MER vs. MRI guidance in placement of DBS electrodes for Parkinson’s disease
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RESULTS – CONT.

PREMEDITATED INTELLIGENT functioning was not significantly different between the groups. MMSE scores were intact and not significantly different between the groups (MRI: 29 vs MER: 26).

Total DRS total scores were significantly different between the groups, but both are considered intact (MDR: 143 vs MER: 140).

No significant differences in depression or anxiety scores. Depression scores were significantly higher for the MER group versus the MRI group (MRI: 4 and MER: 10), but both are considered minimal levels.

MRS allows for electrophysiological mapping of the brain target in DBS procedures (either STN or GPi), but is not the only effective methodology for accurate electrode placement.

This pilot study suggests that, compared to MER guidance for DBS electrode placement, MRI-guided procedures in patients with PD may be associated with:
• Fewer electrode passes
• Fewer post-operative side effects
• Less chance of microlesion effect
• Less radial error in electrode placement
• UPDRS and LEDD should be interpreted with caution due to variance in follow-up interval
• Neuropsychological measures should be interpreted with caution due to small sample size

Further study is warranted to verify these findings in a larger cohort of patients.

BACKGROUND

- Variables determining outcomes in deep brain stimulation (DBS) for Parkinson’s disease (PD) include patient selection, electrode placement, and device programming.
- Methods for optimizing electrode placement include:
  - Microelectrode recording (MER)
  - Macrostimulation
  - Anatomic lead placement with magnetic resonance imaging (MRI) or other image guidance

METHODS

- Patients with PD considered by consensus opinion to be candidates for DBS placement in the subthalamic nucleus (STN) or pallidum (GPi) were randomized to MER vs MRI-guided procedures.

Inclusion Criteria:
- Age 30-79
- Diagnosis of idiopathic PD
- Determined to be candidates for STN or GPi DBS by consensus recommendation of a multidisciplinary team as evidenced by:
  - Ability to provide informed consent as determined by preoperative neuropsychological assessment
  - Optimized medically by a movement disorders neurologist.
- Persistent motor symptoms which are not effectively controlled with optimal medical management. These symptoms may include levodopa-induced dyskinesias, tremor, or fluctuations in the effectiveness of levodopa throughout the day.

Exclusion Criteria:
- Dementia as determined by pre-operative neuropsychological assessment
- Previous intracranial surgery
- Intracranial tumor
- Lack of ability to provide informed consent as determined by preoperative neuropsychological assessment
- Medical co-morbidities that would make the patient a poor surgical candidate

Pre-operative motor score off medications was compared to post-operative on DBS/off medication score at 4-6 months.

Pre-and post-operative neuropsychological assessments, number of MER tracts or stylet passes, incidence of radiologically-apparent hemorrhage, and surgical complications were also compared.

Radial error of electrode placement based on post-op high-res CT

Potential risks of MER

- Requires an awake and prolonged procedure for the patient
- Potential benefits of image guidance

Results

Table 1: Surgical outcomes

Table 2: Neurologic Outcomes

Table 3: Neuropsychological Outcomes

Figure 1: Subject characteristics and follow-up

CONCLUSIONS

- MER allows for electrophysiological mapping of the brain target in DBS procedures (either STN or GPi), but is not the only effective methodology for accurate electrode placement.

This pilot study suggests that, compared to MER guidance for DBS electrode placement, MRI-guided procedures in patients with PD may be associated with:

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REFERENCES