Accelerated transcranial ultrasound neuromodulation in Parkinson’s Disease: A pilot study

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INTRODUCTION

• Parkinson’s Disease (PD) is a neurodegenerative disorder that is characterized by tremors, bradykinesia, rigidity, and postural instability.
• Pharmacotherapy and deep brain stimulation can ameliorate symptoms; however, the progressive nature of the disease calls for novel therapies to address resistant symptoms.
• Transcranial ultrasound stimulation (TUS) shows potential for developing new therapies for PD as a non-invasive brain stimulation (NIBS) technique.

AIM and HYPOTHESIS

• Aim: to investigate the neuromodulatory effects of accelerated theta-burst TUS (a-tbTUS) on the motor cortex excitability and clinical scores of PD patients.
• Hypothesis: a-tbTUS would have excitatory neuromodulatory effects on PD patients.

METHODS

• Subjects: 10 patients with PD (M/F:4/1, mean age: 63.8±7.15)
• Interventions: Bilateral M1 a-tbTUS for 80s during med-OFF (f0: 500kHz, PRF: 5Hz, DC: 10%, Ippp: 2.26 W/cm²)
• Outcome Measures: UPDRS scores, transcranial magnetic stimulation (TMS) measures (Motor-evoked potential [MEP] amp, Short interval cortical inhibition/facilitation [SICI/SICF])

RESULTS

• Fig.2: TMS-elicited measures summarized using barplots. Bars with associated standard deviation are shown for each measure (on the vertical axis). Bars in light blue show the active condition and the dark blue show the sham condition. Each pair is shown for before TUS (pre-TUS) and after TUS (post-TUS).
• Fig.3: Rain plots depicting UPDRS-III global (A) and upper extremity rigidity (B) scores. Plots in light blue show the active condition and the dark blue show the sham condition. Each pair is shown for before TUS (pre-TUS) and after TUS (post-TUS).

CONCLUSION

• a-tbTUS is a safe and feasible NIBS technique in PD.
• a-tbTUS increased motor cortex excitability in PD as measured by MEP amplitudes.
• a-tbTUS did not change SICI/SICF and UPDRS scores in this pilot study.
• Further studies should aim to determine optimal administration parameters and the durability of outcomes in PD patients.