Optimal STN Targeting and One Year Clinical Outcomes in 159 Patients Treated for Parkinson's Disease using 'Asleep' Robotic Electrode Implantation.

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Introduction

Techniques used to implant DBS electrodes under general anaesthesia without performing micro-electrode recordings have emerged in recent years. We report the largest cohort to date using an ‘asleep’ method with Robotic guided implantation. Clinical outcome of 159 consecutive patients treated with bilateral STN implantation using the NeuroMateTM Robot was examined. Active contacts of 298 electrodes were mapped to their auto-segmented STN volumes and those producing best clinical improvements were clustered within the STN.

Methods

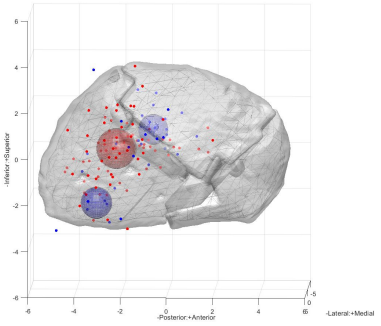
A retrospective review of patients who underwent surgery between 2012 and 2016 was performed. Robot- guided burr hole drilling created an exact fit for push-fit guide tube insertion. Targeting accuracy was assessed using on-table O-armTM imaging prior to electrode implantation. Clinical outcome was assessed comparing pre-operative off-medication with post-operative off medication on-stimulation scores after one year.
We examined the optimal target position by clustering contact points associated with the best clinical outcomes. The STN volumes were normalised using their own geometry.

Results

151 patients underwent follow up. UPDRS III scores improved by 47% (39 to 20.5 points, p<0.001).Total UPDRS, UPDRS II and UPDRS IV scores improved by 46%, 44% and 49% respectively (p,0.001). PDQ-39 self-assessment demonstrated statistically significant improvement in five of the eight sub -scores. Gait, assessed using the Tinetti Assessment Tool (n=135), improved by 19%. Complications included two haemorrhages (no long-term neurological sequelae) and three infections requiring system explantation. Examining optimal contact position, clusters were obtained for those patients who obtained a greater than 70% UPDRS III improvement versus improvement less than 20%. Further clusters were obtained for greater than 70% and less than 20% improvement in specific symptom categories; tremor; rigidity; akinesia; axial and gait.

Conclusions

This method of 'asleep' DBS insertion gives comparable clinical outcomes to other techniques described. Optimised target position using contact clustering within STN for this patient cohort was defined.



Active Contact Clusters Akinesia Score Improvement (Blue: greater than 70%, Red: less than 20% Improvement)

Learning Objectives

To firstly examine overall outcomes of a large cohort of patients treated under general anaesthesia with an 'asleep' technique. To describe the robotic technique using the NeuroMate Robot. To examine detailed contact localisation which is mapped to a 3D STN volume and correlated with specific symptom improvement.

References

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