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Safety and Effectiveness Analysis of Accelerated rTMS in Treating Patients with Post-Stroke Depression

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Abstract: *Objective:* To investigate and analyze the safety and effectiveness of accelerated repetitive transcranial magnetic stimulation (arTMS) in the treatment of post-stroke depression. *Methods:* 70 patients with post-stroke depression from the Department of Psychiatry were selected as research subjects for this study. The study period was from June 2022 to June 2023. The patients were divided into the arTMS group and the general treatment group, with 35 cases in each group. The arTMS group received arTMS and the general treatment group received conventional treatment. The overall efficacy, related scores, sleep level, quality of life, and side effects of treatment were compared between the groups. *Results:* The overall efficacy of aRTMS was ideal. Besides, there were no significant differences in the scores of relevant scores between the two groups before treatment; after treatment, the arTMS demonstrated a greater decrease in the scores. Besides, the sleep quality of the patients in the arTMS group was better ($P < 0.05$). Furthermore, the quality of life of the arTMS group was significantly improved ($P < 0.05$). Lastly, arTMS treatment resulted in fewer adverse reactions, which indicated that it is safer compared to conventional treatment ($P < 0.05$). *Conclusion:* arTMS is more effective and secure in the treatment of post-stroke depression.

Keywords: Accelerated repetitive transcranial magnetic stimulation; Post-stroke depression; Safety; Effectiveness; Treatment

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1. Introduction

Post-stroke depression (PSD) is a mental illness that occurs after a stroke, with an incidence rate of more than 30% [1]. Stroke and depression are both conditions that affect the nervous system. These two diseases are mutually affected each other [2,3]. PSD is mainly manifested as personality changes, low mood, difficulty in falling asleep, and even suicidal thoughts, which significantly reduce the living standard of patients. Many new treatment methods for PSD have been explored in recent years, including drug treatment, emotional guidance, physical therapy, etc [4,5]. Repetitive transcranial magnetic stimulation (rTMS) is a commonly used physical therapy method in treating major depressive disorder that was later introduced into the treatment of PSD.

However, patients often face difficulties in complying with rTMS treatment. Besides, the therapeutic effect is not satisfactory, so accelerated rTMS (arTMS) is proposed [6,7]. This article aims to study and analyze the safety and effectiveness of arTMS in the treatment of PSD.

2. General information and methods

2.1. General information

70 patients with post-stroke depression from the Department of Psychiatry Time were selected as research subjects for this study. The study period was from June 2022 to June 2023. The patients were divided into the arTMS group and the general treatment group, with 35 cases in each group. The baseline data of both groups were compared ($P > 0.05$), as shown in **Table 1**.

Table 1. Comparison of general information between the two groups (*n* [%])/(mean ± standard deviation)

Group	Number of cases	Gender		Age (year)		Course of disease (month)	
		Male	Female	Range	Average	Range	Average
arTMS group	35	17 (48.57)	18 (51.43)	51–77	64.27 ± 1.22	1–4	2.66 ± 0.24
General treatment group	35	16 (45.71)	19 (54.29)	52–77	64.37 ± 1.35	1–5	2.75 ± 0.29
t-value	-	0.0573		0.3251		1.4144	
P-value	-	0.8107		0.7461		0.1618	

2.2. Methods

The general treatment group received routine treatment. The patients were given 5 mg escitalopram per day, and the dosage was gradually increased to 10 mg/d; standard rTMS was given at 10 Hz with an interval of 20 s and an intensity of 100%.

arTMS was performed on the patients of the other group: (1) Escitalopram was administered the same way as the general treatment group; (2) arTMS was performed using the same parameter setting as the general treatment group and was repeated five times.

2.3. Observation indicators

The overall efficacy, relevant scores, sleep quality, quality of life, and adverse reactions to the treatment received in both groups were compared.

2.4. Statistical analysis

SPSS 21.0 statistical software was used for data analysis. The count data were expressed as *n* (%) and compared using a χ^2-test; the measurement data were expressed as mean ± standard deviation and compared using a *t*-test; $P < 0.05$ indicated a statistically significant difference.

3. Results

3.1. Overall efficacy

The overall efficacy of arTMS was higher compared to routine treatment ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of overall effectiveness between groups (*n* [%])

Group	Number of cases	Markedly effective	Effective	Ineffective	Overall efficacy
arTMS group	35	28 (80.00)	6 (45.71)	1 (2.86)	34 (97.14)
General treatment group	35	15 (42.86)	13 (37.14)	7 (20.00)	28 (80.00)
χ^2-*value*	-	-	-	-	5.0806
P-value	-	-	-	-	0.0241

3.2. Relevant scores

Before treatment, there was no difference in the disease-related scores of the patients ($P > 0.05$); after treatment, the arTMS group showed better improvements in the scores compared to the general treatment group ($P < 0.05$). Further details are shown in **Table 3**.

Table 3. Comparison of relevant scores between the two groups (mean ± standard deviation)

Group	Number of cases	Hamilton Depression Rating Scale (HAM-D) score		Severity of Dependence Scale (SDS) score		Siriraj Stroke Score (SSS)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
arTMS group	35	28.57 ± 3.24	13.22 ± 2.58	65.22 ± 4.19	38.54 ± 3.26	39.27 ± 3.21	57.24 ± 2.16
General treatment group	35	28.68 ± 3.46	17.59 ± 2.66	65.34 ± 4.57	43.61 ± 3.27	39.36 ± 3.55	47.21 ± 2.59
t-value	-	0.1372	6.9766	0.1145	6.4959	0.1112	17.5947
P-value	-	0.8912	0.0000	0.9092	0.0000	0.9117	0.0000

3.3. Sleep quality

The sleep quality of the arTMS group was better than the general treatment group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of sleep levels between the two groups (mean ± standard deviation)

Group	Number of cases	Sleep quality	Sleep disorder	Sleep medicine	Sleeping time	Daytime dysfunction	Sleep efficiency
arTMS group	35	1.02 ± 0.21	0.86 ± 0.22	0.84 ± 0.11	0.97 ± 0.32	0.74 ± 0.25	1.03 ± 0.24
General treatment group	35	1.68 ± 0.36	1.25 ± 0.34	1.38 ± 0.37	1.56 ± 0.32	1.38 ± 0.52	1.67 ± 0.26
t-value	-	9.3686	5.6973	8.2762	7.7129	6.5623	10.7006
P-value	-	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

3.4. Quality of life

Before treatment, there was no significant difference in the quality of life of both groups ($P > 0.05$); after treatment, the quality of life of the arTMS group was significantly higher than the general treatment group.

Table 5. Comparison of quality of life between the two groups (mean ± standard deviation)

Group	Number of cases	Physiological improvement		Bodily function		Social activity		Mental condition	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
arTMS group	35	62.58 ± 2.54	81.45 ± 3.21	63.91 ± 2.57	82.49 ± 3.25	62.37 ± 2.58	83.27 ± 3.24	61.24 ± 2.18	80.27 ± 3.14
General treatment group	35	62.66 ± 2.49	74.21 ± 3.55	63.88 ± 2.46	75.14 ± 3.67	62.44 ± 2.89	75.21 ± 3.56	61.33 ± 2.54	74.22 ± 3.18
t-value	-	0.1330	8.9493	0.0498	8.8701	0.1068	9.9059	0.1590	8.0090
P-value	-	0.8945	0.0000	0.9604	0.0000	0.9152	0.0000	0.8741	0.0000

3.5. Adverse reactions

The total incidence of adverse reactions of the arTMS group was lower than that of the general treatment group ($P < 0.05$), as shown in **Table 6**.

Table 6. Comparison of treatment side effects between groups (*n* [%])

Group	Number of cases	Nausea and vomit	Abdominal pain and diarrhea	Dizziness and headache	Total incidence
arTMS group	35	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
General treatment group	35	2 (5.71)	1 (2.86)	1 (2.86)	4 (11.43)
χ^2*-value*	-	-	-	-	4.2424
P-value	-	-	-	-	0.0394

4. Discussion

Stroke is a common disease of the nervous system and some patients may experience depression after a stroke, in which this condition is named PSD [8]. Early detection and diagnosis of the disease are critical, and late discovery may lead to suicide [9,10]. PSD tends to occur two months after the stroke. The condition is relatively hidden, so some patients may be unaware of it. Moreover, some stroke patients cannot express themselves clearly due to cognitive impairment. In recent years, with the development of medicine, the diagnosis of PSD has significantly improved, and timely intervention and treatment measures can be taken to control the disease [11,12]. rTMS is a way to treat neurological disorders. This non-invasive treatment method involves stimulating the nerves using electromagnetic waves [13]. The duration of rTMS treatment is relatively long (about one month), and the time taken for symptom improvement is also rather long. Long-term treatment will affect the patient's compliance, so several adjustments are made to overcome this issue [14]. arTMS can improve symptoms in a relatively short period by continuously stimulating the nerves and increasing cortical excitement, which results in better compliance and a shorter hospital stay [15]. arTMS therapy is relatively safe and has little to no side effects, making it more tolerable for most patients.

Based on the results of this study, arTMS treatment is effective in treating PSD, which is demonstrated in the improvement of relevant scores, sleep quality, and quality of life. Besides, this treatment is also safe and reliable. With this treatment, depressive symptoms can be well-controlled, thus preventing risky behaviors like suicide.

5. Conclusion

In summary, arTMS is more effective than regular rTMS in treating PSD and relieving its symptoms. Therefore,

this method should be popularized in clinical practice.

Disclosure statement

The author declares no conflict of interest.

References

[1] Wang X, Shi F, Lu B, et al., 2022, Effects of Acupuncture and Moxibustion on Neurological Function and Activities of Daily Living in Patients with Post-Stroke Depression. Hebei Medicine, 44(12): 1865–1868.

[2] Xu M, Hao L, Chen G, 2022, Analysis of the Effect and Safety of Bupleurum Plus Longgu Muli Decoction Combined with Transcranial Direct Current Stimulation in the Treatment of Post-Stroke Depression. Chinese Folk Therapy, 30(04): 73–75.

[3] Hu G, Hu X, Xiang M, et al., 2021, Effects of Repetitive Transcranial Magnetic Stimulation Combined with Intensive Cognitive Exercise on the HPA Axis in Patients with Post-Stroke Depression and Cognitive Impairment. Chinese Modern Doctor, 59(14): 99–102.

[4] Wang R, Hu C, Ma Q, et al., 2020, The Curative Effect of Danhong Injection Combined with Sertraline in Treating Post-Stroke Depression and its Impact on Serum Amyloid A and Immune Inflammation Indicators. Clinical Internal Medicine Journal, 37(05): 379–380.

[5] Cheng D, Li P, Ma J, 2019, Discussion on the Curative Effect and Safety Evaluation of Modified Buyang Huanwu Decoction in Treating Post-Ischemic Stroke Depression Based on Fuyang Consolidation. Guizhou Medicine, 43(12): 1934–1936.

[6] Li Z, Chen Y, Zhao Z, et al., 2019, Research on the Regulation Mechanism of Chai Shao Anshen Jieyu Granules on JAK1/STATA3 and cAMP/PKA/CREB Signaling Pathways in Rats with Post-Stroke Depression. Chinese Journal of Traditional Chinese Medicine, 37(12): 3013–3017.

[7] Wang Y, Liu Y, Duan H, et al., 2019, The Effect of Modified Huanglian Wendan Decoction on Post-Stroke Depression and its Impact on the Expression Level of Brain Metabolites. China Medical Herald, 16(32): 75–78 + 94.

[8] Liu Y, Liu L, Yi Y, et al., 2020, Effects of Pepsi Le Modified Prescription on the Inflammatory Balance of the Hippocampus-Prefrontal Cortex Loop in Rats with Post-Stroke Depression. Chinese Journal of Traditional Chinese Medicine, 38(03): 95–99 + 266–269.

[9] Teng X, Gao L, Zhou B, 2019, Effects of Peiyuan Xiaoshuan Jieyu Decoction Combined with Preproprotein Hydrolyzate on the Levels of Cerebrospinal Fluid Monoamine Neurotransmitters, Serum 5-Hydroxytryptamine and Brain-Derived Neurotrophic in Patients with Post-Stroke Depression of Kidney Deficiency and Liver Stagnation Type. The Influence of Factor and Apolipoprotein A1. Hebei Traditional Chinese Medicine, 41(03): 397–401.

[10] Jiang Y, Pan X, Wang H, et al., 2019, Study on the Clinical Efficacy of Chaihu Shugan Pills Combined with Escitalopram in Treating Post-Stroke Depression in Older Women. Practical Drugs and Clinics, 22(03): 299–302.

[11] Zheng L, Zhang L, Zhan J, 2018, Comparison of the Effect of Escitalopram and Venlafaxine in Treating Post-Stroke Depression and the Impact on Patients' Mental State and Quality of Life. Chinese and Foreign Medical Research, 16(33): 124–126.

[12] Zhang M, Liu Y, Yang Y, et al., 2018, The Effect of Cognitive Behavioral Intervention Based on a Transtheoretical Model on Neurological Function, Negative Emotion, and Quality of Life in Patients with Post-Stroke Depression. International Journal of Psychiatry, 45(05): 934–937.

[13] Ayiguli S, Ayiguli Y, 2018, Observation on the Curative Effect of Hyperbaric Oxygen in Treating Neurological Defects and Depressive Symptoms in Patients with Post-Stroke Depression. World Latest Medical Information Abstracts,

18(78): 84.

[14] Ye B, Ye D, 2018, The Effect of Sertraline on the Hypothalamus-Pituitary-Adrenaline Axis and Cognitive Function in Patients with Post-Ischemic Stroke Depression. Chinese Modern Doctor, 56(25): 38–41.

[15] Li S, Hu B, Wu Y, et al., 2018, Effect of Xinnao Kaiqiao Acupuncture Combined with Modified Huoxue Jieyu Decoction on HAMD Score and Quality of Life in Patients with Post-Stroke Depression. Chinese Medicine Clinical Journal, 30(03): 491–494.