Primary motor area map of Congenital Mirror Movements with MRI navigated TMS

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BACKGROUND
Congenital mirror movements (CMM) are a curious and rare neurological disorder in which volitional movements of a limb, are accompanied by simultaneous involuntary symmetrical movements in the contralateral one. They usually are present in the distal upper limbs and may be unilateral or bilateral, but when they are bilateral one side is generally more affected (Cox et al., 2012). Typical neurophysiological finding in CMM are bilateral motor evoked potential when only a primary motor area is stimulated. This has been linked to a lack of crossing of some fibres at the decussatio piramidis (Vale et al., 2017) or to the presence of some ectopical corticospinal ipsilateral fibres. Ipsilateral and contralateral MEP amplitude can vary widely and cases in which ipsilateral MEP amplitude is greater of contralateral one are not uncommon (Cox et al., 2012). We present a MRI-navigated TMS map of the primary motor cortex (M1) of a young man with CMM. Our patient had bilateral CMM, graded 3 on the Wood and Teuber scale (Woods and Teuber, 1978), more pronounced on the right side that caused him some impairment when performing precision bimanual work (like typing), otherwise his neurological and cognitive examination was unremarkable.

OBJECTIVE
To obtain an MRI navigated transcranial magnetic stimulation TMS brain map of primary motor cortex (M1) in Congenital Mirror Movements.

MATERIALS AND METHODS
We used a TMS 3d-navigated device that combined MRI images from a previous scan and the tridimensional position of the head of the patient and the magnetic coil thus obtaining a detailed map of stimulated cortical areas. We recorded MEP on both first digital interosseous and tibialis anterior muscles when stimulating each M1.

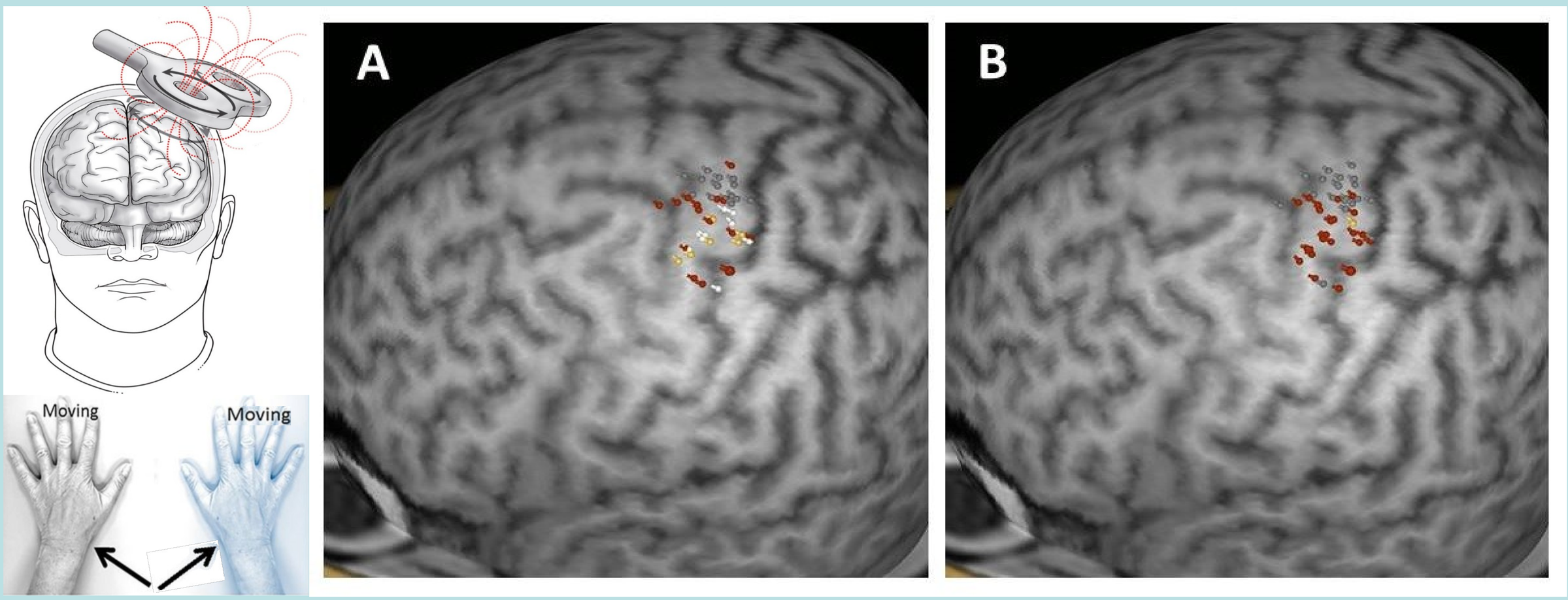

FIGURE LEGEND
Left motor area map is represented. PANEL A shows the map of MEP amplitudes registered from left first dorsal interosseous (FDI), PANEL B shows the map of MEP amplitudes registered from right FDI (white marks = amplitude > 500 mV, yellow marks = amplitude >250 mcV <500 mcV, red marks = amplitude >100 mcV <250 mcV, grey marks = amplitude <50 mcV). Remarkably mean ipsilateral MEP amplitude is greater than the contralateral one.

RESULTS
We registered a MEP on both first digital interosseous muscles when stimulating each M1 with a focal TMS coil, while a bilateral MEP was not present at the lower limbs but we observed a cortical silent period on both tibialis anterior muscles when stimulating each ipsilateral M1.

CONCLUSIONS
Our finding confirm that ipsilateral and contralateral MEP arise from the same cortical areas. Ipsilateral and contralateral motor area maps are comparable. This is the first reported navigated TMS brain mapping of CMM so far.

References
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