Using connectomes for individualised deep brain stimulation in essential tremor

Published: 11-03-2025
Last updated: 19-04-2025

Identify the functional and structural connectomes related to tremor control and to DBS-induced ataxia in patients with ET. The aim of the FINEST study is to improve the treatment of patients with ET and DBS-induced ataxia, by using the connectome...

Ethical review	Approved WMO
Status	Pending
Health condition type	Movement disorders (incl parkinsonism)
Study type	Observational non invasive

Summary

ID

NL-OMON57398

Source
ToetsingOnline

Brief title
FINEST

Condition

- Movement disorders (incl parkinsonism)

Synonym
shaking, tremor

Research involving
Human

Sponsors and support

Primary sponsor: Academisch Medisch Centrum
Source(s) of monetary or material Support: Veni 2022 09150162210043

Intervention

Keyword: connectome, DBS, fMRI, tremor

Outcome measures

Primary outcome

Connectome atlas of tremor, tremor control and DBS-induced ataxia.

Secondary outcome

Objective 1.1: Visualize functional connectomes related to tremor, tremor

control and DBS-induced ataxia.

Objective 1.2: Integrate functional with structural connectomes.

Objective 1.3: Link connectome to neuronal tremor activity.

Study description

Background summary

Essential tremor (ET) is the most common movement disorder. ET can be severely disabling and is medication-resistant in about half of patients. Deep brain stimulation (DBS) can spectacularly improve symptoms in medication-refractory patients. In DBS, electrodes are implanted in the brain providing electric current to surrounding brain tissue. The DBS target for ET is a white matter bundle called the dentatorubrothalamic tract, which connects the cerebellum and thalamus. Although DBS can be an effective treatment, its use is severely limited in one-third of patients due to troublesome DBS-related side-effects such as ataxia (coordination and balance difficulties). This is caused by unintentional spilling of electric current into adjacent structures. Current DBS programming is based on basic flowcharts supplemented with the effects of certain settings in a trial-and-error setting. This is inefficient and often ineffective.

Study objective

Identify the functional and structural connectomes related to tremor control and to DBS-induced ataxia in patients with ET. The aim of the FINEST study is to improve the treatment of patients with ET and DBS-induced ataxia, by using the connectome for individualised DBS. During this study the connectome will be

identified. In a follow-up study (not part of this protocol) the tolerability of connectome-guided DBS settings will be assessed, and the effectiveness of connectome-guided DBS will be tested in a randomised crossover trial.

Study design

Cross-sectional observational study.

Study burden and risks

Participants will undergo one study visit. The visit will take about 4,5 hours and consists of a morning and afternoon part. The morning part of the protocol consist of a clinical evaluation with DBS ON and OFF (DBS-OFF and DBS-BASELINE) and a bipolar review for ataxia assessment (DBS-ATAXIA). Different neurological tests and switching off the DBS stimulator are standard procedures in the department. For DBS-ATAXIA, side-effects such as speech, coordination and gait difficulties will be induced by specific DBS settings. This can cause temporary discomfort for the patient. If settings are not tolerated, they can be changed acutely to settings that are tolerated by the patient. During these assessments, video recordings and tremor recordings using kinematic sensors will be collected. This will take up 3 hours. After a half-hour break we will continue with the afternoon session. During a 1 hour afternoon session, the 3 different DBS settings (DBS-OFF, DBS-BASELINE and DBS-ataxia) will be tested during 6.5 minute scan sessions. The proposed investigations bear virtually no risks and are expected to be well-tolerated. The use of the DBS system in 'MRI-mode' during the MRI acquisition is on-label. All safety requirements regarding DBS in an MR-environment will be met in accordance with the clinical physicists responsible for the MRI (see chapter 11 for an elaborate structured risk analysis). There is a small risk for uncovering coincidental findings on MRI-imaging. This risk is judged to be small considering the fact patients have already undergone pre-operative MRI for DBS work-up. Relevant coincidental findings should therefore have already been picked up before study participation. Clinically relevant coincidental findings will be communicated with the patient, the general practitioner and/or treating neurologist/nurse practitioner. Due to the very specific aim of this study, only patients suffering from severe tremor and are being treated with DBS can participate. There is no direct benefit from this study for the participants.

Contacts

Public
Academisch Medisch Centrum

Meibergdreef 9

Amsterdam 1105AZ
NL
Scientific
Academisch Medisch Centrum

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

- Pre-operative diagnosis of ET
- Bilateral implantation of MR-compatible DBS electrodes (model 3389 or model B33005)
- A 3T MR-compatible neurostimulator system (model B35200 - Percept PC)
- The neurostimulator is implanted in the subclavicular region

Exclusion criteria

- Inability to undergo a 1-hour MRI-scan session (including inability to lie flat for a prolonged amount of time and/or claustrophobia).
- High impedance values on any contact point for both DBS electrodes, indicating open/short circuits or cable fracture.
- A 3T MR-incompatible DBS system, including implantation with:
o Medtronic DBS Pocket Adaptor Model 64001 or 64002
o Other discarded DBS-components in the body
o Hardware from other DBS manufacturers besides Medtronic

Study design

Design

Study type: Observational non invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Basic science

Recruitment

NL

Recruitment status:	Pending
Start date (anticipated):	01-04-2025
Enrollment:	25
Type:	Anticipated

Medical products/devices used

Registration:	No

Ethics review

Approved WMO

Date:	11-03-2025
Application type:	First submission
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	NL86083.018.24