Cynthia Pilot frequency rTMS targeting the SMA bilaterally in children with TS.

Methods

Aim 1: To characterize the effect of low frequency rTMS of the SMA on TS symptoms.

Hypothesis: Tourette’s syndrome symptomatology will decrease with low frequency rTMS targeting the SMA bilaterally in children with TS.

Aim 2: To identify TMS-mediated alterations in brain metabolites and functional connectivity that serve normative cortical activity.

Hypothesis: Improvement in TS symptoms will be moderated by [1]TMS-induced changes in GABA and glutamate in the SMA and [2]potentiation of GABAergic neurotransmission.

Preliminary Results

Clinical measures show improvement in tic severity after rTMS treatment.

Spectroscopy analysis shows a decrease in glutamate and an increase in GABA in the SMA after rTMS treatment.

Neurophysiology measures show changes after rTMS treatment.

Transcranial magnetic stimulation was well tolerated with no adverse effects.

Pre and Post-Treatment Measure Changes

Transcranial magnetic stimulation was well tolerated with no adverse effects.

Neurophysiology measures show changes after rTMS treatment.

Clinical measures show improvement in tic severity and frequency from years of conscious tic suppression.

Neurophysiology data shows a reduction in tic severity and frequency from years of conscious tic suppression.

Discussion

Clinical Measures

- The preliminary results indicate a substantial improvement in tic severity for the first three participants of this pilot study following treatment.
- Quality of life factors, such as anxiety and depression, also improved after the rTMS treatment.

Magnetic Resonance Spectroscopy Measures

- The observed decrease in glutamate and increase in GABA concentrations correlate with the brain metabolic changes observed in Tourette’s patients that show an acceleration in tic severity and frequency from years of conscious tic suppression.

TMS Neurophysiology Test Measures

- Neurophysiology testing can be used to measure intra- and intertrial changes in children with Tourette’s syndrome.
- The changes seen in intracortical inhibition and facilitation are in line with the clinical and MRS measures that were observed.

TMS Motor Mapping Measures

- Motor mapping from Subject 3 shows the mapped motor area becoming more defined after rTMS treatment.
- The preliminary data shows an overall improvement in Tourette’s syndrome symptoms, and implies an improvement in cortical activity and cortical connectivity.
- More participants are being recruited to determine significance, validity, and reliability of the measures of treatment response.

Conclusion

- Transcranial magnetic stimulation appears to be a safe form of neuro modulation technology for children with Tourette’s syndrome.
- Treatment combined with transcranial magnetic stimulation and neuroimaging may inform mechanisms of action and predictors of response.