

**Effective use of microelectrode recording for the implantation of deep brain electrodes into the nucleus subthalamicus in advanced Parkinson's disease**

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**Objective:** For electrode implantation into the STN in Parkinson's disease most DBS centers use microelectrode recording (MER) with multiple trajectories. The aim of the study is to identify MER patterns to predict optimal electrode position and to keep clinical testing as short as possible in order to reduce operation time and adverse events.

**Background:** There is an ongoing debate whether MER is associated with higher operation risks and time-consuming or leading to a significant better clinical outcome. Here, we focus on correlations between background activity and firing rate to predict optimal electrode placement.

**Methods:** 10 patients with advanced PD underwent bilateral STN DBS operation. Recording was done simultaneously for 3–5 microelectrodes using a ben-gun for multiple trajectories. MER data were recorded and analyzed postoperatively using spike2<sup>®</sup> and wave\_clus<sup>®</sup> for segmentation and spike sorting. The overall mean amplitude was determined for each patient separately for firing rate and background activity to define an individual threshold and the needles with the firing rate and background activity above this threshold was selected.

**Results:** In 8 out of 10 patients the permanent electrode was implanted in the trajectory of the microelectrode with the highest background activity compared to all other microelectrodes, in the

other 2 patients a neighbouring trajectory was chosen because of low thresholds for side effects. The postoperatively chosen active contact of the permanent electrode was in 70% in the place of the highest firing rate.

**Conclusions:** MER in implantation of electrodes into the STN is very helpful to predict the optimum stimulation place analysing background activity and firing rate. Finding a good ratio of effect and threshold for side effects at that place further clinical testing might be useless and the permanent electrode could be implanted directly. This helps to save operation time and might reduce adverse events, e.g. haemorrhage und infections.