The Effects of High-Frequency Repetitive Transcranial Magnetic Stimulation and Intensive Speech-language-hearing therapy on Patients with Chronic Aphasia Accompanied by Apraxia of Speech Following Cerebral Infarction: A Two-Case Report

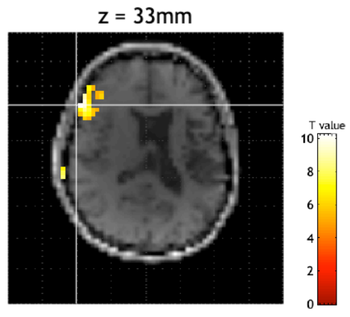
Department of Rehabilitation Medicine, The Jikei University School of Medicine
3-25-8. Nishi-Shinbashi, Minato-ku, Tokyo 105-8461, JAPAN

Masahiro Abo, Kentaro Yoshida

Objective: Apraxia of Speech (AOS) is a challenging condition with limited reports of effective rehabilitation treatments. This study examines the effects of combining functional magnetic resonance imaging (fMRI) to identify language function compensation areas, high-frequency repetitive transcranial magnetic stimulation (rTMS) applied to the right hemisphere's Inferior Frontal Gyrus (IFG), and intensive speech-language-hearing therapy on language function and health-related quality of life in two cases of chronic aphasia with severe AOS.

Methods: The subjects were two patients with chronic aphasia accompanied by AOS, more than one year post-onset. Prior to hospitalization, fMRI was performed to determine the rTMS stimulation site. During a two-week hospital stay, high-frequency rTMS and intensive speech-language-hearing therapy were administered. Long-term evaluations, including the Standard Language Test of Aphasia (SLTA) and the Japanese version of the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39), were conducted at three points: three months before hospitalization, during the rTMS hospitalization, and three months after discharge. Short-term evaluations included the Naming task from the SLTA-ST, the Repetition task from the Japanese version of the Western Aphasia Battery (WAB-J), and the new Japanese version of the Token Test (Token Test), which were administered before and after the two-week hospitalization.

Results: In the long-term evaluations, both cases showed no significant changes in SLTA scores from three months before hospitalization to during the rTMS hospitalization. However, improvements were observed three months after discharge, particularly in speech-related items. Improvements were also noted in the SAQOL-39 scores. In the short-term evaluations, improvements were observed in the SLTA-ST, WAB, and Token Test, with an increase in the rate of immediate responses in the SLTA.



Case1:FMRI image

Short-term evaluation results

	CaseI		CaseII	
	before	after	before	after
Short-term evaluation (2-week evaluation)				
SLTA-ST				
Names (80 words)	62	67	66	70
Instant correct answer (%)	6%	14%	50%	57.5%
WAB				
Repetition (total 100 points)	83	92	74	84
Token test	138	144	121	145

In accordance with the SLTA-ST evaluation criteria, responses were defined as immediate correct responses if the therapist started speaking within 3 seconds of presenting a picture of the target word and responded correctly without hesitation, and the percentage of correct responses was calculated based on the total number of correct responses.。

Long-term evaluation results

	CaseI			CaseII		
	3 months before admission	rTMS on admission	3 months after discharge	3 months before admission	rTMS on admission	3 months after discharge
SLTA						
SLTA Raw Score Total	136	140	151	163	164	183
Auditory comprehension	33	34	35	35	34	39
Speech	54	56	64	64	66	72
Reading comprehension	36	35	37	38	38	39
Writing	13	15	15	26	26	33
SAQOL-39						
Mean[2)]	4.05	4.05	4.23	2.62	2.49	2.87
Physical	4.71	4.71	4.71	3	3.06	3.24
Communication	2.57	2.29	3	2.29	2.29	2.43
Psychosocia	4	4.18	4.27	2.27	2	2.55
Energy	4	4	4.25	2.5	1.75	3

SLTA: Standard Aphasia Test, SAQOL-39: Stroke and Aphasia Quality of Life Scale-39 Japanese version
The maximum score for SLTA word recall was 15 points, and the total raw score for all sub-items was calculated.
The mean of the SAQOL-39 was calculated by dividing the raw scores of all items by 39 items.

We have reported effective results using a Functional MRI-based therapeutic rTMS strategy for the treatment of aphasia 1)-5).
Initially, we have used **low-frequency magnetic stimulation 1)-4).**
The **EBM** published in 2020 recommends **low frequency magnetic stimulation to the right IFG as level B** for recovery of motor aphasia (Lefaucheur JP et al, Clin Neurophysiol. 2020).
However, the safety of rTMS has now been confirmed and it is used to treat many diseases. We are now using high-frequency stimulation to treat aphasia in the identified areas, since functional MRI can identify which side of the brain is contributing to the recovery of aphasia. We are currently using **high-frequency stimulation to treat aphasia** in the identified areas and have reported its effectiveness 5).

Conclusion:

Identifying stimulation sites using fMRI and combining high-frequency rTMS with intensive speech-language-hearing therapy may be an effective rehabilitation strategy for chronic aphasia accompanied by AOS.

1. Kakuda W, **Abo M(CA)**, et al. Functional MRI-based therapeutic rTMS strategy for aphasic stroke patients: a case series pilot study. International Journal of Neuroscience 120: 60-66, 2010.
2. Kakuda W, **Abo M(CA)**, et al. Low-frequency rTMS with language therapy over a 3-month period for sensory-dominant aphasia: case series of two post-stroke Japanese patients. Brain Inj, 2010;24(9):1113-7.
3. Hara T, Abo M, et al. Effects of low-frequency repetitive transcranial magnetic stimulation combined with intensive speech therapy on cerebral blood flow in post-stroke aphasia. Transl Stroke Res, 2015;6(5):365-74.
4. **Abo M**, Kakuda W, et al. Effectiveness of low-frequency rTMS and intensive speech therapy in poststroke patients with aphasia: a pilot study based on evaluation by fMRI in relation to type of aphasia. Eur Neurol. 2012;68(4):199-208.
5. Ohara K, Kuriyama C, Hada T, Suzuki S, Nakayama Y, **Abo M(CA).** A pilot study verifying the effectiveness of high-frequency repetitive transcranial magnetic stimulation in combination with intensive speech-language-hearing therapy in patients with chronic aphasia. NeuroRehabilitation. 2021;49(3):459-467.

rehabweek
REHABWEEK 2025
MAY 12-16 2025 · CHICAGO, IL USA · REHABWEEK.ORG