뇌신경재활
발표일시 및 장소 : **10 월 27 일(토) 10:30-10:40 Room C(5F)**

OP2-3-4

The Effect of Cerebellar rTMS on Post-stroke Dysphagia

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Objectives
There are well-known evidences that multiple regions within the central nervous system such as cerebral cortex, brain stem and cranial nerves play an important role in swallowing. However, the physiologic role of the cerebellum in control of swallowing is unknown. Neuro-imaging of the healthy human brain with positron emission tomography has demonstrated that increased regional blood flow in cerebellum during swallowing. Several studies using functional magnetic resonance imaging have also reported that cerebellum has some involvement in swallowing. Previous study have shown that cerebellar repetitive transcranial magnatic stimulation (rTMS) modulates pharyngeal corticobulbar excitability in healthy human. Thus, the aim of this study is to find out the effect of cerebellar rTMS on post-stroke dysphagia.

Methods
The subacute M1 territory stroke patient with dysphagia were recruited. All patients were randomly divided into the rTMS group and the control group. The rTMS group received rTMS for 10 minutes a day, 10 times. Each session included 900 stimulation over posterior fossa ofthe cerebellum at intensity of 110% pharyngeal motor threshold and frequency of 10 Hz. Both groups received conventional swallowing therapy for 20 minutes a day for 10 times. Both groups underwent a Video fluoroscopic swallowing study (VFSS) within 1 week before and after the treatment. While every VFSS, Functional Dysphagia Scale (FDS), Penetration Aspiration Scale (PAS) and American Speech Language Hearing Association National Outcome Measurement System Swallowing Scale (ASHA-NOMS) were evaluated.

Results
In each group, 15 patients were recruited. There were no significant differences in the baseline characteristics between the two groups (Table 1). After the treatment, in intra-group comparison, FDS showed significant improvement in both groups (Table 2). In inter-group comparison, a significant difference was found in FDS between rTMS and control group (Table 3). Neither group had complications during and after the treatment.

Conclusion
rTMS on cerebellum showed significant improvement In FDS. It is likely that rTMS may have augmented corticobulbar excitability so that have brought improvement in

oropharyngeal function. Therefore, rTMS on cerebellum could be an useful treatment option in M1-associated stroke patients with dysphagia.

table1. Baseline characteristics of the two groups

	rTMS group (n=15)	Control group (n=15)	p-value
Age	67.1±10.7	65.5±7.8	0.589
Sex			
Male	9 (60%)	6 (40%)	
Female	6 (40%)	9 (60%)	
Lesion			
Ischemic / Hemorrhagic	11 / 4	10 / 5	
Left / Right	12 / 3	8 / 7	
Initial NIHSS	17.7±9.5	13.7±8.6	0.203
OTTD			
- / +	5 / 10	9 / 6	0.143
FDS	43.6±12.2	36.7±11.9	0.108
PAS	7.2±1.6	7.1±1.4	0.798
ASHA-NOMS	2.7±1.1	3.2±1.1	0.645

Values are presented as mean±standard deviation.

rTMS; repetitive transcranial magnatic stimulation, OTTD; oral transition time delay, FDS; Functional Dysphagia Scale, PAS; Penetration Aspiration Scale, ASHA-NOMS; American Speech Language Hearing Association National Outcome Measurement System Swallowing Scale

table2. Change of measurements in each group after the therapy

	rTMS group (n=15)			Control group (n=15)		
	Pre	Post	p-value	Pre	Post	p-value
FDS	43.6±12.2	21.4±7.6	**0.015***	36.7±11.9	25.5±9.2	**0.043***
PAS	7.2±1.6	4.8±2.0	0.059	7.1±1.4	5.0±2.5	0.066
ASHA-NOMS	2.7±1.1	3.6±2.0	0.057	3.2±1.1	4.2±1.4	0.062

Values are presented as mean±standard deviation.

rTMS; repetitive transcranial magnatic stimulation, FDS; Functional Dysphagia Scale, PAS; Penetration Aspiration Scale, ASHA-NOMS; American Speech Language Hearing Association National Outcome Measurement System Swallowing Scale

*p<0.05 by Wilcoxon signed rank test.

table3. Comparison of changes between two groups after the therapy

	rTMS group (n=15)	Control group (n=15)	p-value
ΔFDS	-22.2±6.7	-11.2±3.7	**0.032***
ΔPAS	-2.4±2.0	-2.1±2.3	0.069
Δ ASHA-NOMS	0.9±1.9	1.0±1.1	0.733

Values are presented as mean±standard deviation.

rTMS; repetitive transcranial magnatic stimulation, FDS; Functional Dysphagia Scale, PAS; Penetration Aspiration Scale, ASHA-NOMS; American Speech Language Hearing Association National Outcome Measurement System Swallowing Scale

*p<0.05 by Mann-Whitney *U*-test.