

ORAL PRESENTATION 2-2

뇌신경재활

발표일시 및 장소 : 10 월 18 일(금) 14:15-14:25 Room B(5F)

OP2-2-1

Effect of rTMS on Cognitive Function and Depression in Chronic Stroke Patient

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Introduction

The central nervous system is adaptive, or plastic, and has some capacity. Repetitive transcranial magnetic stimulation (rTMS) affects the brain through this plasticity. Previous studies have shown that rTMS is effective for stroke patients in terms of motor, cognition and mood recovery. Even though several studies were conducted to reveal therapeutic effect of rTMS for depression or motor function, the efficacy on cognitive function is still unclear in chronic stroke patients. The purpose of this study is to examine the effects of high-frequency rTMS on ipsilesional dorsolateral prefrontal cortex (DLPFC) on cognitive function and depressive mood.

Methods

We recruited patients diagnosed with vascular dementia more than 6 months of stroke. At the time of screening, patients were with 10-26 points of K-MMSE (Korean Mini-Mental State Examination) and those with clinical symptoms of depression. rTMS was applied to ipsilesional DLPFC (10Hz, 5-second train duration and 55-second intertrain interval, 100% resting motor threshold intensity) for 20 minutes (1000 pulses per session). All patients had received rTMS 5 times a week for 2 weeks by using stimulation device (ALTMS[®], Remed Co., Korea). To measure the efficacy, functional outcomes were assessed at baseline, 2, and 14 weeks after rTMS. Functional magnetic resonance imaging (fMRI) was performed before the start of rTMS and 14 weeks after the end of rTMS.

Results

The demographic characteristics of subjects are summarized in Table 1. In the assessment immediately after rTMS, K-WAIS IV (Korean Wechsler adult intelligence scale-IV), Rey-Kim Memory Quotient, Stroke Specific Quality of Life Scale and MFT (Manual Function Test) were statistically significantly increased than the baseline assessment. There was a statistically significant increase in K-MMSE, MoCA (Montreal Cognitive Assessment), K-WAIS IV, Rey-Kim MQ, GDS (Global Deterioration Scale), BBS (Berg Balance Scale), TIS (Trunk Imbalance Scale) and MFT after 12 weeks of rTMS. As a functional outcome for depression, GDS (Geriatric Depression Scale) was not statistically significant but improved. (Table 2). Follow up fMRI of patient 3 showed cortical reorganization with deactivation of ipsilesional DLPFC. And in patient 6, follow up fMRI showed localized activation of ipsilesional DLPFC (Figure).

Conclusions

The results of this study suggest that high-frequency rTMS on ipsilesional DLPFC has beneficial effect on cognitive function and depressive mood in patients with chronic stroke. However, there is a limitation to the lack of a control group. A large sham-controlled study will help support this study.

Table 1. characteristics of the patients

Characteristic	Values
Age, years	57 (55-67.25)*
Gender (Male / Female)	8 / 2
Etiology (n)	
Cerebral infarction	6
Intracerebral hemorrhage	4
Lesion (n)	
Right hemisphere	3
Left hemisphere	7
Post-stroke duration, months	14 (7.75-21.75)*

*; median (quartile)

Table2. Change in functional evaluation after rTMS

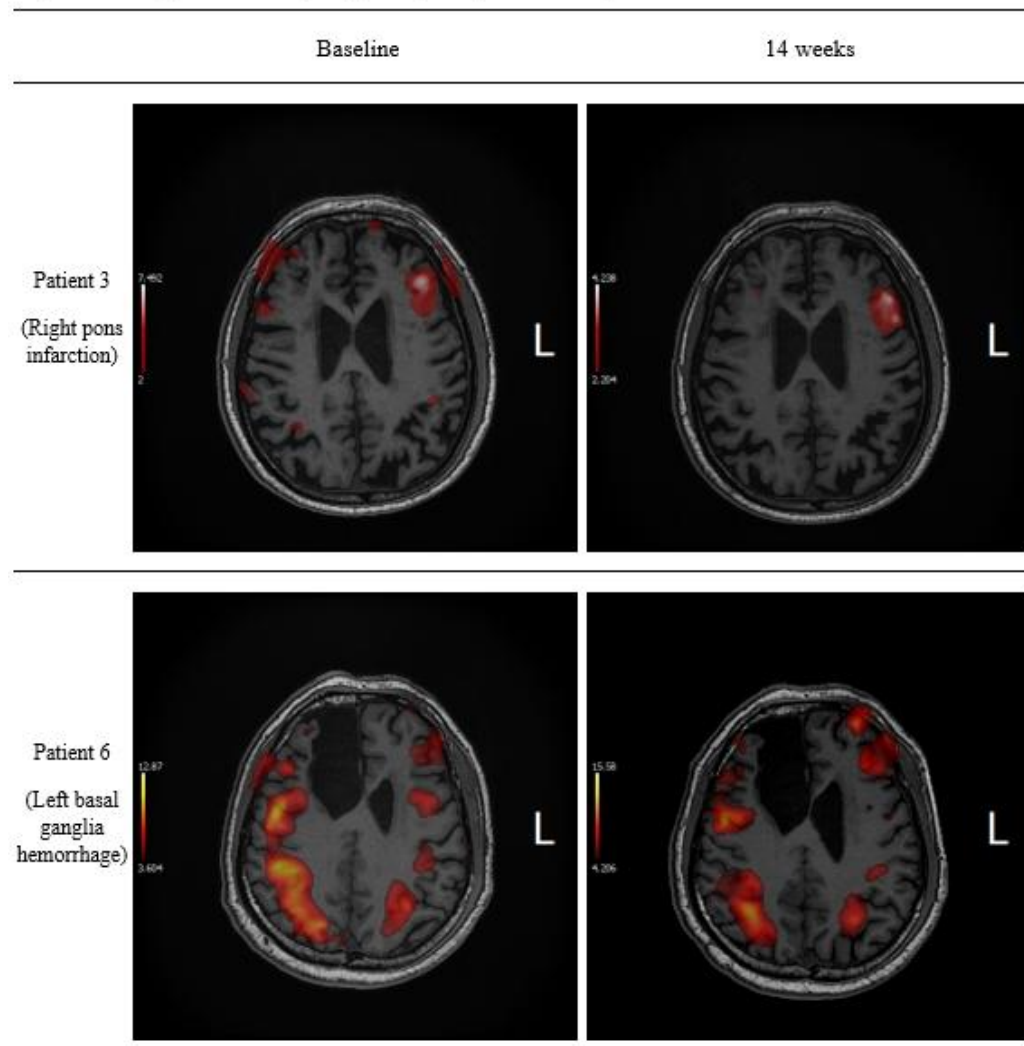
	Baseline	2 weeks	14 weeks	P-value	
				0-2 week	0-14 week
GDS ¹	15.5 (12-21)	15.5 (10-24.75)	10 (6-13.5)	0.399	0.061
K-MMSE	24 (18.5-25.25)	27 (25.5-27.75)	25.5 (22.25-27.75)	0.114	0.024*
MoCA	17.5 (11-19.5)	21 (18.75-23.25)	21 (13-23)	0.059	0.026*
K-WAIS IV	71 (67.5-86)	88.5 (79.5-93)	81.5 (74.5-94.5)	0.046*	0.034*
MQ	92 (70-102)	104 (103.25-107.75)	101.5 (72-108.25)	0.028*	0.028*
GDS ²	4 (3-4.25)		3 (3-4)		0.046*
CDR	0.75 (0.5-1.25)		0.5 (0.5-1)		0.102
S-IADL	23.5 (18.25-31.75)	20 (18-25.5)	20 (16.5-32.5)	0.285	0.440
MMT	54 (41.25-67.5)	54 (45-70.5)	54 (48-70.5)	0.180	0.180
BBS	55.5 (45.25-56)	55.5 (48.25-56)	56 (48.25-56)	0.066	0.042*
TIS	19 (14-20)	19 (16.25-20)	19 (16.5-20.75)	0.109	0.026*
MBI	83.5 (61.75-89.25)	85.5 (61.75-92.25)	82 (63.25-92.25)	0.068	0.168
SS-QoL	139.5 (112.5-161.75)	146.5 (136.5-173.25)	154 (127.5-182.75)	0.043*	0.182
MFT	79.69 (46.10-86.72)	81.25 (57.04-94.54)	81.26 (57.04-95.32)	0.027*	0.027*
FMA	59.5 (36-64.5)	61 (46.25-64.5)	62.5 (37.5-65.75)	0.068	0.066

All values are presented a median (quartile)

* $p < 0.05$, when comparing each scores of baseline and discharge within same group by Wilcoxon signed rank test. The summed scores of the manual muscle testing (MMT), calculated by adding the scores of flexors, extensors, abductors, adductors of the affected side shoulder and hip joints, flexors and extensors of the elbow, wrist, and knee joints, and dorsiflexor and plantarflexor of ankles using the Medical Research Council scale (Paternostro-Sluga et al., 2008)

Abbreviations: GDS¹, Geriatric Depression Scale; GDS², Global Deterioration Scale; S-IADL, Seoul Instrumental Activities of Daily Living; MMT, Manual Muscle Test; FMA, Fugl-Meyer Assessment

Figure. Changes in fMRI by high-frequency rTMS on ipsilesional DLPFC^a



fMRI images were acquired while thinking about the right word to fill in the blanks of the sentence

^afMRI of patient 3 showed cortical reorganization with deactivation of ipsilesional DLPFC after high-frequency rTMS on ipsilesional DLPFC. That of patient 6 showed localized activation of ipsilesional DLPFC after high-frequency rTMS on ipsilesional DLPFC.