Deep Brain Stimulation (DBS) in patients with Parkinson´s disease (PD).

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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 with

****Moderate to severe on-off motor fluctuations**

and/or

****Moderate to severe dyskinesias**

and/or

****Moderate to severe *medical refractory 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 , and duration <5 years.

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

Cardiac pacemaker is **not** a contraindication for DBS!

Patient eligible for DBS

Patient eligibility for DBS is determined at the Movement Disorder Centre after:

Brain imaging

Levodopa challenge test

Neuropsychological assessment of cognitive function and psychiatric symptoms

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 and 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

It is not always necessary for the patient to be awake during surgery. It is not always necessary to remove all hair.

Surgical complications

Intracranial hemorrhage (appr. 1⁄2 -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.

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