INTRODUCTION

- Patients with Tourette syndrome (TS) present heightened sensory sensitivity to sensory stimuli, without altered sensory thresholds.
- Studies have shown that TS is associated with impaired operation of GABA (inhibitory) signalling and GABA-mediated cortical inhibition.
- For the first time in TS, this study focuses on cortical motor representation in TS and control subjects using neuronavigated TMS (nTMS) and non-grid based brain mapping method.
- We hypothesize that loss of GABA-mediated cortical inhibition within sensorimotor cortex leads to loss of separation and spatial specificity of TMS-induced muscle responses.

ANALYSIS

- MEPs were extracted from each muscle and synchronized with TMS coil coordinates offline.
- For each participant and each cortical motor map within a participant we calculated map parameters:
  - Centre-of-Gravity (CoG)
  - Variability of muscle representation
  - Separation between muscle pairs
  - SICI was calculated using median MEP amplitude at each conditioning stimulus as a ratio of unconditioned trials.
  - Group differences in map parameters were assessed using percentile bootstrapping CI (10,000 iterations).
- Multivariate regression was used to assess relationship between maps and median inhibition value observed for 3 ms SICI.

CONCLUSION

- In this study we have shown the efficacy and feasibility of locating and outlining TMS-induced cortical muscle representations using a non-grid based method in 5 distinct muscles.
- Our results suggest an association between cortical muscle representations and measures of GABA-mediated inhibition in TS.

REFERENCES


METHODOLOGY

- Sixteen patients with TS (5 females, Mtsr = 20.4 ± 7.1) and 14 control subjects (CS; 4 females, Mtsr = 17.4 ± 3.9) participated in the study.
- Single pulse TMS was delivered across a 40 cm² area encompassing the left M1, partially overlapping with primary sensory and premotor cortices.
- Stimulus locations (coordinates) were simultaneously recorded with a neuronavigation software (BrainSight, Rogue Resolutions).
- MEPs were recorded from 5 different muscles.
- Level of cortical inhibition was assessed using short-interval intracortical inhibition (SICI) with ISI of 3 ms.

RESULTS

- Figs 2-3: Cortical representation maps for each muscle studied. Top row is an example of maps from one control. Bottom row is an example of maps from one patient. Maps for all muscles are well defined.
- Figs 4-6: Group comparison on map parameters. Far left: FDI muscle area is significantly smaller in TS. Middle: Separation of FDI and Masseter muscles is marginally increased in TS. Far right: Example of one muscle showing no group difference in centre-of-gravity.
- Figs 7: Group means for SICI (3 ms ISI). GABA-mediated inhibition as measured using 3 ms SICI. Patients and controls do not differ on any condition nor on overall median inhibition.
- Figs 8: Multivariate regression with SICI median inhibition predicting variability of cortical muscle representations. Only the deltoid muscle shows a marginal relationship with SICI median inhibition.

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