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Transcranial Magnetic Stimulation Combined with Auricular Point Pressure Bean on Emotional Disorders in Elderly Patients after Intracerebral Hemorrhage Surgery: A Retrospective Cohort Study

ABSTRACT

Objective: To investigate whether the combination of repetitive transcranial magnetic stimulation (rTMS) and auricular point pressure bean could effectively ameliorate postoperative affective disorder in elderly patients suffering from cerebral hemorrhage.

Methods: From June 2020 to September 2023, 116 elderly patients with depression after cerebral hemorrhage, who underwent surgical procedures were divided into the exposure group and the control group. The division was determined based on whether received rTMS and traditional Chinese medicine auricular point pressure bean therapy. Hamilton anxiety scale (HAMA), Hamilton Depression scale (HAMD), National Institutes of Health Stroke scale (NIHSS), Montreal Cognitive Assessment scale (MoCA) and Mini Mental State examination scale (MMSE) were collected and compared between before intervention and after intervention.

Results: In accordance with a 1 : 1 matching ratio, the patients in the study were paired using propensity score matching (PSM), with 53 patients in both the exposure group and the control group. There were no notable differences in baseline characteristics between the 2 groups ($P > .05$). Following the intervention, the HAMA score and the NIHSS score of the exposure group were markedly lower than those of the control group ($P < .001$). Additionally, theMoCA scores ($P = .001$) and MMSE scores ($P < .001$) in the exposure group were significantlyhigher. The difference score have a significant difference in HAMA score ($P = .001$), NIHSS score ($P < .001$), MoCA ($P < .001$) and MMSE scores ($P < .001$).

Conclusion: The combination of rTMS therapy and auricular point pressure bean therapy in traditional Chinese medicine demonstrates can effectively relieve the anxiety level, postoperative emotional and cognitive disorders of elderly patients after intracerebral hemorrhage, and provide certain ideas and support for clinical treatment.

Key words: Auricular point pressure bean, cerebral hemorrhage after surgery, emotional disorders, transcranial magnetic stimulation therapy

Introduction

Cerebral hemorrhage, classified as a hemorrhagic stroke in older individuals, is characterized by significant clinical features including a high prevalence of disability, a high mortality rate, and a sudden onset of symptoms.[1] After intracerebral hemorrhage, various mental disorders are prone to develop. Previous studies on population health have revealed that above 20% of individuals with cerebrovascular diseases experience mental disorders, particularly in the 60-70 age group, where the incidence is as high as 56%.[2,3] Furthermore, a majority of these mental disorders occur within 6-12 months following surgical treatment for cerebrovascular diseases, encompassing both acute and chronic stroke.[4] The occurrence of these mental disorders in hypertensive patients has a significant impact on their treatment and prognosis. However, the primary focus in the prevention and treatment of postoperative complications

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in hypertensive patients is on issues such as pulmonary infections and neurological disorders.[5] Consequently, the crucial aspect of preventing and treating mental disorders tends to be overlooked.

Repetitive transcranial magnetic stimulation (rTMS) is a therapeutic method that utilizes the principles of electromagnetic induction and neuroelectrophysiology. By targeting particular regions of the brain, rTMS effectively activates neurons and facilitates the restoration of brain functionality.[6] Moreover, due to the continual application of traditional Chinese medicine nursing in chronic illnesses, such as auricular point pressure bean being classified as an external therapy, the act of pressing Wang Bu Xing seed on the corresponding auricular points can enhance the flow of qi and blood, enhance the capacity of tissue for blood supply and oxygenation, and can regulate excitement inhibition balance, thereby accomplishing a calming effect.[7] However, the current understanding of the practicality of auricular point pressure bean in elderly patients with emotional disorder after intracerebral hemorrhage surgery remains unclear.

According to the aforementioned context, this study evaluated the effect of rTMS combined with auricular point pressure bean therapy on emotional disorders in elderly patients after intracerebral hemorrhage. This study can not only provide a basis for the clinical treatment of emotional disorders after intracerebral hemorrhage but also is expected to improve the treatment experience and quality of life of patients.

Methods

Date Sources

The present research is a retrospective cohort study and has obtained ethical approval from the Ethics Committee of Hebei Provincial Hospital of Traditional Chinese Medicine (number: 389). Given the anonymized nature of the data, obtaining informed consent was deemed unnecessary. This study was conducted in accordance with the Declaration of Helsinki. The study population comprises patients and corresponding data sourced from the hospital's case system. It specifically focuses on elderly hypertensive patients with depression after cerebral hemorrhage who underwent surgical procedures at our hospital between June 2020 and September 2023. These patients were categorized into 2 groups: the exposure group, which received post-operative rTMS treatment combined with traditional Chinese medicine auricular point pressure bean therapy, and the control group without any treatment. All neuroendoscopic minimally invasive procedures were performed by the same team of physicians.

MAIN POINTS

- *Combined treatment of rTMS and traditional Chinese medicine acupressure effectively alleviates emotional disorders and neural damage in elderly patients with cerebral hemorrhage, offering a new approach to treatment.*
- *The study comprehensively considers the impact of treatment on patients' emotions, nerves, and cognitive functions, providing multiple perspectives for clinical reference.*
- *By combining traditional Chinese medicine with modern neurological therapy, this study explores a new approach to emotional treatment after cerebral hemorrhage, offering valuable insights for integrative medicine.*

The inclusion criteria were as follows: (1) individuals diagnosed with cerebral hemorrhage through cranial CT or MRI; (2) patients with 30-60 mL basal ganglia or lobular hemorrhage without cerebral hernia and without decompressive craniectomy; (3) undergoing neuroendoscopic minimally invasive surgery; (4) aged 60 years or older; (5) meeting the diagnostic criteria for depressive disorder, stress-related and trauma-related disorders, anxiety disorders, schizophrenia spectrum, and other psychotic disorders as outlined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders[8]; (6) receiving diagnosis, treatment, and continuous follow-up at our hospital; (7) absence of any affective disorder prior to admission; (8) inclusion of complete observation indicators and clinical data in this study; (9) systolic pressure ≥ 140 mmHg or diastolic pressure ≥ 90 mm Hg. Criteria for exclusion: (1) coexistence of a malignant tumor; (2) severe impairment of crucial tissues and organs; (3) prior history of antipsychotic therapy; (4) previous surgical intervention for cerebral hemorrhage or cerebral infarction.

Exposure Factors

After the neuroendoscopic minimally invasive surgery, all patients were carefully monitored and received standard posttreatment care, which included nutritional support, blood pressure control, intracranial pressure management, and anticoagulation therapy. Additionally, the patients in the exposed group were treated with rTMS combined with traditional Chinese medicine auricular point pressure bean therapy. Beginning 4 weeks after surgery, in addition to the usual rehabilitation program, the exposed group received a combination of rTMS and auricular point pressure bean therapy. The rTMS treatment was administered using an instrument while the patient lay on their back on the treatment bed. The therapist positioned the coil perpendicular to the treatment site on the dorsolateral side of the right anterior frontal lobe. The treatment parameters were as follows: frequency of 1 Hz, 20 pulses per sequence with a 5-second interval between sequences, a total of 30 sequences per treatment session, and the intensity set to the patient's resting exercise threshold.[9] The rTMS treatment cycle is 1 treatment per day, four days per week, for 3 weeks. The key auricular pressure points of auricular point pressure bean therapy comprise the heart acupoint, antihypertensive point, Shenmen acupoint, and matching acupoints like the spleen and liver acupoints. The ear skin is disinfected using 75% alcohol by the operator. To ensure that the ear acupoints do not shed or dry out from the alcohol, a probe stick is utilized to locate the acupoints, applying slight pressure to identify the acupoint with a sense of pain or numbness. An indentation is left as a marker, and the corresponding acupoint sticker is affixed. The "counterpressing method" is then applied for moderate pressure, resulting in a sensation of distension, warmth, acidity, and pain in the ear.[10] It is advised that the patient avoid contact with water to prevent displacement of the sticker and self-administer the daily 3-minute session of pressing each acupoint in the morning, midday, and evening for 3 consecutive weeks.

Observed Index

Baseline Characteristic: Data on the baseline characteristics of the patients were gathered, encompassing age, gender, body mass index (BMI), presence of coronary artery disease, hypertension, type 2 diabetes mellitus (T2DM), preoperative blood cell analysis involving red blood cell count (RBC), white blood cell count (WBC), platelet

count (PLT), and hemoglobin level (Hb). Additionally, changes of blood biochemical parameters before and after the operation were checked, such as albumin (ALB), alanine aminotransferase (ALT), total bilirubin (TBil), and serum creatinine (Scr). The assessment of postoperative coagulation function consisted of measuring prothrombin time (PT) and activated partial thromboplastin time (APTT).

Study Variables: The assessment of post-operative and post-rehabilitation treatment included the evaluation of adverse emotional states, physiological indicators, nerve impairment, and cognitive functioning. The intensity of negative emotions was measured using the Hamilton Anxiety Scale (HAMA) and the Hamilton Depression Scale (HAMD).[11,12] The extent of nerve injury was assessed using the National Institutes of Health Stroke Scale (NIHSS).[13] Cognitive abilities were evaluated using the Montreal Cognitive Assessment scale (MoCA) and the Mini Mental State Examination (MMSE).[14,15] These scales were tested under the guidance of 2 professional psychiatrists, and the results were obtained through outpatient follow-up.

Detection Method

The HAMA scale comprised 14 items, while the HAMD scale consisted of 17 items. Each item was assigned a score ranging from 0 to 4, with 0 indicating no symptoms and 4 indicating extremely severe symptoms. As the HAMA and HAMD scores increased, they indicated a greater level of anxiety and depression experienced by the patients. The reliability coefficients for the HAMA and HAMD scales ranged from 0.762 to 0.890 and 0.770 to 0.889, respectively. The validity coefficients for the HAMA and HAMD scales were 0.721 and 0.733, respectively.

The NIHSS scale encompasses a range of metrics including cognitive function, visual acuity, motor abilities, speech capabilities, and sensory perception. This comprehensive assessment consists of 15 items and yields a cumulative score out of 42. A lower score on this scale indicates a reduced severity of neurological deficits. The reliability coefficients for the NIHSS scale ranged from 0.791 to 0.912, and the validity coefficients were 0.767.

The MoCA scale comprises eight components, encompassing memory, attention, and temporal and spatial orientation, whereas the MMSE scale comprises five components centered on memory and attention. Both scales yield a total score of 30, with higher scores indicating improved cognitive function in patients. The reliability coefficients for the MoCA and MMSE scales ranged from 0.759 to 0.894 and 0.777 to 0.837, respectively. The validity coefficients for the MoCA and MMSE scales were 0.752 and 0.751, respectively.

Statistical Analysis

Statistical analysis was conducted using SPSS v27.0 (IBM SPSS Corp.; Armonk, NY, USA). To address baseline differences, a caliper width of 0.2 times the PS logit standard deviation was applied in propensity score matching (PSM). The PSM approach involved grouping patients in a 1 : 1 nearest neighbor match, ensuring that each individual in the exposure group was matched with 1 individual in the control group. The effectiveness of PSM was assessed using the standardized mean deviation (SMD). A value of SMD ≤ 0.1 indicates complete balance in the baseline tendency model.

Harman's factor analysis is employed to assess the occurrence of common method deviation in the subjective index values of HAMA, HAMD, NIHSS, MoCA, and MMSE. The cumulative variance explained by the initial factor falls below the critical value of 40%, suggesting the absence of significant common method deviation in the aforementioned indices.

The incidence data (gender, complicated with coronary artery disease, hypertension, T2DM ratio) were expressed as the total number and percentage of cases. The metrics data (age, BMI, WBC, RBC, PLT, Hb, ALB, ALT, TBil, PT, APTT, HAMA, HAMD, NIHSS, MoCA, and MMSE) were presented as mean values with standard deviation ($\bar{x} \pm SD$). The comparison of incidence data between groups was performed using the χ^2 test, while the t-test was used to compare the normal measurement data between groups. The paired sample t-test was utilized to assess the before and after intervention differences. Non-normal distribution measurement data (the difference in MoCA scores and MMSE scores) were expressed as median and quartile [M(P25, P75)] and Mann–Whitney *U*-test was used. $P < .05$ was considered statistically significant.

Results

Patient Characteristic

In this study, a total of 138 patients diagnosed with cerebral hemorrhage were initially considered for inclusion. Ultimately, 116 patients were included in the analysis, with 53 assigned to the exposure group and 63 to the control group. Prior to implementing PSM, there were notable disparities in the average age and BMI of patients in the exposure and control groups. However, after PSM was conducted, 53 patients who underwent minimally invasive debridement of intracerebral hematoma and received routine intervention were successfully matched with 53 patients who received rTMS combined with auricular point pressure bean therapy. Subsequent analysis revealed no significant differences in average age, gender distribution, BMI, prevalence of coronary heart disease, hypertension, T2DM, or average levels of WBC, RBC, PLT, Hb, ALB, ALT, TBil, Scr, PT, and APTT between the 2 groups ($P > .05$, Table 1).

Analyzing Variations in Negative Affect Among Disparate Groups

After different methods of intervention, it was observed that the exposure group had a significant reduction in HAMA score compared to the control group ($P < .001$, Table 2). However, no significant difference was found in HAMD score between the 2 groups ($P = .674$, Table 2). Additionally, the difference score in HAMA had a significant difference between the 2 groups ($P = .001$, Table 3). The difference score in HAMD had no significant differences between the 2 groups ($P = .404$, Table 3). These findings indicate that the combination of rTMS therapy and traditional Chinese medicine auricular point pressure bean therapy can successfully alleviate anxiety in elderly patients following intracerebral hemorrhage.

Analyzing Variations in Neural Damage Among Disparate Groups

After different methods of intervention, the exposure group exhibited a noteworthy decrease in the NIHSS score compared to the control group ($P < .001$, Table 4). There was a significant reduction in the difference scores in NIHSS between the 2 groups($P < .001$, Table 4). These findings indicate that the combination of rTMS therapy and traditional Chinese medicine auricular point pressure bean therapy

Table 1. Between-Group Comparison of General Clinical Characteristic

Index	Before PSM: Exposure Group (n = 53)	Before PSM: Control Group (n = 63)	P
Age (years, $\bar{x} \pm SD$)	70.89 ± 6.66	74.10 ± 9.40	.039
Gender [Female, n(%)]	31 (58.49)	33 (52.38)	.510
BMI (kg/m^2, $\bar{x} \pm SD$)	22.57 ± 1.95	23.52 ± 2.61	.031
Coronary artery disease [n(%)]	15 (28.30)	17 (26.98)	.874
Hypertension [n(%)]	14 (26.42)	18 (28.57)	.796
T2DM [n(%)]	16 (30.19)	20 (31.75)	.857
RBC (×10^{12}/L)	4.81 ± 1.28	5.02 ± 1.31	.376
WBC (×10^9/L)	4.89 ± 1.17	5.04 ± 1.12	.488
PLT (×10^9/L)	187.68 ± 16.64	190.58 ± 15.79	.338
Hb (g/L)	134.60 ± 16.24	130.88 ± 15.30	.207
ALB (g/L)	44.51 ± 6.45	42.35 ± 6.12	.067
ALT (U/L)	32.26 ± 5.64	31.13 ± 5.46	.273
TBil (μmol/L)	13.17 ± 2.30	13.09 ± 1.86	.838
Scr (μmol/L)	76.82 ± 9.07	75.63 ± 9.80	.501
PT(s)	11.77 ± 1.72	11.97 ± 1.60	.518
APTT(s)	33.70 ± 2.98	33.13 ± 2.83	.290
Index	**After PSM: Exposure group (n = 53)**	**After PSM: Control group (n = 53)**	**P**
Age (years, $\bar{x} \pm SD$)	70.89 ± 6.66	69.40 ± 6.63	.251
Gender [Female, n(%)]	31 (58.49)	28 (52.83)	.558
BMI (kg/m^2, $\bar{x} \pm SD$)	22.57 ± 1.95	22.56 ± 1.74	.983
Coronary artery disease [n(%)]	15 (28.30)	14 (26.42)	.828
Hypertension [n(%)]	14 (26.42)	15 (28.30)	.828
T2DM [n(%)]	16 (30.19)	15 (28.30)	.831
RBC (×10^{12}/L)	4.81 ± 1.28	5.04 ± 1.35	.374
WBC (×10^9/L)	4.89 ± 1.17	5.05 ± 1.09	.453
PLT (×10^9/L)	187.68 ± 16.64	190.14 ± 16.64	.448
Hb (g/L)	134.60 ± 16.24	131.15 ± 15.61	.268
ALB (g/L)	44.51 ± 6.45	42.41 ± 6.39	.095
ALT (U/L)	32.26 ± 5.64	31.14 ± 5.57	.305
TBil (μmol/L)	13.17 ± 2.30	13.10 ± 1.89	.870
Scr (μmol/L)	76.82 ± 9.07	75.58 ± 9.58	.496
PT (s)	11.77 ± 1.72	12.02 ± 1.68	.438
APTT (s)	33.70 ± 2.98	33.18 ± 2.85	.356

ALB, albumin; ALT, alanine aminotransferase; APTT, activated partial thromboplastin time; BMI, body mass index; Hb, hemoglobin; PLT,platelet; PSM, propensity score matching; PT, prothrombin time; RBC, red blood cell; Scr, serum creatinine; T2DM, type 2 diabetes mellitus; TBil, total bilirubin; WBC, white blood cell.

can effectively mitigate nerve injury in elderly patients following intracerebral hemorrhage.

Analyzing Variations in Cognitive Function Among Disparate Groups

After different methods of intervention, there was a significant increase in the MoCA scores (P = .001, Table 5) and MMSE scores(P < .001, Table 5) of the exposure group, when compared to the control group. The difference in MoCA scores (P = .002, Table 6) and the change in MMSE score (P = .008, Table 6) showed significant differences between the 2 groups. These findings indicate that the combination of rTMS therapy and traditional Chinese medicine auricular point pressure bean therapy can effectively and efficiently restore cognitive function in elderly patients with intracerebral hemorrhage.

Table 2. Analyzing Variations in Negative Affect Among Disparate Groups ($\bar{x} \pm SD$)

Index	Time	Exposure group (n = 53)	Control group (n = 53)	P
HAMA	Before intervention	23.81 ± 2.94	24.02 ± 2.85	.713
	After intervention	8.19 ± 2.07	10.23 ± 2.03	< .001
	P	< .001	< .001	
HAMD	Before intervention	21.64 ± 2.73	21.19 ± 2.84	.404
	After intervention	11.26 ± 1.60	11.13 ± 1.63	.674
	P	< .001	< .001	

HAMA, Hamilton anxiety scale; HAMD, Hamilton depression scale.

Table 3. Analyzing Difference Score in Negative Affect Among Disparate Groups ($\bar{x} \pm SD$)

Index	Exposure group (n = 53)	Control group (n = 53)	P
HAMA	−15.62 ± 2.94	−13.79 ± 2.80	.001
HAMD	−10.38 ± 3.16	−10.06 ± 3.27	.466

Difference in scores = after intervention − before intervention; HAMA: hamilton anxiety scale; HAMD: hamilton depression scale.
HAMA: Hamilton anxiety scale; HAMD, Hamilton depression scale.

Discussion

Stroke has emerged as a global health menace and is the leading cause of mortality.[16] Spontaneous cerebral hemorrhage is a prevalent underlying factor contributing to the incidence of stroke, constituting approximately 10%-15% of all stroke cases. The prognosis for elderly individuals with cerebral hemorrhage is unfavorable, as it leads to a decline in self-care capacity, significantly compromising their overall quality of life.[17,18] Currently, the treatment approaches for elderly individuals suffering from cerebral hemorrhage are primarily categorized into conservative therapy and surgical intervention.[19] Among these, conservative therapy is appropriate for patients with mild symptoms and a confined intracranial hematoma. Surgical intervention encompasses procedures such as large bone flap craniotomy and minimally invasive puncture hematoma removal.[20] Due to its precise localization, minimal trauma, quick intraoperative duration, and minimal postoperative complications, the application of minimally invasive hematoma evacuation has become prevalent in clinical practice.[21] Despite continuous advancements in this treatment, cognitive and affective impairments persist in elderly patients afflicted with intracerebral hemorrhage. Consequently, it is imperative to assess approaches that can enhance the postoperative management of intracerebral hemorrhage in this specific patient population, as it may be important for improving emotional and cognitive function in elderly patients after surgery.

A majority of individuals experiencing cognitive impairment following intracerebral hemorrhage also face psychological burdens, with severe cases progressing towards the development of anxiety, depression, and affective disorders over time.[22] Furthermore, cerebral hemorrhage can impair patients' physical abilities, triggering even more intense psychological stress reactions and exacerbating their anxiety and depression. Koivunen et al found that individuals

Table 4. Analyzing Variations in NIHSS Scores Among Disparate Groups ($\bar{x} \pm SD$)

Time	Exposure Group (n = 53)	Control Group (n = 53)	*P*
Before intervention	24.64 ± 3.49	23.43 ± 4.04	.103
After intervention	12.72 ± 3.51	16.04 ± 4.24	< .001
P	< .001	< .001	
Difference score	−12.00 (−12.00, −13.00)	−8.00 (−9.00, −5.00)	< .001

Difference in scores = after intervention − before intervention; NIHSS: National Institute of health stroke scale.
NIHSS, National Institutes of Health stroke scale.

Table 5. Analyzing Variations in Cognitive Function Among Disparate Groups ($\bar{x} \pm SD$)

Index	Time	Exposure Group (n = 53)	Control Group (n = 53)	*P*
MoCA	Before intervention	18.81 ± 3.17	19.30 ± 3.12	.424
	After intervention	23.11 ± 4.01	20.66 ± 3.33	.001
	P	< .001	.032	
MMSE	Before intervention	18.43 ± 2.98	18.19 ± 3.55	.701
	After intervention	22.64 ± 3.24	19.98 ± 3.21	< .001
	P	< .001	.008	

MoCA, Montreal cognitive assessment; MMSE, mini-mental state examination.

Table 6. Analyzing Difference Score in Negative Affect Among Disparate Groups ($\bar{x} \pm SD$)

Index	Exposure Group (n = 53)	Control Group (n = 53)	*P*
MoCA	4.00 (4.00, 4.00)	1.00 (0.00, 3.00)	< .001
MMSE	4.00 (4.00, 5.00)	1.00 (0.00, 3.00)	< .001

Difference in scores = after intervention − before intervention.—
MMSE, mini-mental state examination; MoCA, Montreal cognitive assessment.

with cerebral hemorrhage experience both cognitive decline and emotional disturbances like depression and anxiety, which coexist separately and mutually affect each other.[23] Scopelliti et al conducted a 2-year follow-up study on patients with cerebral hemorrhage and cognitive impairment. The findings revealed that the patients experienced a certain degree of cognitive function improvement following the alleviation of depression.[24] Within traditional Chinese medicine, the application of pressurized beans on auricular points is a frequently employed external treatment. Those belonging to the Wang Buxiu seed family, along with magnetic beads and rapeseeds, are applied to stimulate acupoints on the auricle for disease treatment. Auricular point pressing beans possess the ability to regulate the nervous system, provide desensitization, and alleviate itching.[25] The present investigation reveals a noteworthy decrease in the HAMA score among elderly patients suffering from intracerebral hemorrhage who received a combination therapy of rTMS and traditional Chinese medicine auricular point pressure beans, as compared to those who underwent standard intervention. The essential acupoints for emotional regulation are the Xin acupoint and Shenmen acupoint. The hypotensive point can induce hypotension, while the spleen acupoint helps in the restoration of spleen function, which serves as the source of qi and blood biochemical processes. The liver acupoint, known as the primary emotional acupoint, provides a fundamental solution to negative emotions. Furthermore, by stimulating the aforementioned acupoints and adjusting the Zang-fu organs' functions through meridian conduction, applying pressure to the auricular point using a bean can facilitate the flow of qi and blood and ultimately regulate blood pressure levels. Simultaneously, this technique has the ability to activate the nervous and endocrine systems, safeguarding against the excessive stimulation provoked by the initial pathological afferent signals. It also suppresses the adjacent pathological areas of heightened activity, facilitates physiological regulation, elevates the quality of sleep, and enhances the psychological well-being of patients. Additionally, the application of pressure on auricular points such as Shenmen, sympathetic, cerebral cortex, and other acupoints is believed to modulate the excitability of the nerve center, augment the excitability of the cerebral cortex, regulate the sleep quality of patients, and subsequently enhance their psychological state.

Previous research has indicated that leukoencephalopathy is responsible for cognitive decline in individuals with cerebral hemorrhage. This condition disrupts the subcutaneous network in the brain, leading to impairments in cognitive functions such as attention, memory, executive functions, and analytical skills.[5,26] rTMS therapy, a type of neuroelectrophysiological treatment, utilizes magnetic fields with a specific intensity to induce an electric field in targeted areas of the brain. By doing so, it effectively facilitates the restoration of brain function.[27] Jiang et al validated the extensive application of rTMS treatment among individuals diagnosed with mild cognitive impairment, resulting in substantial enhancement of patients' cognitive abilities along with improved safety.[28] In our investigation, it was noted that the NIHSS score among elderly individuals diagnosed with intracerebral hemorrhage and subjected to a combination therapy of rTMS and traditional Chinese medicine auricular point pressure bean exhibited a substantially diminished value compared to those who underwent conventional treatment. Simultaneously, the MoCA and MMSE scores were noticeably elevated in this particular group. Jiao et al employed rTMS as a therapeutic intervention for patients with dysphagia caused by stroke. Their findings indicated that the application of rTMS could modulate the neural network by altering the membrane potential of neurons, thereby leading to improvements in neural function.[29] It was also observed that rTMS treatment could enhance the excitability of both subcortical and distant functional networks within the stimulated region, as well as regulate cortical excitability, intracortical inhibition, and intracortical facilitation.[30] According to Yao et al's study, it is believed that the stimulation of the cerebellum can enhance the flow of blood in specific brain regions and facilitate the release of neurotransmitters like acetylcholine. Furthermore, it has the potential to inhibit neuronal cell death and eliminate harmful free radicals, ultimately leading to an improvement in neurological function. Additionally, the cerebellar fastigial nucleus is interconnected with the hypothalamus through fibrous connections, and it has extensive associations with other nuclei. Consequently, the stimulation of the cerebellar fastigial nucleus can effectively enhance the connectivity between neurons, thereby promoting an improvement in consciousness.[31]

There are certain limitations to consider in this study as well. To begin with, being a retrospective study conducted in a single center, although the utilization of PSM matching aids in achieving

comparability between the exposure group and control group, the relatively limited overall sample size could introduce bias to the results. Secondly, while our findings demonstrate that the combination of rTMS therapy and traditional Chinese medicine auricular point pressure bean therapy can effectively alleviate affective disorders and enhance cognitive function, the precise underlying mechanism remains unclear. Therefore, further investigation into the therapeutic effect's mechanism by constructing an animal model of intracerebral hemorrhage is necessary.

The utilization of a combination of TMS therapy and auricular point pressure bean therapy, a treatment deeply rooted in traditional Chinese medicine, has exhibited remarkable efficacy in mitigating anxiety levels among elderly patients who have undergone intracerebral hemorrhage surgery. In addition to its efficacy, the implementation of this intervention method has yielded promising outcomes in terms of reducing the incidence of postoperative cognitive dysfunction while simultaneously facilitating the restoration of postoperative emotional function. As a result, this innovative approach holds tremendous clinical application value, providing a potential avenue for improving patient outcomes and overall quality of life.

Availability of Data and Materials: *Data to support the findings of this study are available upon reasonable request from the corresponding author.*

Ethics Committee Approval: *This study has been approved by the Medical Ethics Committee of Hebei Provincial Hospital of Traditional Chinese Medicine (Approval No.: 2022-KY-001-01).*

Informed Consent: *Written informed consent was obtained from the patients/patient who agreed to take part in the study.*

Peer-review: *Externally peer reviewed.*

Author Contributions: *Concept – L.H.; Design – L.H., L.D.; Supervision – H.L., H.W., Y.H.; Materials – L.H., L.D., H.L., H.W.; Data Collection and/or Processing – L.H., L.D., R.S., Y.H.; Analysis and/or Interpretation – L.H., L.D., H.W., R.S., Y.H.; Literature Search – H.L., R.S., Y.H.; Writing – L.H., L.D., H.L., R.S.; Critical Review – H.L., H.W., Y.H.*

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