

STAGE MASTER 2

LOCAL FIELD POTENTIALS OF THE SUBTHALAMIC NUCLEUS IN PATIENTS WITH PARKINSON'S DISEASE AND NEUROPSYCHIATRIC FLUCTUATIONS

Objectives:

To define the electrophysiological signature of neuropsychiatric fluctuations in patients with Parkinson's disease, treated with subthalamic stimulation.

Summary:

Neuropsychiatric fluctuations are disabling and very common symptoms in Parkinson's disease, with anxiety, sadness, lack of energy and motivation during the OFF condition (i.e. when the dopaminergic treatment does not work) and wellbeing, self-confidence, up to euphoria in the ON condition (i.e. when the dopaminergic treatment works).

Subthalamic stimulation is an effective treatment for Parkinson's disease complicated with fluctuations. Beyond its clinical role, subthalamic stimulation has opened new avenues of research allowing the recording of subthalamic activity in Parkinsonian patients. Several studies have shown that akinesia correlates with an abnormal synchronized activity in the beta band (13–30 Hz) in the motor dorsal subthalamic nucleus, which is reduced by motor improvement induced by levodopa. However, the electrophysiological signature of neuropsychiatric fluctuations is unknown to date.

Several electrophysiological studies point toward a role of the subthalamic nucleus also in the affective domain. So far, the electrophysiological studies have been performed only during or immediately after surgery, before the implantation of an internal pulse generator (IPG). The advent of new stimulators allowing recording local field potentials (LFPs) offers the possibility to record the subthalamic activity in patients chronically treated with subthalamic stimulation at distance of surgery. This is very interesting since it allows the possibility to investigate whether the activity could change over time after chronic subthalamic stimulation.

Methods:

This is a prospective study in Parkinsonian patients treated with subthalamic stimulation. Local field potentials (LFPs) and scalp EEG will be recorded without and with dopaminergic medication at rest in the acute postoperative phase, and at 3 and 12 months after surgery.

Neuro-psychometric scales will be used to measure the neuropsychiatric state of the patients.

The study will involve interactions with clinicians and neuroscientists, including both experimental and theoretical aspects:

- Participation to the experiment: recording of EEG and LFP and the synchronization of the signal in patients with Parkinson's disease and subthalamic stimulation with a neurologist
- Signal processing and data analysis of LFP and EEG. Analysis will be performed with Matlab.

Supervision:

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