fluctuations
and/or
**Moderate to severe dyskinesias
and/or
Medical refractory **moderate to severe tremor
** Defined as moderate to severe impact on quality of life
* Patients with tremor dominated PD can be treated with VIM DBS also >75 years of age

Exclusion criteria
Dementia
Significant medical resistant psychiatric disease (e.g. severe depression)
Significant medical conditions with limited life expectancy
Conditions that prevent surgery or MRI

Patient eligible for DBS
Patient eligibility for DBS is determined at the Movement Disorder Centre after:
Brain imaging
Neuropsychological assessment of cognitive function and psychiatric symptoms
Levodopa challenge test
Cardiac pacemaker is not a contraindication for DBS
It is not always necessary for the patient to be awake during surgery
It is not always necessary to remove all hair

**Expected outcome of DBS treatment**
Expected outcome corresponds to the effect of an optimal levodopa dosage on the motor symptoms
Tremor reduction
Significant reduction of motor fluctuations
Decreased use of medication depending on surgical target, see below
Significant reduction of dyskinesias
Levodopa unresponsive symptoms like
  Axial symptoms as postural instability
  Freezing of gait
  Dysarthria
will not improve

**Surgery in Parkinson’s disease**
Target

  The subthalamic nucleus (STN) to treat the cardinal symptoms tremor, rigidity and hypokinesia and reduce motor fluctuations
  The internal part of globus pallidus (GPi) is an alternative target to treat cardinal symptoms and especially dyskinesias, however often results in less reduction of medication
  The ventral intermediate nucleus of thalamus (VIM) to treat tremor only

The electrodes are implanted bilaterally and connected to a subcutaneous lead and impulse generator (IPG) localised beneath the clavicle
Each electrode has four contacts and stimulation contact and parameters are adjusted by computer telemetry
Surgical complications
Intracranial hemorrhage (appr. ½ -1 %)
Infection

Side effects
Worsening of dysarthria
Sometimes worsening of gait and balance especially patients > 65 years of age
Eyelid apraxia
Dystonia
Psychiatric symptoms (usually transient, treatable and potentially preventable) (7,9)

- Confusion
- Depression
- Mania
- Psychosis
- Apathy
- Increased risk of suicide

Neuropsychological symptoms
- Reduced verbal fluency

Hardware complications

Patient management and follow-up
During the first 3-6 months frequent controls in the outpatient clinic to adjust stimulation parameters and medication to obtain maximum effect of stimulation
Shared control (referral neurologist and DBS centre) of symptoms and disease development and stimulation effect
Battery replacement every 3-4 years
Rechargeable battery available.
DBS is in general a contraindication for MRI. However MRI can be performed at the DBS centre if the MRI/neurostimulator guidelines elaborated by the manufacturer are followed
Diathermy including shortwave diathermy, microwave diathermy or therapeutic ultrasound diathermy are contraindicated
It is safe, however, to perform diagnostic ultrasound examination in a patient with DBS. In case of surgery in patients with DBS monopolar electrocoagulation should be avoided. Bipolar is recommended.

If a patient with DBS needs examination by ECG, EEG or EMG the DBS can be temporarily switched off during the procedure to avoid disturbance of the examination.

References


18. Østergaard K, Sunde NAa, Dupont E. Effects of bilateral stimulation of the subthalamic nucleus in patients with severe Parkinson’s disease and motor fluctuations. Mov Disord 2002;17: 693-700

19. Østergaard K and Sunde N. Evolution of Parkinson’s disease during four years of bilateral stimulation of the subthalamic nucleus. Mov Disord 2006;21:624-631