뇌신경재활

게시일시 및 장소 : 10 월 18 일(금) 13:15-18:00 Room G(3F)

질의응답 일시 및 장소 : 10 월 18 일(금) 15:45-16:30 Room G(3F)

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Different Motor Network Changes and Responsiveness to Noninvasive Brain Stimulation for Stroke

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Objective

Noninvasive brain stimulation (NBS) such as repetitive transcranial magnetic stimulation (rTMS) and transcranial direct current stimulation (tDCS) has recently been applied to stroke patients with motor impairment. NBS is helpful for motor function restoration by modulating the cortical excitability of stroke patients. It is well known that there is a significant inter-individual variability in efficacy of NBS, however, the underlying neural mechanism of this variability was not sufficiently investigated. In this study, we investigated the motor network connectivity changes in patients receiving NBS and compare their responsiveness to NBS and subsequent network connectivity changes.

Materials and Methods

Twenty-one subacute stroke patients (13 males, mean age 59.6±11.5 years) participated. NBS was applied using both rTMS and tDCS over bilateral primary motor cortices (M1s); simultaneous application of 2 mA anodal tDCS over the ipsilesional M1 and 1,000 pulses of 1 Hz rTMS at 90 % resting motor threshold over the contralesional M1 for 20 minutes. All participants underwent 10 daily NBS sessions for consecutive 2 weeks. Participants were classified into two groups (good and poor responder groups) according to their responsiveness to NBS measured by improvement of Fugl-Meyer Assessment Upper Extremity (FMA-UE) score; good responder group (FMA-UE gain ≥ 10; 7 males and 5 females, mean age 58.8±13.1 years) and poor responder group (FMA-UE gain < 10; 6 males and 3 females, mean age 60.6±11.3 years). Two times of resting-state functional MRI were obtained before and after NBS and alterations in the motor network connectivity were analyzed. Healthy subjects participated as an age-matched healthy control group (8 males and 4 females, age 56.1±14.3 years). M1 intrahemispheric connectivity, interhemispheric connectivity, laterality index, and global network efficiency were analyzed to investigate differences in the motor network characteristics between good and poor responders.

Results

There were significant differences in motor network connectivity between good and poor responders. The motor network of the good responder group had a disrupted balance of the M1 intrahemispheric connectivity with the contralesional hemisphere being dominant. The network of this group had relatively high interhemispheric interaction and efficient network structure. The motor network of the poor responder group had less disruption of network balance because the contralesional M1 had less involvement. In addition, the network of this group had less interhemispheric interaction and a less efficient network structure than the good responder group.

Conclusions

These results may indicate that NBS gives more benefit to the patients who suffer from existing imbalance of motor network connectivity caused by stroke, which can provide insight into patient-specific NBS treatment according to the brain network characteristics prior to stimulation.

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