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Effects of rTMS on Cognition and Neuroplasticity in Subacute Stroke Patients

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Objective

The purpose of this study is to determine the cognitive improvement and neurophysiological effects of repetitive transcranial magnetic stimulation (rTMS) over the left dorsolateral prefrontal cortex (L-DLPFC) in subacute stroke patients. Methods Twelve consecutive first-ever stroke patients with cognitive impairment were enrolled. All subjects were randomly assigned to real or sham stimulation group and completed 10 sessions of rTMS for 2 weeks (Figure 1). 10Hz of navigation rTMS were applied (5sec stimulation and 25sec resting, total 1500 pulses) on the L-DLPFC at 80% of resting motor threshold (rMT). At the time of baseline, 1 month and 3 months after stroke onset, all subjects received the cognitive, behavioral and depression assessments. In addition, the vascular cognitive impairment harmonization standards (VCIHS), motor evoked potentials (MEP), event-related potentials (ERPs) and resting state functional magnetic resonance imaging (RS fMRI) were completed for the neuroplasticity at baseline and 3 months after stroke onset.

Results

After the treatment period, the real stimulation group improved significantly in the Montreal Cognitive (MoCA), Fugl-Meyer Assessment (FMA), Modified Bathel Index (MBI) and Geriatric Depression Scale (GDS) compared with sham stimulation group. And these effects lasted after three months. Among the VCIHS parameters, Z-scores of executive and memory function showed higher delta value between baseline and 3months timepoints in rTMS group. The MEP showed higher TIME x GROUP interaction in the percentage of intracortical inhibition and facilitation amplitude ratio in right hand. It suggests that there is beneficial effect on premotor cortical excitability of rTMS. The change of P300 amplitude in ERPs was more increased in real stimulation group significantly. The RS fMRI analysis results showed more increased functional connectivity of left frontal pole, Middle frontal gyrus, posterior parietal cortex and Right posterior parietal cortex in real group after stimulation compare with the sham group.

Conclusion

These results suggest that high frequency rTMS on the L-DLPFC improves cognitive function and functional network activity in subacute stroke. The rTMS seems to be an recommendable treatment in stroke patients with cognitive impairment.

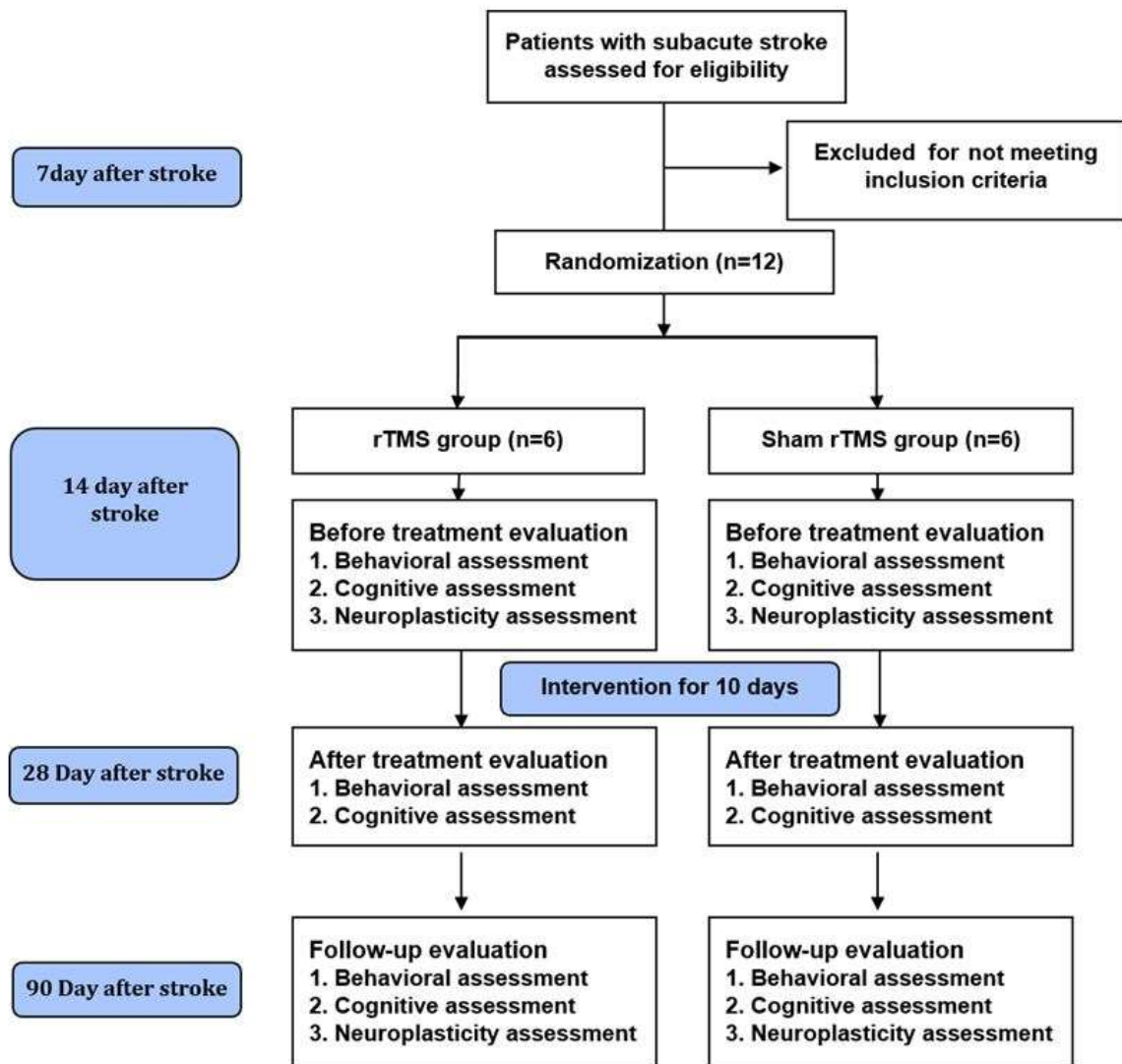


Fig1. Clinical Study Phase