Randomized Controlled Trial comparing imaging-based programming with threshold-assessment based programming of Deep Brain Stimulation in Parkinson's Disease.

Published: 21-11-2023
Last updated: 10-01-2025

The aim of this study is to assess whether the effectiveness of STN DBS for the treatment of Parkinson motor symptoms using imaging-based DBS programming is non-inferior compared to DBS programming with the current standard practice of clinical...

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Movement disorders (incl parkinsonism)
Study type	Interventional

Summary

ID

NL-OMON53191

Source
ToetsingOnline

Brief title
DBS Imaging-based vs. Threshold-Assessment-based Programming (DBS-ITAP)

Condition

- Movement disorders (incl parkinsonism)

Synonym
Parkinson's Disease

Research involving
Human

Sponsors and support

Primary sponsor: Amsterdam UMC
Source(s) of monetary or material Support: Ministerie van OC&W,Medtronic B.V.,ROMO foundation / TKI

Intervention

Keyword: Deep Brain Stimulation, Imaging, Parkinson's disease, Threshold assessment

Outcome measures

Primary outcome

The primary outcome is the mean change from baseline to six months follow-up on

the Movement Disorders Society Unified Parkinson*s Disease Rating scale motor

examination part (MDS-UPDRS III) score in standardized OFF-drug phase.

Secondary outcome

A. Motor symptoms in ON-drug phase (MDS-UPDRS III)

B. Number of hours in OFF-drug phase (MDS-UPDRS IV)

C. Dyskinesia duration and severity (MDS-UPDRS IV)

D. Non-motor symptoms (MDS-UPDRS I)

E. Motor aspects of experiences of daily living (MDS-UPDRS II) for OFF- and

ON-drug phases

F. Level of physical disability, measured with the Academic Medical Center

Linear Disability Score (ALDS)

G. Disease specific quality of life (Parkinson*s Disease Questionnaire 39)

H. Adverse effects

I. Patient satisfaction on the outcome of treatment

J. Patient evaluation of the burden of therapy

K. Proportion of patients for whom it is necessary to switch to the other

intervention arm during the follow-up period

L. Use of care (e.g., number of hospital visits and telephone calls)

M.Total duration of programming sessions

N. Final DBS settings (e.g., electrical current, pulse-width, and frequency)

O. Proportion of patients at six months stimulated at same contact point (for both hemispheres) suggested by threshold assessment or imaging

P. Local field potentials for patients with PerceptTM PC (Medtronic, Dublin, Ireland) DBS system (see chapter 5.1 and 6.2)

Exploratory objectives also include the correlation between the assessment of PD symptoms and neuronal activity at the level of the STN at different time scales (seconds to minutes). This includes:

A. The correlation of AI-based analysis of bradykinesia (a), tremor (b), dyskinesia (c) and freezing (d) in weekly home videos with the LFP data.

B. The correlation of AI-based analysis of bradykinesia (a), tremor (b), dyskinesia (c) and freezing (d) in videos recorded during clinical practice with the LFP data.

C. The change in LFPs due to DBS or medication.

D. Difference between DBS responders (more than 30% improvement on MDS UPDRS III score), DBS superresponders (more than 70% improvement on MDS UPDRS III score), and DBS non-responders.

Study description

Background summary

Deep Brain Stimulation (DBS) of the subthalamic nucleus (STN) is an established treatment for disabling motor symptoms of Parkinson*s disease (PD). Correct programming of DBS settings to provide optimal stimulation within the target region is crucial for a successful clinical outcome. To date, programming of the DBS settings is done with the threshold assessment. For each contact point the current is increased in small steps and the severity of motor symptoms and possible adverse effects are assessed with each step. This process is challenging and time consuming because of the vast number of possible parameter combinations. This results in long programming sessions that can be exhausting for patients and often lead to inconclusive results due to fatigue. Imaging techniques have been improved greatly over the years and could be useful for programming DBS based on patient-specific anatomy.

Study objective

The aim of this study is to assess whether the effectiveness of STN DBS for the treatment of Parkinson motor symptoms using imaging-based DBS programming is non-inferior compared to DBS programming with the current standard practice of clinical threshold assessment in DBS of the subthalamic nucleus in patients with Parkinson's disease.

Study design

The study is a single centre prospective, randomised, open-label, blinded end-point (PROBE design) clinical trial. Following surgery for DBS implantation, in total 132 patients will be randomized to DBS programming with initial imaging-based contact point selection only (Imaging group) or to DBS programming with initial threshold assessment-based contact point selection (Threshold group). Follow-up is six months.

Intervention

In both groups (i.e., Imaging and Threshold), DBS programming will start ±4 weeks after DBS surgery. For this programming patients are admitted in the hospital for a day.

In the Imaging group, the stimulation parameters are determined with help of the software program Brainlab (München, Germany) with the module GUIDE XT (Boston Scientific, Marlborough, US). Both programs are CE-marked and commercially available. The programs are already used in the regular patient care in the Amsterdam UMC with the preparation of the deep brain stimulatie surgeries and for the programming of patients where we are unable to find optimal parameters with the threshold assessment. The recommendation of the optimal contactpoint(s) and stimulation parameters will be made based on the

localisation of the electrodes towards the patientspecific anatomical structures. In the program Brainlab the pre-operative MRI-scan and the post-operative CT-scan will be fused. Based on these images of the patient and the anatomical atlas of the thalamus and the basal ganlgia as reference, a 3D reconstructie will be made of the STN and the surrounding structures, with the DBS-electrodes visible within. In this reconstruction we determine which contactpoint(s) is located on the most ideal spot (the dorsolateral part of the STN). With help of the Volume of Tissue Activated (VTA; i.e., the tissue enclosed within an iso-surface of the activation function), the optimal parameters will be determined, and will be passed on to the nurse specialist that will program the DBS-system. The fusion and determination of the contactpoint(s) and stimulation parameters will be carried out by a research team member with clinical experience in the use of Brainlab and GUIDE XT. Programming the DBS-system itself will be performed by the nurse specialist. The frequency and pulse width will be set to a standard of 130 Hz and µs for all patients. The optimal amount of electrical current will also be proposed to the nurse specialist. The start amount of current will be lower than the proposed amount, given that the Parkinson mediaction will be phased out over the following months. The exact amount of current will be determined by the nurse specialist, based on the clinical response of the patient. This method is already in use in the regular patient care for patients where efficient stimulation parameters can not be found with the threshold assessment.

In the Threshold group, the preferred stimulation parameters for DBS programming will be determined according to current clinical practice. During the threshold assessment, the amount of electrical current needed to generate symptomatic improvement and the amount of electrical current needed to generate adverse-effects are determined for every contact point of both DBS leads by increasing current with 0.5 mA steps from 0 to approximately 5.0 mA. With each step, severity of Parkinson symptoms and presence of possible adverse-effects are assessed. For each side (i.e., left and right), the contact point with the most favourable trade-off between clinical improvement and adverse-effects will be used for stimulation.

Study burden and risks

The results of the study may well contribute to reducing the burden of DBS treatment. If imaging-based contact point selection is non-inferior to threshold assessment-based contact point selection, this may result in more efficient programming sessions with reduced programming time (less use of health-care resources) and less discomfort for patients.

The screening at baseline, the threshold-assessment and the assessment at six months are part of the current standard of care. Participating in this study does not lead to extra hospital visits; the extra assessments relating to the trial are scheduled during standard of care appointments or via phone. The

surplus of burden related to assessments for both groups consist of the randomization, the informed consent conversation (estimated time 30 minutes), a phone call for follow-up at three months (estimated time 15 minutes) and an extra questionnaire (estimated time 10 minutes) at six months follow-up.

If the participant chooses participate in the part investigating the correlation between real time objectified Parkinson*s disease symptoms and neuronal activity, 2 extra hospital visits will be scheduled. These visits typically last around 30 minutes and are usually combined with one of the standard hospital visits related to DBS care. Additionally, the patient is requested to record a weekly video of their symptoms, taking approximately 5 minutes each time.

The patient has a 50% chance of being randomized to imaging-guided DBS programming (Imaging group). The expected benefit for this group is that they will not need the threshold-assessment and therefore have less burden due to less hospital visits for the programming. There are no extra risks associated with participation in this study. If the stimulation parameters found with imaging-guided programming do not yield enough effect in the Imaging group, the healthcare professionals can choose to execute the threshold-assessment for these patients.

Contacts

Public
Amsterdam UMC

Meibergdreef 9
Amsterdam 1105AZ
NL
Scientific
Amsterdam UMC

Meibergdreef 9
Amsterdam 1105AZ
NL

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

Parkinson diagnosis based on the clinical diagnostic criteria of Movement Disorder Society
Referred to Amsterdam UMC for DBS screening

Exclusion criteria

Previous functional stereotactic neurosurgery
Dementia
Current depression or psychosis

Study design

Design

Study type:	Interventional
Intervention model:	Parallel
Allocation:	Randomized controlled trial
Masking:	Single blinded (masking used)
Control:	Active
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	03-01-2024
Enrollment:	132
Type:	Actual

Ethics review

Approved WMO Date:	21-11-2023
Application type:	First submission
Review commission:	METC Amsterdam UMC
Approved WMO Date:	31-07-2024
Application type:	Amendment
Review commission:	METC Amsterdam UMC

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL84601.018.23