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Clinical Neuroscience Research

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The Effect of Detailed Nursing in the Perioperative Period on Patients with Hypertensive Cerebral Hemorrhage

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Abstract: *Objective:* To explore the clinical effect of detailed nursing on patients with hypertensive cerebral hemorrhage during the perioperative period. *Methods:* The study was carried out from January 2022 to June 2023. A total of 98 patients with hypertensive cerebral hemorrhage were sampled and divided into a research group (n = 49) and a control group (n = 49) by the digital table method. Patients in the control group received basic perioperative care, and patients in the research group received detailed perioperative care. The complication rate, quality of life scores, and nursing satisfaction were compared between the two groups. *Results:* The incidence of complications in the research group was lower than that in the control group ($P < 0.05$); the quality-of-life score of the patients in the research group was higher than that in the control group ($P < 0.05$); the nursing satisfaction of the patients in the research group was higher than that in the control group ($P < 0.05$). *Conclusion:* Detailed perioperative nursing care for patients with hypertensive cerebral hemorrhage can reduce the complication rate and improve the quality of life and nursing satisfaction. Therefore, this practice should be popularized in medical institutions.

Keywords: Detailed nursing; Hypertensive cerebral hemorrhage; Complications; Quality of life; Nursing satisfaction

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1. Introduction

Hypertensive intracerebral hemorrhage is a common clinical cerebrovascular disease that is characterized by necrosis, ischemia, and degeneration of cerebral artery walls caused by hypertension, which in turn leads to rupture of cerebral blood vessels and cerebral parenchymal hemorrhage [1]. The onset of hypertensive intracerebral hemorrhage is sudden, and the main symptoms of patients are hemiplegia, sensory disturbance, nausea and vomiting, impaired consciousness, etc. If it is not treated in time, it may be life-threatening [2]. The main clinical treatment for hypertensive intracerebral hemorrhage is by removing the hematoma through surgery. In order to ensure the effect of surgery and prognosis, careful and comprehensive nursing intervention is required during the perioperative period [3,4]. In this study, 98 samples of patients with hypertensive cerebral hemorrhage were included to explore the clinical effect of detailed perioperative nursing.

2. Materials and methods

2.1. General information

Matters related to this study were approved by the hospital's medical ethics committee. The study was carried out from January 2022 to June 2023. A total of 98 patients with hypertensive cerebral hemorrhage were sampled. They were divided into the research group (n = 49) and the control group by the digital table method. The research group consisted of 26 males and 23 females, with an age range of 44–65 years, with an average age of 54.58 ± 4.26 years, including 15 cases of lobar hemorrhage, 18 cases of basal ganglia and internal capsule hemorrhage, and 16 cases of hemorrhage in the thalamus and other parts. In the control group, there were 27 males and 22 females, with an age range of 46–64 years, with an average of 54.63 ± 4.19 years, including 17 cases of lobar hemorrhage, 15 cases of basal ganglia and internal capsule hemorrhage, and 17 cases of hemorrhage in the thalamus and other parts. The general data of the two groups of patients were comparable ($P > 0.05$).

Inclusion criteria: (1) Diagnosed with hypertensive intracerebral hemorrhage through imaging examinations, (2) fulfilled surgical indications, (3) patients or family members signed the research consent form.

Exclusion criteria: (1) Presence of coagulation dysfunction, (2) presence of major organ diseases such as heart, lung, liver, or kidney diseases, (3) incompliance with the study procedures.

2.2. Methods

Patients in the control group received basic perioperative care. Nurses completed various preoperative preparations and assisted the physicians during surgery. Patients' vital signs were monitored after surgery, incision care was given, smooth drainage was ensured, and the physicians were informed in case of abnormalities.

The patients in the research group were given detailed nursing in the perioperative period, and the specific procedures were as follows.

(1) Preoperative care

(i) Surgery preparation: Preoperative nurses assisted patients in completing coagulation, hematuria routine, blood type, and other examinations according to the doctor's instructions. The electrocardiogram (ECG) of the patients was monitored, and the puncture points were marked based on CT examinations. The patients' breathing and urinary tract were kept unobstructed, some patients underwent tracheotomy or intubation, and the insertion of the indwelling urinary catheter was completed in a standardized manner. The patients were instructed to fast, their heads were shaved and their skin was prepared. The patients underwent drug susceptibility tests and crossmatch testing as prescribed by the doctor and were infused with an appropriate amount of sedatives. (ii) Psychological intervention: The preoperative nurses communicated with the patients and their families, which included a brief explanation of hypertensive cerebral hemorrhage, the surgery plan and expected results, the success rate of the operation, and the successful cases. The nurses also encouraged the patients in several ways.

(2) Intraoperative care

During the operation, the nursing staff delivered the equipment in a timely and accurate manner, monitored the vital signs of the patient, assisted the physician during hematoma removal and other procedures, and dealt with various abnormal conditions in a timely manner.

(3) Postoperative care

(i) Basic postoperative care: After the operation, the nursing staff controlled the temperature of the ward to 20–23°C and the humidity to 50–60%, opened the windows for ventilation every day, disinfected the ground, and limited the number of visitors. Before the patient regained consciousness, the nursing staff kept the patient in a supine position with the pillow removed and the head tilted to one side. After waking up, the head of the bed was raised by 30°, and the sheets were changed regularly to ensure that they were dry and clean, and the patients were turned over every 2 hours. Wipe the skin once a day, and the nursing staff cleans the mouth of the patient every day. (ii) Condition monitoring: The patients' blood pressure, pupils, state of consciousness, fluid intake and output, ECG, etc., were monitored. If a patient's pupils were dilated, consciousness was impaired, blood pressure was elevated, and breathing and pulse were abnormal, the patient was at risk of cerebral hernia, and the physicians were notified promptly. A dehydration agent was then applied to reduce intracranial pressure; the breathing of the patient was monitored, and oxygen inhalation therapy was performed concurrently. If a patient's urine output was less than 25 mL/h with an imbalance of fluid intake and output, the volume of fluid replacement was adjusted and dehydration prevention was performed concurrently. (iii) Incision care: The incision was monitored and the dressing was replaced regularly to ensure that it was dry and clean. The doctor was notified immediately if an incision seepage was found. (iv) Drainage tube care: A drainage bag was placed 20–30 cm below the puncture area of the drainage tube, and the total amount, color, and properties of the drainage fluid were observed. If there was excessive drainage fluid or it was bright red or turbid, the doctor was notified as soon as possible. The drainage tube was fixed properly to avoid putting pressure on the patient or it bending or falling off. The patients were instructed to protect the drainage tube when turning around and take care of their hygiene. (v) Nursing of complications: The postoperative nurses cleaned up the patients' oral and nasal secretions regularly to keep the airway unobstructed and prevent respiratory infections. They also wiped the patients' perineum every day, used iodophor cotton balls to disinfect their urethra, and replaced their drainage tubes regularly to prevent urinary system infection. The patients were given air mattresses, and the nurses turned them over regularly and massaged the pressured skin to prevent pressure sores. (vi) Rehabilitation care: After the patient's condition is stable, the nursing staff assists him with limb function training, and language training, and guides the patient to complete active and passive movements. (vii) Discharge guidance: Before the patients were discharged, they were advised to eat a healthy diet to prevent constipation or diarrhea, quit smoking and drinking, measure their blood pressure regularly, control their emotions, and visit the hospital for check-ups regularly.

2.3. Evaluation criteria

(1) The incidence of complications in the two groups of patients was calculated. (2) The quality-of-life scores of the patients were evaluated immediately after surgery and at discharge. The quality of life of the patients was evaluated using a short-form survey (SF-36), which consisted of the following items: physical function, emotional function, social function, and overall health. The full marks for each item were 1000 points; the higher the score, the higher the quality of life. (3) A self-made questionnaire was used to evaluate the nursing satisfaction of the two groups of patients.

2.4. Statistical methods

SPSS 23.0 was used to perform data analysis, the measurement data was expressed as mean ± standard deviation and analyzed with a *t*-test; the count data was expressed as percentages and analyzed using a χ^2-test, with $P < 0.05$, indicating statistical significance.

3. Results

3.1. Complication rate

As shown in **Table 1**, the complication rate in the research group was lower than that in the control group ($P < 0.05$).

Table 1. Comparison of complication rates between the two groups (n [%])

Group	Respiratory infection	Pressure sore	Urinary tract infection	Complication rate
Research group (n = 49)	2	0	1	3 (6.1)
Control group (n = 49)	4	3	3	10 (20.4)
χ^2				4.345
P				0.037

3.2. Quality-of-life scores

As shown in **Table 2**, the quality-of-life scores of the research group were higher than those of the control group at discharge ($P < 0.05$).

Table 2. Comparison of quality-of-life scores between the two groups (mean ± standard deviation)

Group	Bodily function		Emotional function		Social function		General health	
	Immediately after surgery	Before discharge	Immediately after surgery	Before discharge	Immediately after surgery	Before discharge	Immediately after surgery	Before discharge
Research group (n = 49)	48.25 ± 3.66	75.44 ± 3.98	50.25 ± 3.96	78.44 ± 4.05	46.25 ± 3.92	77.06 ± 4.27	45.01 ± 3.55	78.24 ± 4.25
Control group (n = 49)	48.19 ± 3.72	61.25 ± 2.77	50.18 ± 4.02	65.42 ± 2.98	46.18 ± 3.85	63.81 ± 2.95	44.97 ± 3.62	69.22 ± 3.18
t	0.080	20.484	0.087	18.126	0.089	17.871	0.055	11.895
P	0.936	0.000	0.931	0.000	0.929	0.000	0.956	0.000

3.3. Nursing satisfaction

The nursing satisfaction of the research group was 95.9%, which was higher than that of the control group, which was 79.6%, ($P < 0.05$).

4. Discussion

Statistics show that the incidence of hypertensive cerebral hemorrhage in China is about 15/100,000, accounting for about 15% of all kinds of stroke diseases. Hypertensive intracerebral hemorrhage has a sudden onset, with clinical manifestations such as nausea and vomiting, headache, hemiplegia, sensory disturbance, etc., and it has high disability and mortality rates [4]. Hypertensive cerebral hemorrhage is often treated through hematoma removal. In order to improve postoperative recovery, effective nursing intervention is required [5].

Basic perioperative nursing measures lack complication prevention, rehabilitation nursing, humanistic care, and other elements, which are not conducive to postoperative rehabilitation of patients [6]. With detailed perioperative nursing, common perioperative problems of hypertensive cerebral hemorrhage are analyzed, suitable nursing measures are formulated, and better preparations can be made for the surgery. Psychological intervention and other measures can also be carried out to improve the patients' health and emotional state. Besides, the patients are monitored closely and extra care is given to the incision and drainage to prevent complications in a targeted manner [7,8]. Implementing rehabilitation nursing after the patient's condition is

stable and providing health guidance before the patient is discharged can accelerate the recovery of the patient and allow them to perform proper self-care, which in turn improves their prognosis. Detailed perioperative nursing measures are superior to basic nursing plan in that they can meet the diverse nursing needs of patients, so they should be widely practiced [9,10].

The results of this study showed that the complication rate in the research group was lower than that in the control group, suggesting that meticulous perioperative care can reduce the complication rate. This is because, in basic nursing care, the prevention of complications was not emphasized. In detailed care, respiratory, urethral, and skin care measures were refined. Besides, the procedures were done in aseptic conditions to prevent infections, therefore reducing the incidence of complications [11,12]. The results of this study showed that the quality-of-life scores of patients in the research group were higher than those in the control group, suggesting that meticulous perioperative care can improve the quality of life of patients. This is because, in detailed perioperative care, both physical and mental health were taken into account, allowing the diverse nursing needs of patients to be met, hence improving their quality of life [13]. The data of this study showed that the nursing satisfaction of the patients in the research group was higher than that in the control group. The reason is that patient-centered nursing was emphasized in detailed perioperative nursing, and the comprehensive application of various nursing measures improved the physical and mental state of the patients, resulting in higher nursing satisfaction [14-15].

5. Conclusion

In summary, detailed perioperative care for patients with hypertensive cerebral hemorrhage can reduce the complication rate, and improve quality of life and nursing satisfaction, so it should be popularized in medical institutions. However, the sample size of this study was small, and no multi-center cross-sectional data comparative analysis was conducted. Therefore, the specific plan for detailed perioperative care still needs to be refined.

Disclosure statement

The author declares no conflict of interest.

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Effect of Remote Ischemic Conditioning Combined with Arterial Thrombolysis on Patients with Ultra-Early Cerebral Infarction

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Abstract: *Objective:* To observe the effect of remote ischemic conditioning + arterial thrombolysis in patients with ultra-early cerebral infarction. *Methods:* 60 patients with ultra-early cerebral infarction were used as samples, and this study was carried out from April 2022 to April 2023. The patients were randomly divided into Group A and Group B. The patients in Group A received remote ischemic treatment + arterial thrombolysis, whereas the patients in Group B received arterial thrombolysis. *Methods:* The coagulation indicators, inflammatory factors, quality of life, and adverse reactions of both groups were compared. *Results*: The blood coagulation indexes of the patients in Group A were better than those in Group B ($P < 0.05$); the inflammation indexes in Group A were lower than those in Group B ($P < 0.05$); the SF-36 scores in Group A were higher than those in Group B ($P < 0.05$); the adverse reaction rate in patients with cerebral infarction was lower than that in Group B ($P < 0.05$). *Conclusion*: Remote ischemic conditioning + arterial thrombolysis is effective and feasible in treating patients with ultra-early cerebral infarction, and it inhibits inflammation and improves coagulation function.

Keywords: Ultra-early cerebral infarction; Arterial thrombolysis; Remote ischemic treatment; Curative effect

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1. Introduction

Cerebral infarction is a cerebrovascular disease that can damage brain function. This disease is prevalent, complicated, and life-threatening. Cerebral infarction is more common among older people due to their weakened immunity, and it is difficult to treat. In addition, after cerebral infarction, the blood supply to the brain can be affected, leading to brain tissue necrosis, causing impaired brain function and residual cognitive, language, and physical impairments, thereby reducing patients' quality of life. Currently, arterial thrombolysis is the primary treatment method for cerebral infarction. The most commonly used drug is urokinase, which can improve the neurological function of patients. Ultra-early administration of urokinase aids in clearing occluded cerebral blood vessels, diminishing the infarct area, and fostering the restoration of cerebral nerve function [1].

However, the effect of arterial thrombolysis alone is limited, and it cannot reduce neuronal damage and avoid reperfusion injury in the infarcted area. In recent years, some scholars have suggested the incorporation of remote ischemic conditioning (RIC) into the treatment of cerebral infarction, which can stimulate the distal limbs through ischemia to increase the tolerance of brain tissue to ischemia, thereby protecting the cranial nerves and avoiding reperfusion damage of ischemic brain tissue [2]. In this study, 60 patients with ultra-early cerebral infarction admitted from April 2022 to April 2023 were used as samples to explore the effect of remote ischemic treatment and arterial thrombolysis.

2. Material and methods

2.1. Information

60 patients with ultra-early cerebral infarction were used as samples for this study, which was carried out from April 2022 to April 2023. There were no significant differences in the baseline data of both groups ($P > 0.05$), as shown in **Table 1**.

Table 1. Baseline data of patients with cerebral infarction

Group	Gender		Age (years)		Onset time (h)		Basic illness		
	Male	Female	Range	Average	Range	Average	Diabetes	Hypertension	Heart disease
Group A ($n = 30$)	18	12	52–88	69.11 ± 2.42	0.5–5	2.41 ± 0.36	10	12	8
Group B ($n = 30$)	19	11	52–89	69.13 ± 2.39	0.5–5.5	2.43 ± 0.38	11	13	6
χ^2/t	0.0705		0.0322		0.2093		0.0687		
P	0.7906		0.9744		0.8350		0.8012		

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) MRI suggested cerebral infarction, (2) onset time < 6 hours; (3) signed an informed consent, (4) first cerebral infarction.

Exclusion criteria: (1) Abnormal immune system, (2) abnormal visceral function, (3) drug allergy, (4) history of traumatic brain injury, (3) brain tumor.

2.3. Treatment methods

After the patients were enrolled in the study, various treatments were administered, including diuresis, dehydration, oxygen inhalation, management of hypoglycemia, hypotension, pH adjustment, water-electrolyte correction, and other relevant therapeutic measures. Simultaneously, supplementary measures such as brain neurotrophy, intracranial pressure adjustment, and reconstruction of brain microcirculation were implemented.

Group A underwent RIC in addition to arterial thrombolysis: The procedure involved the use of two non-invasive blood pressure cuffs. One cuff was placed around the upper limb, approximately 1–2 cm above the elbow joint, while the other was affixed to the lower limb, positioned approximately 3–5 cm above the lower joint. The cuffs were inflated to achieve a pressure of 200 mmHg to momentarily obstruct blood flow, resulting in the temporary absence of dorsal pedis artery and cerebral artery pulses. Once the desired pressure was reached, inflation ceased. Each treatment session consisted of maintaining inflation and pressure for 5 minutes, followed by a 5-minute deflation period. The process involved alternating inflation and pressure between the upper and lower limbs, completing three cycles of alternating pressurization during each session. This treatment regimen was administered once a day for a duration of 7 days.

Group B underwent arterial thrombolysis: Patients were positioned supine and administered anesthesia along with heparin. Subsequently, a No. 7 injection needle was utilized to puncture the pulsating area of the anterior carotid artery of the sternocleidomastoid, ensuring the needle tip was maintained at a 45° oblique puncture angle. The thrombolytic drug was administered at a rate of 2 mL/min through intra-arterial infusion. Following the completion of intra-arterial thrombolytic administration, angiographic examination was conducted to ensure vascular patency. The disappearance of local vascular occlusion was observed, and if occlusion persisted, an additional dose of urokinase (100,000 U) was administered, with a total dosage not exceeding 750,000 U. After the treatment was completed, the needle tube was removed, and gentle vertical pressure was applied to the local area for 15 minutes.

2.4. Observation indicators

(1) Coagulation: An automatic coagulation analyzer was used to detect indicators such as thrombin time (TT), prothrombin time (PT), activated partial thromboplastin time (APTT), and fibrinogen (FIB).

(2) Inflammation: Detection of tumor necrosis factor-α, interleukin-6, and hypersensitive-C-reactive protein indicators.

(3) Quality of life: The quality of life of the patients was assessed with a short-form survey (SF-36); the scores positively correlate with the quality of life of the patients.

(4) Adverse reactions: The incidence of adverse reactions including fatigue, upper gastrointestinal bleeding, gastrointestinal irritation, etc. were recorded.

2.5. Statistical analysis

Statistical analysis was completed using SPSS21.0, and categorical variables were expressed as percentages; measurement data were expressed as mean ± standard deviation. In comparing measurement data between two groups, the t-test was employed if the data met the typical assumptions; otherwise, the rank sum test was used. Differences in categorical variables were assessed using the chi-square test. A significance level of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Blood coagulation indicators

After medication, the blood coagulation indexes of the patients in Group A were better than those in Group B ($P < 0.05$), as shown in **Table 2**.

Table 2. Analysis of blood coagulation indicators in patients with cerebral infarction (mean ± standard deviation)

Group	TT (s)		PT (s)		APTT (s)		FIB (g/L)	
	Before medication	After medication	Before medication	After medication	Before medication	After medication	Before medication	After medication
Group A (n = 30)	11.78 ± 1.25	15.01 ± 1.32	10.35 ± 2.11	15.01 ± 2.43	26.21 ± 1.35	30.67 ± 2.11	3.61 ± 0.45	4.68 ± 1.11
Group B (n = 30)	11.82 ± 1.27	12.84 ± 1.29	10.34 ± 2.09	11.24 ± 2.25	26.19 ± 1.34	27.45 ± 2.09	3.63 ± 0.49	3.82 ± 1.08
t	0.1229	6.4397	0.0184	6.2352	0.0576	5.9385	0.1647	3.0415
P	0.9026	0.0000	0.9853	0.0000	0.9543	0.0000	0.8698	0.0035

3.2. Inflammatory indicators

After medication, the inflammatory indicators in Group A were lower than in Group B ($P < 0.05$), as shown in **Table 3**.

Table 3. Inflammatory indicators of the patients (mean ± standard deviation)

Group	Tumor necrosis factor-α (μg/L)		Interleukin-6 (pg/mL)		Hypersensitive-C reactive protein (μmol/L)	
	Before medication	After medication	Before medication	After medication	Before medication	After medication
Group A (n = 30)	70.61 ± 2.88	36.11 ± 1.85	191.36 ± 4.51	100.36 ± 2.96	7.79 ± 1.36	4.25 ± 0.62
Group B (n = 30)	70.63 ± 2.91	43.69 ± 2.01	191.41 ± 4.49	155.61 ± 3.18	7.75 ± 1.41	5.43 ± 0.74
t	0.0268	15.1979	0.0430	69.6564	0.1118	6.6948
P	0.9787	0.0000	0.9658	0.0000	0.9113	0.0000

3.3. Quality-of-life indicators

After treatment, the scores of SF-36 in Group A were higher than those in Group B ($P < 0.05$), as shown in **Table 4**.

Table 4. Analysis table of SF-36 scoring indicators (mean ± standard deviation)

Group	Physical health (points)		Mental health (points)		Physiological functions (points)		Social functions (points)	
	Before medication	After medication	Before medication	After medication	Before medication	After medication	Before medication	After medication
Group A (n = 30)	62.58 ± 2.42	81.36 ± 3.29	63.11 ± 2.38	80.49 ± 3.35	62.48 ± 2.36	80.42 ± 2.88	60.36 ± 2.41	80.36 ± 2.91
Group B (n = 30)	62.61 ± 2.39	74.66 ± 2.78	63.13 ± 2.36	75.15 ± 2.84	62.51 ± 2.33	75.43 ± 2.75	60.39 ± 2.43	74.81 ± 2.86
t	0.0483	8.5199	0.0327	6.6597	0.0495	6.8636	0.0480	7.4503
P	0.9616	0.0000	0.9740	0.0000	0.9607	0.0000	0.9619	0.0000

3.4. Adverse reactions

The rate of adverse reactions of Group A was lower than that of Group B ($P < 0.05$), as shown in **Table 5**.

Table 5. Analysis table of cerebral infarction complications (mean ± standard deviation)

Group	Fatigue	Upper gastrointestinal bleeding	Gastrointestinal irritation	Incidence rate
Group A (n = 30)	0 (0.00)	0 (0.00)	1 (3.33)	3.33
Group B (n = 30)	1 (3.33)	2 (6.67)	3 (10.00)	20.00
χ^2	-	-	-	4.0431
P	-	-	-	0.0444

4. Discussion

Cerebral infarction is life-threatening, so it should be diagnosed and treated promptly.

When treating cerebral infarction diseases, comprehensive discussions should be undertaken regarding the treatment plan by considering factors such as the cause of the disease, symptoms, and medical history. The primary objectives should include restoring blood supply to the brain's ischemic site, reinstating brain microcirculation, enhancing brain cell function, preventing cerebral edema, and slowing the progression of cerebral infarction [3]. Conventional diuresis, dehydration, oxygen supply, regulation of intracranial pressure,

and improvement of microcirculation can alleviate the condition of cerebral infarction, but the overall curative effect is limited. Therefore, it is essential to explore effective treatment options for cerebral infarction to reduce its mortality rate [4]. In recent years, thrombolytic regimens have been gradually used to treat cerebral infarction, and many lives have been saved. However, studies have shown that thrombolysis at different time points following cerebral infarction yields diverse effects. Despite this variation, scholars generally agree that thrombolysis should be carried out at the ultra-early stage [5].

Thrombolytic therapy within 6 hours of cerebral infarction can promote the recovery of cranial nerve function and improve the safety of thrombolysis. The later the procedure is carried out, the higher the risk of secondary intracranial hemorrhage in patients, resulting in a poorer prognosis. The most commonly used thrombolytic drug is urokinase, which is safe. It can activate plasminogen and convert it into plasmin, thus avoiding cerebrovascular adverse events. Depending on the procedure, thrombolytic therapy can be divided into two types: intravenous thrombolysis and arterial thrombolysis, with the latter being relatively superior. Carotid artery thrombolysis stands as a standard clinical approach. Administering urokinase directly to the occluded vascular area does not affect blood coagulation indicators, ensuring high drug safety. While intravenous thrombolysis offers simplicity in operation, its treatment window is short, necessitating completion within 4 hours of onset. Moreover, intravenous thrombolysis requires a higher dose of urokinase, escalating the risk of side effects. Consequently, physicians often prefer recommending arterial thrombolysis for cerebral infarction patients [6]. Simple thrombolytic therapy can recanalize local blood vessels and alleviate the symptoms of cerebral infarction, but the complication rate of cerebral infarction remains high. Therefore, it is essential to explore safe and efficient solutions to improve the prognosis of patients with cerebral infarction [7]. The RIC scheme has been gradually used to treat cerebral infarction in the context of the continuous deepening medical research on cerebral infarction. Studies show that transient and constant insufficient blood oxygen supply stimulates the distal limbs during RIC treatment. This can enable the body's endogenous ischemic protection mechanism, strengthen the antioxidant defense system, and prevent free radicals from damaging the brain tissues [8]. Moreover, the RIC procedure is easy to perform, cost-effective, and non-invasive. The treatment solely involves using a non-invasive blood pressure cuff for compression therapy, making it a simple process to carry out.

The results of this study indicate that RIC + arterial thrombolysis can optimize blood coagulation indicators, inhibit the inflammatory response, and is safe and efficient. This is because alteplase can interact with plasminogen during arterial thrombolytic therapy but will not trigger a systemic fibrinolytic reaction. Besides, this regimen can improve the coagulation function of patients and inhibit the inflammatory response. This is because RIC involves increasing the local pressure of the limbs, creating a condition of reduced blood oxygen supply. This prompts the body to adapt to low oxygen levels, triggering internal protective mechanisms through hormonal and nerve regulation. These mechanisms mobilize natural defenses to prevent and manage ischemic damage in brain tissue [9]. However, the actual thrombolytic therapy should not be neglected. The half-life of alteplase is short, which can lead to neurological deterioration within a few hours after thrombolysis and increase the risk of secondary occlusion of blood vessels. Therefore, alteplase should be administered quickly, and the blood pressure changes in patients should be monitored, combined with expansion therapy if necessary [10].

5. Conclusion

In short, the RIC + arterial thrombolysis is effective in treating patients with ultra-early cerebral infarction. Besides, it enhances the coagulation function, improves the anti-inflammatory effect, and has fewer adverse effects compared to thrombolytic therapy alone. Therefore, this regimen should be promoted in clinical practice.

Disclosure statement

The authors declare no conflict of interest.

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Effects of Repetitive Magnetic Stimulation of the Vagus Nerve Combined with Intermittent Tube Feeding on Patients with Dysphagia Due to Cerebral Infarction

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Abstract: *Objective:* To study the effect of repetitive magnetic stimulation of the vagus nerve combined with intermittent tube feeding on the swallowing function and the incidence of aspiration pneumonia in patients with dysphagia due to cerebral infarction. *Methods:* This article recruited 60 patients after cerebral infarction as research subjects. The patients were divided into an observation group and a control group using the random number method. The control group received conventional rehabilitation treatment, and the observation group received repetitive vagus nerve magnetic stimulation combined with intermittent tube feeding on top of conventional treatment. The Gugging Swallowing Screen (GUSS) score, Rosenbek Penetration/Aspiration Scale (PAS) score, and Functional Oral Intake Scale (FOIS) score were measured before and after the test, and the occurrence of pneumonia in patients after treatment was recorded. *Results:* After treatment, the GUSS, PAS, and FOIS scores of the patients in the control group improved ($P < 0.05$), and the swallowing function improved; the incidence of aspiration pneumonia was 3.03%, which was lower than that in the control group ($P < 0.05$). *Conclusion:* Vagus nerve repetitive magnetic stimulation combined with intermittent tube feeding can well improve the swallowing function of patients after cerebral infarction.

Keywords: Intermittent tube feeding; Vagus nerve magnetic stimulation; Cerebral infarction; Swallowing disorder; Aspiration pneumonia

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1. Introduction

With the gradual application of mobile stroke units and the continued progress of late-time window reperfusion therapy, the survival rate of patients with cerebral infarction has significantly improved in recent years [1]. Swallowing disorder is one of the common complications after stroke, which is characterized by the inability to safely and effectively transport food from the mouth to the stomach. Studies show that 37% to 78% of patients will develop a swallowing disorder [2], resulting in pneumonia, malnutrition, and

complications such as dehydration. Although current rehabilitation treatments can improve patients' ability to eat to some extent, a large number of patients still rely on dietary modification and enteral feeding. Long-term indwelling gastric tube may induce reflux esophagitis, bleeding, etc., affecting the recovery of the patient's swallowing function [3], and it is also highly predictive of mortality [4]. Therefore, it is of great significance to seek new strategies for the treatment of dysphagia after stroke to improve patients' quality of life and prognosis. In this study, the effect of repetitive magnetic stimulation of the vagus nerve combined with intermittent tube feeding on patients with dysphagia due to cerebral infarction was analyzed, and its treatment mechanism was explored.

2. General information and methods

2.1. Information

This study recruited 60 cerebral infarction patients in our department who met the inclusion and exclusion criteria and were randomly divided into an observation group and a control group. The purpose, nature, and potential risks of the trial were fully explained before the trial. All subjects expressed their willingness to comply with the research protocol and signed the informed consent form.

Inclusion criteria: (1) Patients who had the first onset of illness and whose head CT or MRI examination met the diagnostic criteria for cerebral infarction based on the proceedings of the 4th Meeting of the Chinese Medical Association on Cerebrovascular Disease; (2) patients with the age of onset of between 45 and 78 years old, with a course of disease of 1 to 6 years; (3) patients who were experiencing swallowing disorder for the first time; (4) patients who were stable and able to maintain a sitting position; (5) patients with swallowing abnormalities confirmed by swallowing angiography; (6) patients with no severe cognitive, visual, auditory dysfunction, or mental illness, with a mini-mental state examination (MMSE) score of ≥ 24 points.

Exclusion criteria: (1) History of dementia, or MMSE score < 22; (2) severe medical disease or disease progression, sleep apnea syndrome; (3) presence of cardiac pacemaker implantation, intracranial metal device, and metal internal fixation in the throat and neck; (4) severe anxiety, depression, schizophrenia, use of sedatives, and inability to cooperate with the treatment program; (5) swallowing disorders caused by other diseases.

2.2. Method

The subjects included in the control group received conventional rehabilitation treatment according to the "2017 Guidelines for Early Stroke Rehabilitation Treatment in China" [12] of the Neurology Branch of the Chinese Medical Association. The rehabilitation program is described as follows. (1) Orbicularis oris muscle training: lip contraction training, practicing whistling or blowing, ice stimulation, etc. (2) Throat exercises: soft palate training, vocal cord training, pharyngeal muscle training, laryngeal elevator muscle group training, Mendelsohn exercise, vocal training, etc. (3) Swallowing reflex training: cold stimulation, tongue control method, tongue massage, rapid soft palate arching, etc. (4) Ice stimulation: salivary side of the lips, anterior palatine arch, velum palatine, tonsil crura, etc. (5) Neuromuscular electrical stimulation treatment of the suprahyoid and inferior muscles.

The subjects included in the observation group received vagus nerve electrical stimulation combined with intermittent tube feeding at the same time on top of regular treatment. Wuhan YRD magnetic field stimulator, model YRDCCY-II was used to perform vagus nerve repetitive magnetic stimulation. Based on the position of the vagus nerve exiting the skull, we aimed at the jugular foramen in the patient's left mastoid area and performed stimulation in the sagittal direction along the direction of the vagus nerve.

Each session of the treatment lasted for 20 minutes (a total of 600 magnetic pulse stimulations), with

a frequency of 5Hz, a stimulation time of 3s, and an interval of 27s. The stimulation intensity was adjusted between 1.5 and 6 Tesla based on the patient's mandibular movement. The treatment was done once a day, 5 days/week, and the course of treatment was 4 weeks. If the subject develops hoarseness, sore throat, cough, shortness of breath, or other adverse reactions, the treatment will be stopped. Intermittent tube feeding was performed before the operation, and the purpose of treatment and possible discomfort symptoms that may occur during the process were introduced to the patient in detail to eliminate their fear. Before each meal, patients were instructed to sit with their heads slightly raised, and a check was conducted to verify the absence of foreign objects in both the nasal and oral cavities. Once patency was confirmed, lubricant was applied to the feeding tube. Patients were then directed to open their mouths as the gastric tube was gently and slowly inserted through the mouth, alongside the patient's dysphagia, and advanced to the upper esophagus.

2.3. Evaluation methods and observation indicators

The indicators were evaluated by experienced therapists from the Rehabilitation Department of Huai'an People's Hospital at baseline and after 4 weeks of intervention. The assessors were blinded to the patient group assignments.

2.3.1. Gugging Swallowing Screen (GUSS)

GUSS includes direct and indirect swallowing test dimensions. If the patient could not swallow pasty food, it was indicative of severe dysphagia, elevating the risk of aspiration pneumonia, and was expressed as 0–9 points. If the patient could swallow pasty food but experienced difficulty with liquid and solid foods, leading to a potential risk of aspiration pneumonia, it was denoted as 10–14 points. When the patient could swallow pasty and liquid foods without coughing but struggled with solid food, signifying a low degree of dysphagia and a lower risk of aspiration pneumonia, it was scored as 15–19 points. A score of 20 indicated that the patient could swallow pasty, liquid, and solid food without dysphagia or with mild dysphagia, with a lower risk of aspiration pneumonia.

2.3.2. Rosenbek Penetration/Aspiration Scale (PAS)

The PAS scale is a swallowing function assessment scale based on swallowing imaging. This scale can not only quantify the severity of aspiration, but is more objectively reliable than other scales [5]. In this scale, penetration occurs when food falls into the vestibule of the larynx but remains above the vocal cords, while aspiration happens when food enters the trachea. Scale levels ranging from 1 to 8 correspond to 1 to 8 points, where the severity of the patient's swallowing function is inversely proportional to the score.

All patients underwent swallowing imaging examination within 24 hours of admission and upon completion of treatment, and PAS scores were calculated based on the images. Swallowing angiography was performed using digital subtraction angiography. In this procedure, the patient sat upright, and two frontal and lateral views were taken Xanthan gum (1.5g/bag by NUTRI, Japan) was added into 3 mL of Onapex (iohexol injection) to make thin (1.5%), medium thick (2.0%), and thick (3.0%) liquids, respectively. The patients were then instructed to swallow the liquids in the order of medium thick, thin, and thick [6]. The skull top, cervical esophagus, mandible, and cervical vertebrae could be observed within the fluoroscopy range.

2.3.3. Functional Oral Feeding Scale (FOIS)

The FOIS scale is a scale that analyzes and evaluates patients' oral feeding status. Scale levels 1 to 7 correspond to 1 to 7 points, and higher scores indicate better swallowing ability [7].

2.3.4. Incidence of aspiration pneumonia

The occurrence of aspiration pneumonia in both groups of patients was recorded.

2.4. Data statistics and analysis

Demographic and clinical data were statistically analyzed using SPSS 26.0. Measurement data were expressed as mean ± standard deviation. Paired samples *t*-test was to compare the data of both groups before and after treatment, and independent samples *t*-test was used for comparison between groups. The Wilcoxon Signed Ranks test was used for skewed distribution data, and the χ^2 test was used to compare the count data between groups, with a significance level of 0.05.

3. Results

3.1. Baseline characteristics

Table 1. Comparison of general information between the two groups of patients

Group	Number of cases	Male/female ratio	Age (years, mean ± standard deviation)	Disease duration (months, mean ± standard deviation)
Control group	30	19/11	66.23 ± 7.40	4.11 ± 1.01
Observation group	30	20/10	65.73 ± 7.56	3.95 ± 1.16
t/χ^2		0.07	-0.26	0.56
P		0.79*	0.80#	0.58#

Note: *The *P-value* of the χ^2-test; #the *P-value* of the independent sample *t*-test

3.2. Results of changes in swallowing function

Before treatment, there was no significant difference in the GUSS score, PAS score, and FOIS score between the two groups of patients ($P > 0.05$). Following treatment, the patients in the control group exhibited improvements in GUSS score, PAS score, and FOIS score compared to their scores before treatment ($P < 0.05$). Moreover, the patients in the observation group demonstrated notably higher GUSS score, PAS score, and FOIS score post-treatment in comparison to both their pre-treatment scores and the scores of the control group during the same period ($P < 0.01$, $P < 0.001$), as shown in **Table 2**.

Table 2. Comparison of GUSS, PAS, and FOIS scores between the two groups of patients before and after treatment (mean ± standard deviation)

Group	Number of cases		GUSS rating	PAS score	FOIS score
Control group	30	Before treatment	9.25 ± 1.06	4.8 ± 1.30	2.23 ± 1.14
		After treatment	11.84 ± 1.57*	3.27 ± 1.14*	3.83 ± 1.02*
Observation group	30	Before treatment	9.18 ± 1.01	4.80 ± 1.56	2.33 ± 1.37
		After treatment	16.98 ± 1.85*#	2.30 ± 0.99*#	5.03 ± 1.16*#

Note: *$P < 0.05$ compared to before treatment; #$P < 0.01$ compared to the control group after treatment.

3.3. Incidence of aspiration pneumonia

Based on the results shown in **Table 3**, the incidence of aspiration pneumonia in the observation group was significantly lower than that in the control group ($P < 0.05$).

Table 3. Comparison of the occurrence of aspiration pneumonia in the two groups of patients (n, %)

Group	*n*	Number of occurrences	Incidence
Control group	30	7	22.33
Observation group	30	1	3.33
χ^2	–	–	5.192
P	–	–	0.023

4. Discussion

The pathophysiological mechanism underlying dysphagia after a stroke primarily involves nerve damage among the brain, tongue, pharynx, and their related structures. This damage subsequently results in reduced coordination among the muscles involved in swallowing [13]. The cerebral cortex, brainstem, and multiple pairs of cranial nerves, including the vagus nerve, play an extremely important role in the swallowing process. The vagus nerve is the longest pair of parasympathetic nerves in the human body. It is mainly responsible for regulating autonomic nervous functions such as heart rate, breathing, and digestion. Stimulating the sensory fibers of the vagus nerve can improve the patient's swallowing function. Studies have shown that the motor network of the undamaged area around the lesion as well as the symmetrical cortical and subcortical structures on the contralateral side after stroke shows significant reorganization. The plasticity of these areas provides an anatomical basis for functional recovery, while vagus nerve electrical stimulation can mediate motor synaptic reconnection and connection strengthening, which is key to the remodeling of neural function.

The occurrence of dysphagia is related to damage to the cortical motor area, sensory information feedback pathway, brainstem swallowing integration area, and other parts. Sensory impairment is also a potential cause of aspiration [14]. Peripheral swallowing information is continuously transmitted and fed back to the patient through sensory afferent pathways. Cortical centers that activate sensorimotor integration processes, which are essential for establishing safe and effective swallowing. In addition to controlling the movement of soft palate muscles, pharyngeal muscles, laryngeal muscles, and upper esophageal sphincter, the vagus nerve is also responsible for sensory uploading to the base of the tongue and the epiglottis area. Although after a stroke, the bihemispheric cortical symmetry pattern that integrates normal pharyngeal sensory input is disrupted, there is a temporal delay or impaired integration of sensory input to the hemisphere affected by the lesion, but it does not disappear.

Additionally, the vagus nerve has the ability to regulate neurotransmitters. Research shows that 80% of the vagus nerve are afferent fibers that terminate in the nucleus of the solitary tract of the brainstem. The fibers of the nucleus of the solitary tract project to the locus coeruleus and raphe nucleus, promoting the activation of 5-hydroxytryptamine, norepinephrine, and cholinergic. It is released throughout the cerebral cortex and strengthens synaptic connections in brain circuits; the joint activation of cholinergic and norepinephrine can also activate the anti-inflammatory mechanism and relieve brain inflammation [15].

Intermittent tube feeding simulates the movement of relevant oropharyngeal muscles during human food intake through repeated intubation, thereby stimulating muscle contraction of the tongue and pharynx and producing voluntary swallowing movements. Intermittent tube feeding includes intermittent oral to esophageal tube feeding, which is a new feeding compensation method that is inserted orally into the upper esophagus or stomach when the patient needs to eat and removed immediately after the feeding is completed. This method avoids negative effects of long-term tube feeding, such as gastric and esophageal mucosal damage and ulcers caused by indwelling gastric tubes, and damage to the absorption and utilization of nutrients.

The results of this study showed that all indicators of swallowing function in the observation group were

significantly better than those in the control group, and the incidence of aspiration pneumonia was significantly lower than that in the control group. It is suggested that vagus nerve magnetic stimulation technology combined with intermittent tube feeding treatment for patients with dysphagia due to cerebral infarction can promote the improvement of swallowing function and reduce the risk of aspiration pneumonia. The combined application of the two can improve the treatment effect and accelerate the patient's recovery.

5. Conclusion

In summary, intermittent tube feeding combined with repetitive magnetic stimulation of the vagus nerve is effective in treating dysphagia in cerebral infarction. However, the treatment course of this study was short and its long-term efficacy could not be observed. Most of the indicators were based on the subjective feelings of the patients. Therefore, more objective indicators should be used in future research.

Disclosure statement

The authors declare no conflict of interest.

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Clinical Effect of the Modified Huatan Tongluo Formula on Acute Cerebral Infarction Patients with Wind-Phlegm Obstruction Syndrome

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Abstract: *Objective:* To analyze the clinical effect of the modified Huatan Tongluo formula on acute cerebral infarction patients with wind-phlegm obstruction syndrome. *Methods:* 70 cases of acute cerebral infarction with wind-phlegm blocking syndrome admitted from May 2022 to May 2023 were selected as the study subjects. The subjects were divided into a control group and an observation group by randomized numerical table method, each with 35 cases; the control group was treated with conventional Western medicine, and the observation group was treated with the modified Huatan Tongluo Formula in addition to conventional treatment. The two groups were compared in terms of traditional Chinse medicine (TCM) evidence points, quality of life, clinical efficacy, and adverse reactions. *Results:* Before treatment, there were no significant differences in each index between the two groups of patients ($P > 0.05$); after treatment, the observation group scored better in terms of TCM evidence and quality of life compared to the control group. Besides the total clinical efficacy of the treatment received in the observation group was also higher than that of the control group ($P < 0.05$). However, there was no significant difference in terms of incidence of adverse reactions between the two groups ($P > 0.05$). *Conclusion:* The modified Huatan Tongluo formula can improve the clinical symptoms and the quality of life of acute cerebral infarction patients with wind-phlegm obstruction syndrome.

Keywords: Acute cerebral infarction; Wind-phlegm obstruction syndrome; Modified Huatan Tongluo formula

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1. Introduction

Cerebral infarction is a cerebrovascular condition characterized by ischemic necrosis of brain tissue due to a sudden interruption in blood supply. This disease is prevalent among middle-aged and elderly individuals. Its onset is abrupt, with symptoms including dizziness, headache, unilateral limb dysfunction, speech disorders, or impaired consciousness [1]. The time window for thrombolysis and endovascular treatment is limited, making drug treatment, such as anticoagulation and antiplatelet therapy, the primary approach. Western medicine alone comes with certain limitations when it comes to the rehabilitation of cerebral infarction. In recent years, Chinese medicine has been developing rapidly, and it has also been widely popularized and clinically applied.

According to Chinese medicine, cerebral infarction belongs to the category of stroke [2], and it often comes with wind-phlegm obstruction syndrome, so it is necessary to extinguish the wind, resolve the phlegm, and clear the collaterals. Therefore, the effect of the modified Huatan Tongluo formula in treating acute cerebral infarction patients with wind-phlegm obstruction was observed in this study.

2. Information and methods

2.1. Data

70 cases of acute cerebral infarction patients admitted to our hospital were selected as the study subjects (admission time: May 2022 to May 2023). They were divided into a control group and an observation group by the random number table method, with 35 cases in each group.

The control group consisted of 20 males and 15 females aged 52–78 years (average: 65.26 ± 5.13 years). The observation group consisted of 21 males and 14 females, aged 51–79 years (average: 65.38 ± 5.20 years. There were no significant differences in the baseline data of both groups ($P > 0.05$).

Inclusion criteria: (1) Patients who meet both Chinese and Western medical diagnostic criteria and fall under the wind-phlegm obstruction syndrome in Chinese medicine. Primary symptoms encompass crooked mouth, tongue, hemiplegia, speech and sensory loss, while secondary symptoms include phlegm and mucus, dizziness, and vertigo. Additional diagnostic indicators involve a thin and white tongue coating, pale tongue, and a slippery pulse. (2) NIHSS scores between 5 and 15 before the treatment. (3) The patients and their family members were informed of and agreed to the treatment plan. (4) Patients with complete clinical data.

Exclusion criteria: (1) The existence of thrombolysis or vascular intervention thrombolysis indication; (2) The combination of other serious diseases; (3) The existence of mental disorders can not be normal communication; (4) At the same time participate in other medical research projects.

2.2. Methods

Control group: Conventional Western medical treatment. Aspirin enteric-coated tablets (oral, once a day, 100 mg each time), Rosuvastatin calcium tablets (oral, once a day, 10 mg each time), etc. for two weeks. Other glycemic control, blood pressure, and other symptomatic treatment were also given if needed. Patients who experienced difficulty swallowing, were given nasal feeds, and guidance for rehabilitation exercises was provided.

Observation group: Modified Tongluo Huatan formula for resolving phlegm and clearing collaterals combined with Western medicine. The basic formula included: 3 g scorpions, 6 g gall bladder, 9 g Angelica, 9 g Atractylodes, 9 g *Atractylodes macrocephala*, 9 g *Pinellia ternata*, 10g *Paeonia lactiflora*, 10g Poria mushroom, 12 g tall Gastrodia, and 15 g *Salvia miltiorrhiza*. Dialectical additions and subtractions: (1) If the patient had slurred speech 6 g *Polygala tenuifolia* 10 g calamus, and 12 g *Radix curcumae* were added; (2) if the patient had severe headache, 0.3 g antelope horn powder, 3 g Asarum, 6 g Radix Saposhnikoviae, 6 g *Angelica dahurica*, 9g cranberries; (3) if the patient had heavy leg and foot stagnation, 15 g mistletoe and 15 g *Eucommia ulmoides* were added; if the patient experienced sweating, 6 g Radix Saposhnikoviae, 15 g Fructus Tritici Levis, and 15 g Radix Oryzae Glutinosae were added. The patients were given 300 mL of the decoction once a day.

2.3. Observation indexes

(1) Traditional Chinese medicine (TCM) evidence points: The TCM evidence points of both groups were compared before and after treatment. The points include hemiplegia, dysarthria, crooked mouth, and

numbness of limbs, according to the relevant standards of the "Guide to Diagnosis and Treatment of Common Diseases in Internal Medicine of Chinese Medicine" [3]. The scores ranged from 0 (no symptoms) to 3 (severe symptoms), with 1 and 2 indicating mild and moderate symptoms, respectively.

(2) Quality of life: The quality of life of the patients was assessed using the World Health Organization Quality of Life Measurement Scale Brief Form (WHOQOL-BREF) [4], which includes four dimensions, i.e., physiological, psychological, environmental, and social relations, with higher scores indicating higher quality of life.

(3) Clinical efficacy: The clinical efficacy of the treatments was assessed using the National Institutes of Health Stroke Scale (NIHSS), in which the score ranges from 0–42 points [5]. A 90–100% decrease in this score indicated "full recovery," a 46–89% decrease indicated significant progress, a decrease of 18–45% indicated "progress," and a decrease of less than 18% or an increase in this score was considered "ineffective." The total efficacy was the sum of "full recovery," "significant progress," and "progress."

(4) Adverse reactions: Drowsiness, nausea and vomiting.

2.4. Statistical analysis

The patients' data were analyzed using SPSS 25.0. The measurement data were represented as mean ± standard deviation (conforming to normal distribution), and the count data were represented as percentages. Independent samples *t*-tests and χ^2 tests were conducted, with $P < 0.05$ indicating statistical significance.

3. Results

3.1. TCM evidence points

As shown in **Table 1**, there were no significant differences in the TCM evidence points between the groups of patients before treatment ($P > 0.05$); after treatment, all the evidence points of the observation group were lower than those of the control group ($P < 0.05$).

Table 1. TCM evidence points (mean ± standard deviation, points)

Group	Cases (*n*)	Hemiplegia		Slurred speech		Slanting of the corners of the mouth		Numbness of the limbs	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group	35	2.13 ± 0.15	0.93 ± 0.20	2.15 ± 0.28	0.90 ± 0.17	2.19 ± 0.17	0.86 ± 0.13	2.21 ± 0.20	0.91 ± 0.17
Observation group	35	2.17 ± 0.14	0.41 ± 0.15	2.17 ± 0.20	0.40 ± 0.13	2.22 ± 0.16	0.43 ± 0.10	2.25 ± 0.17	0.45 ± 0.15
t	-	1.153	12.305	0.344	13.822	0.760	15.511	0.902	12.004
P	-	0.253	0.000	0.732	0.000	0.450	0.000	0.370	0.000

3.2. Quality of life scores

As shown in **Table 2**, there were no significant differences in the quality-of-life scores between the two groups before treatment ($P > 0.05$). However, after treatment, the scores for all dimensions in the observation group were significantly higher than those in the control group ($P < 0.05$).

Table 2. Quality of life scores (mean ± standard deviation, points)

Group	Cases (*n*)	Physiology		Psychology		Environment		Social relations	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group	35	10.12 ± 2.13	13.59 ± 2.15	10.18 ± 1.36	13.54 ± 2.15	11.52 ± 2.13	14.10 ± 2.18	9.52 ± 1.16	12.31 ± 1.58
Observation group	35	10.05 ± 2.29	16.18 ± 2.17	10.23 ± 1.51	17.02 ± 2.13	11.48 ± 2.10	17.21 ± 2.34	9.50 ± 1.12	13.91 ± 1.15
t	-	0.132	5.016	0.146	6.803	0.079	5.753	0.073	4.844
P	-	0.895	0.000	0.885	0.000	0.937	0.000	0.942	0.000

3.3. Clinical efficacy

As indicated in **Table 3**, the total efficacy of treatment in the observation group was higher compared to the control group, with a statistically significant difference ($P < 0.05$).

Table 3. Clinical efficacy (*n* [%])

Group	Cases (*n*)	Full recovery	Significant progress	Progress	Ineffective	Total efficacy
Control group	35	3 (8.57)	10 (28.57)	12 (34.29)	10 (28.57)	25 (71.43)
Observation group	35	9 (25.71)	18 (51.43)	5 (14.29)	3 (8.57)	32 (91.43)
χ^2	-	-	-	-	-	4.629
P	-	-	-	-	-	0.031

3.4. Adverse reactions

As shown in **Table 4**, there was no significant difference in the incidence of adverse reactions between the two groups ($P > 0.05$).

Table 4. Adverse reactions (*n* [%])

Group	Cases (*n*)	Drowsiness	Nausea and vomiting	Dizziness	Total
Control group	35	2 (5.71)	1 (2.86)	1 (2.86)	4 (11.73)
Observation Group	35	1 (2.86)	1 (2.86)	1 (2.86)	3 (8.57)
χ^2	-	-	-	-	0.159
P	-	-	-	-	0.690

4. Discussion

Cerebral infarction is a complex condition involving mechanisms such as the formation of carotid atherosclerosis plaques, intracerebral thromboembolism, and the development of intracerebral arterial stenosis or occlusion. This leads to the necrosis of cerebral tissue due to hypoxia and ischemia, resulting in clinical symptoms such as dizziness, headache, and numbness of the limbs. It is a type of cerebrovascular disease associated with a high rate of disability and mortality. Cerebral infarction damages the brain nerve tissue, which then leads to neurological dysfunction, manifested as speech disorder, cognitive abnormality, limb disorder, etc. Conventional Western medicine treatment advocates symptomatic treatment, which does not cure the disease fundamentally, resulting in slow recovery or recurrence.

Chinese medicine categorizes cerebral infarction as "stroke," which is caused by a deficiency of the liver and kidney, deficiency of qi and blood, etc, which can be stimulated by factors such as weather, diet, emotions,

etc., leading to qi and blood disorder and dysfunction of internal organs, manifested as wind and phlegm blocking the collaterals. The basic ingredients of the Huatan Tongluo formula include scorpions, gall bladder, Angelica, Atractylodes, *Atractylodes macrocephala*, *Pinellia ternata*, *Paeonia lactiflora*, Poria, tall Gastrodiae, *Salvia miltiorrhiza*. Scorpions are effective in alleviating wind and clearing channels for pain relief, while gall bladder dispels wind, stops spasms, and clears away heat and phlegm. Angelica invigorates blood and opens channels for pain relief. *Atractylodes macrocephala* and poria strengthen the spleen and eliminate dampness. *Pinellia ternata* dries dampness and resolves phlegm, and *Paeonia lactiflora* nourishes and activates blood. Poria calms the liver and quenches wind, while *Salvia miltiorrhiza* activates and cools the blood. This formula exhibits effects such as meridian dredging, wind dispelling, and phlegm resolution. Modern pharmacological analysis suggests that scorpions have satisfactory antihypertensive, sedative, and anticoagulant properties. Gall bladder improves the hypoxia and ischemia state of cerebral tissues and regulates lipids. *Salvia miltiorrhiza* enhances microcirculation, lowers blood pressure, and expands blood vessels. Poria demonstrates antioxidant effects, tall Gastrodia lowers blood pressure and lipids while protecting cerebral nerves, and *Pinellia ternata* contributes to blood pressure reduction and resistance to atherosclerosis [7,8]. In this study, 35 patients in the observation group received treatment with the modified Huatan Tongluo formula. The results indicated that the patients in the observation group had a lower TCM symptom score and a higher overall treatment efficacy, suggesting that the therapy in the observation group was more satisfactory. Patients with cerebral infarction experience significant physiological, psychological, and functional impairments, leading to a decline in their ability to live. Their quality of life is substantially worse than before, and enhancing the quality of life for these patients is a key objective of clinical treatment [9-11]. Furthermore, cerebral infarction often results in numerous sequelae, accompanied by substantial mood changes, leading to a significant decline in the quality of life. The outcomes reveal that patients in the observation group exhibited lower scores and higher overall treatment efficacy, signifying that the therapy applied in the observation group yielded more satisfactory results. Across all dimensions of quality of life, the scores for patients in the observation group were higher than those in the control group, indicating an enhanced quality of life following treatment. This suggests that the treatment regimen employed in the observation group had a more favorable impact on improving both the condition and quality of life. Addressing adverse drug reactions remains a major concern for most patients [12]. Based on the results of this study, there were no differences in the adverse reactions between patients who received TCM treatment and those who did not. Therefore, it is evident that the addition of Chinese medicine prescription will not increase the adverse reactions.

5. Conclusion

In short, the Huatan Tongluo formula increased the efficacy of the treatment for cerebral infarction patients suffering from wind-phlegm obstruction syndrome. Besides, the addition of this TCM regimen does not result in a higher incidence of adverse reactions. Therefore, this treatment regimen should be popularized in clinical practice.

Disclosure statement

The author declares no conflict of interest.

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Comparison of Minimally Invasive Drainage and Craniotomy in the Treatment of Epidural Hematoma Caused by Brain Trauma

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Abstract: *Objective:* To compare and analyze the clinical efficacy of craniotomy compared to minimally invasive drainage in treating patients with traumatic brain injury and epidural hematoma. *Method:* 60 patients with traumatic epidural hematoma due to traumatic brain injury admitted to our hospital from August 2019 to August 2022 were selected as study subjects. The patients were divided into a control group and an observation group, with 30 cases in each group. The patients in the control group underwent craniotomy, whereas the patients in the observation group underwent minimally invasive drainage. The general indexes of the operation and the incidence of postoperative complications were compared between the two groups. *Results:* There was no difference in the hematoma clearance rate between the two groups ($P > 0.05$). The operation duration, tube placement time, incision length, and duration of hospital stay of the observation group were shorter than those of the control group. Besides, the intraoperative blood loss of the observation group was lesser than that of the control group, and the postoperative complication rate of the observation group was also lower than that of the control group ($P < 0.05$). *Conclusion:* Compared with craniotomy, minimally invasive drainage has a shorter operation time and can improve postoperative recovery of patients with epidural hematoma. It offers a hematoma clearance rate with craniotomy, with a smaller intraoperative blood loss and a lower risk of postoperative complications. Therefore, this treatment regimen should be popularized in clinical practice.

Keywords: Minimally invasive drainage; Craniotomy; Traumatic brain injury; Epidural hematoma

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1. Introduction

Epidural hematoma is one of the common complications of traumatic brain injury, which requires early surgical intervention due to its high incidence and rapid progression. Otherwise, there would be a high risk of brain hernia [1]. Craniotomy has been the primary choice when it comes to treating epidural hematoma due to its many advantages. However, this procedure is more traumatic and time-consuming, resulting in postoperative infections and other complications, which are not conducive to the patients' recovery [2]. In recent years, minimally invasive surgery has been widely promoted in clinical practice, and this procedure has been developing rapidly, resulting

in more treatment options for critically ill patients. An example of minimally invasive surgery is minimally invasive drainage, which is less invasive than open craniotomy but is still able to remove hematoma efficiently. This procedure reduces the occurrence of stress reactions and accelerates the postoperative recovery of the patient. However, this procedure demands a high level of skill and requires clearly defined indications for the patient's operation; otherwise, it will be difficult to obtain the ideal clinical efficacy [3]. The purpose of this study was to compare and analyze the clinical value of craniotomy and minimally invasive drainage to explore which treatment plan is more conducive to improving the prognosis of patients with traumatic brain injury with epidural hematoma. A total of 60 cases were selected as the study sample, and the details are described below.

2. Information and methods

2.1. Data

A total of 60 cases of traumatic brain injury with epidural hematoma were enrolled in this study, all of which were admitted between August 2019–August 2022). The patients were divided into a control group and an observation group, with 30 cases in each group.

The patients in the control group underwent craniotomy, whereas the patients in the observation group underwent minimally invasive drainage. In the control group, there were 18 males and 12 females with ages ranging from 24 to 68 years (mean age: 46.55 ± 5.98 years). The bleeding volume ranged from 50 to 82 mL, with a mean value of 66.32 ± 7.14 mL. The hematoma sites involved the temporal parietal region in a ratio of 12:9:9 for frontal, and occipital regions. The reasons for injury were traffic accidents, falls from height, and percussion injuries, with a ratio of 12:10:8. In the observation group, there were 16 males and 14 females, with ages ranging from 25 to 65 years (mean age: 45.96 ± 5.81 years). The bleeding volume ranged from 50 to 84 mL, with a mean value of 66.39 ± 7.18 mL. The distribution of hematoma sites was temporoparietal: frontal: occipital = 11:10:9. The reasons for injury were traffic accidents, falling from a height, and striking injuries, with a ratio of 11:11:8. There were no significant differences in the baseline data between both groups ($P > 0.05$).

Inclusion criteria: (1) Diagnosed with craniocerebral trauma according to the criteria listed in the "China Surgical Guidelines" [4]; (2) confirmation of the disease by clinical symptoms, imaging and other examinations; (3) complete medical records; (4) met the indications for surgery; (5) signed the consent form.

Exclusion criteria: (1) Presence of contraindications to surgical procedures; (2) unstable vital signs; (3) dysfunction of the liver, kidney, or other important organs; (4) coagulation disorders or immune system diseases; (4) death or withdrawal from the study.

2.2. Methods

Upon admission to the department, both groups underwent standardized interventions such as hemostasis, anti-inflammation, and dehydration based on their individual conditions. Subsequently, different surgical treatments were implemented for each group according to their respective interventions.

The patients in the control group underwent craniotomy, which involved utilizing CT examination to determine the hematoma's location. Surgical incisions, such as straight, horseshoe, or curved incisions, were designed based on the lesion's location. After confirming the access plan, general anesthesia was administered accordingly. Once in full effect, the scalp and muscles were incrementally incised to fully expose the skull. Using a milling cutter, the skull was drilled and cut open until the dura mater was exposed. The hematoma was then effectively removed, and the operation was concluded with hemostasis and cranial closure. Postoperative antibiotics were routinely administered to prevent infection.

The patients in the observation group underwent minimally invasive drainage. Before the operation, the

surgical indications for each patient were thoroughly assessed, and a brain CT was performed to determine the hematoma's location. The lower edge of the hematoma's projection was identified as the puncture point, marked, and subsequently reviewed on CT to ensure the accuracy of the puncture point.

After the surgery, a 2% lidocaine solution (Drug Administration Code: H65020295, Manufacturer: Sinopharm Xinjiang Pharmaceutical Co.) was used for infiltration anesthesia. Once the drug took effect, the large blood vessels of the meninges and relevant functional areas were avoided. A disposable hematoma puncture needle was then used for vertical puncture. During the first attempt at reaching the hematoma, the liquid was slowly withdrawn, removing approximately 3/10th of the hematoma. In case of resistance, the position of the side hole of the needle tip was adjusted appropriately. For crushed hematomas, 0.9% sodium chloride solution (5 ml) could be taken each time for flushing. Simultaneously, any active bleeding was observed, and if present, timely measures were taken to stop the bleeding. Subsequently, an appropriate amount of urokinase (Drug Administration Code: H23020109, Manufacturer: Heilongjiang Dilong Pharmaceutical Co.) was injected to liquefy the hematoma, retained for about 4 hours, and administered four times a day. The amount of drainage was monitored closely daily, guiding the adjustment of the CT and the depth of the puncture needle. In cases with more hematoma, the puncture point could be extended towards both sides to form a localized guide line. For those with less hematoma, the clot could be extracted under negative pressure, and if there was any blood outflow, norepinephrine (Drug Administration Code: H31021177, Manufacturer: Shanghai Hefeng Pharmaceutical Co.) was used to stop bleeding. This process continued until the bloody fluid was completely released. Then, the operation of flushing and drainage was carried out. If there were no abnormalities after 3 days, the drainage tube could be removed, and the incision could be sutured to complete the operation. The postoperative measures taken were the same as in the control group.

2.3. Observation indicators

(1) General indicators of surgery

The operation time, intraoperative blood loss, incision length, tube placement time, duration of hospital stay, and hematoma clearance rate of the two groups of patients were recorded, and the results were compared.

(2) Postoperative complications

The postoperative complications of the two groups were recorded, including re-bleeding, infection, epilepsy, craniocerebral injury, and so on, and their incidences was compared in a standardized manner.

2.4. Statistics

SPSS 25.0 for Windows software was used as the statistical basis for analyzing all the obtained data. For the nature of the score, if it was considered as measurement data, the results were presented as (mean ± standard deviation), and the *t*-test was employed. If the data was considered as counting data, it was presented as a percentage (%), and both the chi-square test and the final P-value were calculated. A *P-value* smaller than 0.05 was considered to indicate statistical significance.

3. Results

3.1. General surgical indicators

As depicted in **Table 1**, upon observing the general surgery indexes of both groups, all values in the observation group were lower, and the difference between the groups was statistically significant ($P < 0.05$). However, when comparing the hematoma clearance rate between the two groups, the difference was not

statistically significant ($P > 0.05$).

Table 1. Comparison of observations of general surgical indicators (mean ± standard deviation)

Group	Cases	Operation duration (min)	Intraoperative blood loss (mL)	Incision length (cm)	Intubation time (d)	Duration of hospital stay (d)	Hematoma clearance (*n* [%])
Control group	*n* = 30	165.52 ± 31.41	355.58 ± 58.65	14.41 ± 4.58	7.45 ± 3.22	12.82 ± 5.54	27 (90.00)
Observation group	*n* = 30	61.42 ± 18.44	56.25 ± 16.78	3.12 ± 1.05	3.98 ± 1.49	6.14 ± 2.54	28 (93.33)
t	-	15.654	26.876	13.160	5.357	6.003	0.218
P	-	0.001	0.001	0.001	0.001	0.001	0.640

3.2. Postoperative complication rate

As can be seen from **Table 2**, after the observation of the total value of postoperative complications in the two groups, the results shown in the observation group were 6.67%, which was lower than that of the control group (26.67%), and the difference between the groups was statistically significant, with a $P < 0.05$.

Table 2. Comparison of observations of postoperative complications (*n* [%])

Group	Case	Re-bleed	Infection	Epilepsy	Cranial injury	Total
Control group	*n* = 30	3 (10.00)	3 (10.00)	1 (3.33)	1 (3.33)	8 (26.67)
Observation group	*n* = 30	1 (3.33)	1 (3.33)	0 (0.00)	0 (0.00)	2 (6.67)
χ^2	-	-	-	-	-	4.320
P	-	-	-	-	-	0.038

4. Discussion

Traumatic brain injury is a serious clinical trauma, characterized by visible trauma of the head caused by external objects, and its clinical manifestations may vary depending on the nature of the injury, whether it is focal or diffuse [5]. Epidural hematoma is one of the critical complications of traumatic brain injury which can occur within a short time after the injury, and is often manifested by symptoms such as headache, drowsiness, retardation, memory loss, etc. Individuals can be accompanied by delirious motor excitement, optic papillae edema, and other symptoms. In severe cases, it can lead to dementia, brain herniation and other adverse outcomes, so it is important to remove hematomas from the brain promptly. Therefore, hematoma removal is the first principle of this disease, but the specific choice of intervention is a major challenge [6].

Craniotomy is a conventional surgical procedure that involves opening the patient's skull using specific surgical instruments. This allows for the direct removal of hematoma and associated necrotic brain tissue under direct vision. However, the procedure requires a large incision, resulting in a relatively lengthy operation time and posing a certain risk of damaging normal brain tissue. Additionally, there is an increased risk of infection during the operation, leading to less favorable prognoses for a significant portion of patients [7]. The results of this study showed that the hematoma clearance rates of the two groups were 90.00% and 93.33%, respectively, suggesting that the two types of surgery can achieve a relatively satisfactory clinical treatment efficiency. However, compared with the control group, the observation group's operation duration, tube placement time, incision length, and hospitalization time were shorter, intraoperative blood loss was smaller, and the total value of postoperative complications was lower, suggesting that minimally invasive drainage resulted in a better prognosis of patients. Our results also suggest that minimally invasive drainage has higher shortens

the treatment, accelerates postoperative recovery, and reduces the incidence of related complications. The reasons for this are that minimally invasive drainage does not need to open the skull, and the hematoma can be effectively drained out by precise puncture and repeated drainage operations based on the clear location of the hematoma, which is a relatively simple operation procedure, and the urokinase applied during the operation can continuously liquefy the hematoma. The procedure is relatively simple, and the urokinase used in the operation can continuously liquefy the hematoma, so the overall effectiveness and safety of the treatment are relatively guaranteed [8-9]. However, it should be noted that whether minimally invasive drainage can ultimately achieve satisfactory clinical results depends on whether the patient's surgical indications are strictly mastered, whether the operator's business ability is at a high level, and whether the drainage flow and nature of the drainage process are closely observed, and once abnormal changes in the color of the drainage fluid are detected, it should be changed to a craniotomy in time, so as not to jeopardize the patient's life safety [10]. Once abnormal changes in the color of the drainage fluid are found, it should be changed to craniotomy in time to avoid jeopardizing the life of the patient [10].

5. Conclusion

In conclusion, both craniotomy and minimally invasive drainage are effective methods for treating traumatic brain injury with epidural hematoma, achieving a relatively satisfactory hematoma clearance rate. However, minimally invasive drainage stands out with its shorter operation time, tube placement time, and hospitalization duration. Moreover, it is less likely to cause serious postoperative complications. Therefore, it is more conducive to promoting the body's recovery and improving the prognosis. It is recommended to prioritize minimally invasive drainage when conditions permit.

Disclosure statement

The authors declare no conflict of interest.

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Study of the Use of Medical Chitosan in Neurosurgery Eye Care

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Abstract: *Objective:* This study aimed to investigate the effectiveness of medical chitosan in ophthalmic care in neurosurgery. *Methods:* Through a randomized controlled trial, 90 patients who were undergoing neurosurgery were randomly divided into three groups, with 30 cases in each group. Each group underwent a different type of eye care: Medical chitosan film, erythromycin eye ointment, or homemade eye patch. The occurrence of ocular complications, ocular symptom scores, and quality of life scores of the three groups were observed. *Results:* The complication rate of the medical chitosan group was significantly lower than that of the erythromycin eye ointment and the homemade eye patch group ($P < 0.05$). The ocular scores of the medical chitosan film group were significantly better than those of the erythromycin eye ointment and homemade eye protection patch group, and the difference between the medical chitosan film group and the other two groups was statistically significant ($P < 0.05$) The quality-of-life score of the medical chitosan film group was significantly better than that of the erythromycin eye ointment and the homemade eye patch groups ($P < 0.05$). *Conclusion:* Medical chitosan film aids eye care in neurosurgery, so it is worth popularizing and applying.

Keywords: Medical chitosan film; Neurosurgery; Eye care

Online publication: December 26, 2023

1. Introduction

Eye care is one of the important links in the postoperative care of neurosurgery patients, as the patients are in the state of general anesthesia during the operation, so they cannot blink on their own. Furthermore, the duration of the surgery is long, which easily leads to eye dryness, inflammation, and other complications [1-6]. Therefore, it is important to find an effective eye care method. Medical chitosan membranes have been widely used in surgical procedures because of their biocompatibility, low immunogenicity, and moisturizing properties. In this study, we will investigate the application effect of medical chitosan films in eye care in neurosurgery.

2. Information and methods

2.1. General information

Ninety patients who were undergoing neurosurgery in our hospital from January 2019 to December 2020 were

selected. Among them, 53 cases were male and 37 cases were female, aged between 20 and 65 years old, with a mean age of 45.31 ± 11.23 years. The duration of surgery was 3 to 6 hours, with a mean duration of 4.23 ± 1.34 hours. The patients were divided into a medical chitosan film group, an erythromycin eye ointment group, and a homemade eye patch group using the randomized numerical table method, with 30 cases in each group. There was no statistically significant difference between the three groups in terms of gender, age, and duration of surgery ($P > 0.05$).

2.2. Methods

Routine eye care is provided for patients, including preoperative cleaning of the eye, keeping the eye moist during the surgery, and cleaning and observing the eye at the end of the surgery. On top of basic eye care, medical chitosan film, erythromycin eye ointment, and homemade eye patches were given according to the group that the patients were in, all of which were operated according to the instructions. Medical chitosan film was applied as follows: (1) The patient's eye was cleaned with saline upon entering the operating room. (2) A medical chitosan film was pasted on the patient's eye. (3) During the surgery, the patient's eye was checked regularly; the chitosan film was replaced if the patient's eye dried up. (4) After the surgery, the skin around the eye was cleaned using dressings the patient's eyes were observed.

2.3. Observation indicators

(1) Ocular complication rate: The patients were observed for ocular dryness, inflammation, conjunctivitis, and so on.

(2) Scoring of ocular symptoms: The visual analog scoring (VAS) was used to score the postoperative ocular symptoms of the patients. The score ranged from 0 to 10, with 0 indicating no symptoms and 10 indicating severe symptoms.

(3) Quality-of-life score: The SF-36 quality-of-life scale was used to score the quality of life of the patients in surgery. The score ranged from 0 to 100 points, with higher scores indicating a better quality of life.

2.4. Statistical analysis

SPSS23.0 statistical software was used for data analysis. The measurement data were expressed as mean ± standard deviation and analyzed using a *t*-test; the count data were expressed as *n* (%) and were analyzed using a χ^2-test. $P < 0.05$ indicated a statistically significant difference.

3. Results

3.1. Ocular complication rate

The complication rate of the medical chitosan film group was significantly lower than that of the erythromycin eye ointment and homemade eye patch group ($P < 0.05$).

Table 1. Occurrence of ocular complications

Group	Dry	Conjunctivitis	Complication rate *n* (%)
Medical chitosan film group	1	1	2 (6.67)
Erythromycin eye ointment group	4	3	7 (23.33)[a]
Homemade eye patch group	3	4	7 (23.33)[bc]

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

3.2. Eye symptom scores

The ocular scores of the medical chitosan film group were significantly better than those of the erythromycin eye ointment and homemade eye patch groups ($P < 0.05$).

Table 2. Ocular symptom scores

Group	Score of eye symptom
Medical chitosan film group	2.51 ± 1.31
Erythromycin eye ointment group	4.82 ± 1.73[a]
Homemade eye patch group	4.42 ± 1.83[bc]

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

3.3. Quality-of-life score

The quality-of-life score of the medical chitosan film group was significantly better than that of the erythromycin eye ointment and homemade eye protection patch groups ($P < 0.05$).

Table 3. Quality-of-life scores

Group	Quality-of-life score
Medical chitosan film group	85.33 ± 12.41
Erythromycin eye ointment group	71.58 ± 11.84[a]
Homemade eye patch group	72.07 ± 10.94[bc]

Note: *a* indicates $P < 0.05$ for the medical chitosan film group compared to the erythromycin eye ointment group; *b* indicates $P < 0.05$ for the medical chitosan film group compared to the homemade eye patch group; *c* indicates $P > 0.05$ for the homemade eye patch group compared to the erythromycin eye ointment group.

4. Discussion

As individuals age and are affected by lifestyle habits, the skin around the eyes is susceptible to issues such as dryness, wrinkles, and pigmentation. These concerns necessitate specialized care. Medical chitosan film, recognized for its moisturizing, antioxidant, and antibacterial properties, finds extensive application in the realm of eye care [7-11].

Medical chitosan film has good moisturizing properties. It helps retain the moisture of the skin around the eyes and prevents wrinkles. Besides, chitosan film is rich in antioxidant components, such as polyphenolic compounds and vitamin C, which can scavenge free radicals and slow down the aging of the skin around the eyes. It also demonstrates antimicrobial properties, which can inhibit the growth of ocular bacteria and prevent ocular infections. Furthermore, chitosan films are compatible with ocular skin tissues and will not cause irritation or allergic reactions. Chitosan films undergo strict medical testing and approval procedures, making them highly safe. Applying medical chitosan eye patches to the eye area offers benefits such as moisture, reduced dryness, and diminished wrinkles. These patches also provide antioxidant effects and help prevent eye infections due to their antibacterial properties.

Chitosan eye injections can be used to fill in fine lines and fold under the eyes to improve the elasticity and improve the appearance of the skin under the eyes. Chitosan can stimulate the generation of eye collagen and improve the texture and elasticity of the skin around the eyes. In addition, eye cream containing chitosan can be

quickly absorbed by the skin around the eye, achieving deep nourishment. Chitosan promotes blood circulation and metabolism in the skin around the eyes, addressing issues such as dark circles and under-eye bags. Eye masks containing chitosan adhere closely to the eyes, preventing infections. This film provides ample nutrition and moisture to the eye area, stimulating cell regeneration and repair due to the chitosan ingredients, thereby improving concerns like fine lines and wrinkles around the eyes.

The results showed that the patients who used medical chitosan film for eye care were better than those who used conventional eye care in terms of the ocular complication rate, ocular symptom scores, and quality-of-life scores. This demonstrates that medical chitosan film has a good effect in terms of eye care during neurosurgery. Chitosan film has moisturizing properties, breathability, and low immunogenicity, which can effectively alleviate ocular dryness and prevent inflammation, conjunctivitis, and other complications. Meanwhile, chitosan film also promotes the repair and regeneration of corneal epithelial cells, which accelerates the recovery of postoperative vision and quality of life. Erythromycin eye ointment and homemade eye patches play a significant role in neurosurgery eye care by reducing the occurrence of ocular complications and improving patient comfort and vision recovery. However, it is also important to the individual ocular condition and needs of the patients and ensure that the treatment provided is tailored for them.

Eye care in neurosurgery can be carried out in the following aspects: To keep their eyes clean patients should regularly wash their eyes with eye drops or eyewash recommended by the doctor and avoid touching the eyes with their hands to minimize the spread of bacteria. To prevent eye dryness, patients can use artificial tear drops or gently cover the eyes with a warm, moist gauze; they should also avoid staring at electronic screens or reading books for a long time to reduce eye strain and eye dryness. During neurosurgery, patients undergo either general or local anesthesia. While under anesthesia, patients may face challenges such as incomplete eye closure or oculomotor disorders. To prevent the risk of eye rupture or infection, patients must refrain from rubbing or squeezing their eyes before and during surgery [12]. Patients should use antibacterial drugs and anti-inflammatory medications according to their doctor's instructions to prevent infections. Besides, they should avoid using cosmetics and skin care products at the surgical site [13] to reduce the risk of infections. During the postoperative recovery period, patients should take precautions such as avoiding prolonged periods of staring at electronic screens or reading books to reduce eyestrain and discomfort. Forceful rubbing of the eyes or excessive use should be avoided to prevent vision loss and ocular discomfort [14]. Patients should inform their doctors or nurses about any ocular discomfort or abnormalities so that proper measures can be taken to avoid further complications[15].

5. Conclusion

In summary, medical chitosan film has a good eye care effect in neurosurgery, which can effectively prevent the occurrence of ocular complications, alleviate ocular symptoms, and improve the quality of life of patients. Therefore, the application of medical chitosan film is worth promoting in neurosurgery.

Disclosure statement

The authors declare no conflict of interest.

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The Application of Video Electroencephalogram in the Classification and Diagnosis of Post-Stroke Epilepsy

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Abstract: *Objective:* To explore the value of video electroencephalogram in the classification and diagnosis of post-stroke epilepsy. *Methods:* The medical records of patients diagnosed with suspected post-stroke epilepsy in our hospital from November 2020 to November 2023 were retrospectively analyzed, and a total of 116 research subjects were included based on several inclusion and exclusion criteria. All patients had undergone video and conventional electroencephalogram. The detection of epileptic discharges and clinical symptoms by the two methods were evaluated, their diagnostic efficacies were compared, and the effect of video electroencephalography on post-stroke patients was analyzed. Classification of epilepsy. *Results:* The comprehensive clinical diagnosis conclusion showed that among 116 patients with suspected post-stroke epilepsy, a total of 64 cases were diagnosed. The diagnostic accuracy, specificity, and sensitivity of video electroencephalogram were significantly higher than those of conventional electroencephalogram. Besides, among the patients diagnosed with post-stroke epilepsy, the detection rate of epileptiform discharges and clinical seizures by video electroencephalogram was significantly higher than that of conventional electroencephalogram ($P < 0.05$). Among the clinical seizure cases detected by video electroencephalogram, only 6 cases were inconsistent with the epilepsy classification based on a comprehensive clinical diagnosis. *Conclusion:* Video electroencephalogram has important value in diagnosing and classifying post-stroke epilepsy.

Keywords: Video electroencephalography; Conventional electroencephalography; Post-stroke epilepsy; Classification; Diagnosis

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1. Introduction

Epilepsy is a common neurological complication after a stroke, and it is reported that 5% to 20% of stroke cases are accompanied by epileptic seizures [1]. For stroke patients, epileptic seizures can cause persistent changes in the brain, aggravate neurological damage, and negatively affect clinical prognosis. Therefore, early and accurate diagnosis and classification of post-stroke epilepsy are of vital significance to controlling the patient's condition and ensuring clinical efficacy. Electroencephalography (EEG) is currently the primary method of diagnosing

epilepsy. However, the recording time of conventional electroencephalography is short (generally 20–40 minutes). Because epileptiform discharges are highly random and it is difficult to capture epileptic waves, the detection rate of epilepsy is low [2]. Video EEG enables synchronized recording that allows continuous monitoring of brain wave changes over 24 hours. This method is complemented by video monitoring of various body activities, enhancing the diagnostic accuracy of epilepsy [3,4]. To further explore the value of video EEG in the classification and diagnosis of post-stroke epilepsy and to guide clinical diagnosis, treatment, and prognosis assessment, we retrospectively analyzed the EEG and routine evaluation results of 116 patients with post-stroke epilepsy who were previously admitted to our hospital.

2. Materials and methods

2.1. Information

Screening of research subjects: The hospitalization data of patients with suspected post-stroke epilepsy who were diagnosed in our hospital from November 2020 to November 2023 were collected and retrospectively analyzed. Finally, 116 research subjects were included based on several inclusion and exclusion criteria.

Inclusion criteria: (1) First epileptiform seizure and diagnosed as suspected epilepsy by a neurologist, (2) completed video EEG and conventional EEG in our hospital, (3) complete medical record, (4) gave consent to the study. Exclusion criteria: (1) Family history of epilepsy, (2) non-post-stroke epilepsy, (3) presence of major underlying diseases (malignant tumors, organ dysfunction, other neurological diseases, etc.) or mental illness.

The sample was composed of 77 males and 39 females, aged 48–73 years (mean age: 58.33 ± 7.49 years). Among them, there were 49 cases of cerebral infarction and 67 cases of cerebral hemorrhage.

2.2. Method

All cases underwent EEG and conventional EEG by the same group of senior EEG physicians, and a clear diagnosis of epilepsy was made. Detection operations:

(1) Conventional EEG

In conventional EEG, the patient was assisted into a sitting position and instructed to stay relaxed. The electrodes were placed on the scalp according to the international 10–20 system. The EEG monitoring parameters were set including a high-frequency filter set to 70 Hz and a time setting of 0.3 s. Recordings were conducted during both awake and sleeping states, incorporating relevant induction tests (such as opening and closing the eyes, flash stimulation, hyperventilation, etc.) during awake state recordings. The detection process was typically completed within 20 to 30 minutes, and the results were saved to the computer's hard disk for subsequent playback and analysis.

(2) Video EEG

The patients' posture was adjusted so that the monitoring system equipment could be properly placed and fixed. The parameters were set similarly to the conventional EEG. A high-definition video camera was aimed at the patient, with the patient's head, face, limbs, and torso fully presented in the video interface. The patient's brain electrical activity was recorded during the asleep and awake states, with video synchronization capturing the patient's clinical performance during various periods of brain electrical activity. Induction tests, such as opening and closing eyes, flash stimulation, and hyperventilation, were conducted, and the brain's electrical activity was monitored during non-rapid eye movement and rapid eye movement periods. The detection time lasted not less than 12 hours, with some even lasting up to 24 hours. After the monitoring, the results were saved for playback and analysis.

2.3. Observation indicators

The diagnostic performance of video EEG and conventional EEG detection were evaluated, and the detection rates of epileptic discharges and clinical seizures of the two methods were compared. The standard for interpreting epileptic discharges involved identifying typical arrhythmia characteristics, including sharp waves, spikes, and slow waves. The criteria for assessing clinical seizures were based on the "Clinical Diagnosis and Treatment Guidelines: Epilepsy Volume."

Two senior neurologists, relying on medical history information and relevant clinical guidelines, conducted comprehensive interviews and reached clear diagnostic conclusions. These clinical, comprehensive diagnostic conclusions were considered the "gold standard." The cases were divided into "positive" (presence of abnormalities) and "negative" (normal). The diagnostic results of video EEG and conventional EEG tests were compared for the same cases, and the diagnostic accuracy, specificity, and sensitivity for each method were calculated. Lastly, the role of video electroencephalography in classifying post-stroke epilepsy was further analyzed.

In the "Clinical Diagnosis and Treatment Guidelines: Epilepsy Volume," epilepsy seizures are categorized into four types based on the patient's clinical manifestations. These include generalized seizures, partial seizures, partial seizures followed by generalized seizures, and seizures that cannot be classified.

2.4. Statistical methods

The patients' data were input into Excel and processed using SPSS 18.0. Measurement data were expressed as mean ± standard deviation and analyzed by a t-test. Count data were expressed as percentages and were analyzed using an χ^2-test. $\alpha = 0.05$ was used, with $P < 0.05$ indicating statistically significance.

3. Results

3.1. Diagnostic performance

The comprehensive clinical diagnosis conclusion showed that among 116 patients with suspected post-stroke epilepsy, a total of 64 cases were diagnosed. The specific results of video EEG and conventional EEG are shown in **Table 1**. The diagnostic accuracy, specificity, and sensitivity of video EEG were determined to be 92.24%, 94.23%, and 90.63%, respectively. These values were superior to those of conventional EEG, which were 64.66%, 76.92%, and 54.69%, respectively ($P < 0.05$).

Table 1. Comparison of diagnostic performance of two detection methods (cases)

Comprehensive clinical diagnosis	Video EEG		Conventional EEG		Total
	Positive	Negative	Positive	Negative	
Positive (n = 64)	58[a]	6[b]	35[a]	29[b]	64
Negative (n = 52)	3[c]	49[d]	12[c]	40[d]	52
Total	61	55	47	69	116

Note: [a]True positive, [b]false negative (missed diagnosis), [c]false positive (misdiagnosis), and [d]true negative.

3.2. Detection rates of epileptic discharges and clinical seizures

Among patients diagnosed with post-stroke epilepsy, the detection rate of epileptiform discharges and clinical seizures through video EEG was notably higher compared to conventional EEG ($P < 0.05$).

Table 2. Comparison of the detection rates of epileptic discharges and clinical seizures between two detection methods [cases (%)]

Detection method	*n*	Epileptic discharge	Clinical onset
Video EEG	64	49 (76.56)	40 (62.50)
Conventional EEG	64	21 (32.81)	22 (34.38)
χ^2	-	24.717	10.134
P	-	0.000	0.001

3.3. The role of video EEG in classifying post-stroke epilepsy

Among the clinical seizure cases identified by video EEG, six cases exhibited inconsistencies with the epilepsy classification in the comprehensive diagnostic conclusion. Specifically, five cases of generalized seizures were detected as partial seizures by video EEG, and one case that could not be classified was classified as a partial seizure by video EEG.

4. Discussion

During an epileptic seizure, abnormal brain electrical activity serves as a crucial reference for the clinical diagnosis of epilepsy. However, it is noteworthy that approximately 1% of healthy individuals may also exhibit epileptiform electrical activity [5,6]. Therefore, during the period between epileptic seizures, EEG alone cannot be relied upon as the exclusive diagnostic reference for epilepsy. Video EEG combines EEG technology with video monitoring capabilities, enabling the simultaneous recording of EEG in awake states, during natural sleep, and the awakening period. This is particularly advantageous as approximately 80% of epileptiform discharges tend to occur during sleep and complete sleep cycles, making it easier to track these discharges. Additionally, camera and video equipment are employed for real-time monitoring of the patient's seizure status. This approach proves beneficial in eliminating external interference factors, thereby facilitating the detection of more subtle forms of seizures [7-9]. The results of this study showed that video EEG's diagnostic accuracy, specificity, and sensitivity are significantly higher than those of conventional EEG. In patients with post-stroke epilepsy diagnosed, video EEG is more effective. The detection rate of epileptiform discharges and clinical seizures was also significantly higher than that of conventional EEG ($P < 0.05$). Therefore, it is suggested that video EEG detection is superior in the diagnosis of post-stroke epilepsy.

EEG represents a dynamic process of change, and meticulous observation of its evolution from the interictal period to the ictal period can provide valuable guidance in the classification and localization of epilepsy [10]. Among the clinical seizure cases detected by video EEG in this study, only 6 cases were inconsistent with the epilepsy classification by comprehensive diagnosis; 5 cases of generalized seizures were detected as partial seizures by video EEG, and 1 case that could not be classified was detected as partial seizures by video EEG. Video EEG detection can reflect the patient's seizure status and is an effective method for identifying epileptic and non-epileptic seizures. Nonetheless, the occurrence of alpha rhythm during epileptic seizures is often indicative of pseudoseizures. When evident clinical signs are documented during a seizure episode without accompanying epileptiform discharges, the diagnosis of non-epileptic seizures is confirmed. This underscores the significant clinical value of video EEG detection in determining the specific type of epilepsy following a stroke.

5. Conclusion

In summary, compared to conventional EEG, video EEG detection has higher diagnostic efficiency for post-stroke epilepsy and plays a significant role in determining the type of post-stroke epilepsy. Therefore, it should be widely applied in clinical practice.

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Clinical Efficacy and Safety Analysis of Amisulpride Combined with Venlafaxine in Treating Geriatric Depression

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Abstract: *Objective:* To analyze the therapeutic effect of amisulpride (ASP) combined with venlafaxine (VEN) on depression among the elderly. *Methods:* 75 elderly patients with depression who were hospitalized between January 2020 and January 2021 were selected and randomly divided into 2 groups: Group A and Group B. The 38 patients in Group A were treated with ASP combined with VEN, and the 37 patients in Group B were treated with VEN. The effects of the two treatments were compared. *Results:* The treatment in Group A was more effective than Group B ($P < 0.05$). Before treatment, there was no difference in the depression score and coping mechanisms between the two groups ($P > 0.05$). After six weeks of treatment, the depression score of Group A was lower than that of Group B, and the coping mechanism score of Group A was higher than that of Group B ($P < 0.05$). Group A had a lower adverse reaction rate compared to Group B ($P < 0.05$). *Conclusion:* ASP combined with VEN therapy is more effective in treating geriatric depression. It improves their symptoms and coping mechanisms, and the drugs used are relatively safe.

Keywords: Amisulpride; Venlafaxine; Geriatric depression; Clinical efficacy; Safety

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1. Introduction

Geriatric depression is a common psychological disorder. Its pathogenesis is related to aging. Geriatric depression can be caused by physiological, psychological, or social factors. Patients with this form of depression experience negative emotions, low self-esteem, social avoidance, etc., and might even attempt suicide in severe cases [1]. This disease is usually treated by drugs. ASP, as a preparation of eicosapentaenoic acid (EPA), possesses various biological effects, such as anti-inflammatory and antioxidant properties.. VEN is a new type of antidepressant with high selectivity and affinity and has inhibitory effects on serotonin and norepinephrine transporters [2]. In this study, 75 elderly patients with depression were selected to analyze the therapeutic effect of combining the above two drugs.

2. Material and methods

2.1. General information

A total of 75 elderly patients with depression who were admitted to the hospital between January 2020 and January 2021 were selected and divided into two groups (Group A and Group B) by the random number table method. There were 38 cases in group A, and the ratio of male patients/to female patients was 22/16; the patients' ages ranged from 61 to 88 years old, with a mean age of 68.24 ± 2.15 years; the course of the disease ranged from 4 to 73 months, with a mean of 33.15 ± 2.79 months. There were 37 cases in Group B, and the male/female patient ratio was 23/14; the patients' ages ranged from 62 to 89 years old, with a mean age of 68.12 ± 2.29 years old; the course of disease ranged from 3 to 71 months, mean 33.47 ± 2.62 months. After the data were compared, it was recorded as $P > 0.05$.

2.2. Methods

Group A was treated with ASP combined with VEN. One week before the medication, a medication washout was carried out to eliminate the effect of previous antidepressants. The dosage of ASP was set at 100 mg each time, once daily. The initial dose of VEN was 75 mg each time, once a day; after two weeks of medication, the dosage was increased to 150 to 225 mg each time, once a day, and the average daily dose was about 135.00 ± 61.00 mg. Group B was treated with VEN only, with the same dosage as Group A. Antipsychotics or antidepressants could not be taken together during the treatment period, and the treatment cycle was six weeks. All patients signed an informed consent.

2.3. Observation indicators

The severity of depression was evaluated using the Hamilton Depression Rating Scale-17 (HAMD-17), which included 17 items, and each item was scored on a 5-point scale, ranging from 0 to 4 points. Including the following factors: (1) anxiety somatization (5 items), (2) body weight (1 item), (3) cognitive impairment (3 items), (4) retardation (5 items), (5) insomnia (3 items). The degree of depression is scored positively. The coping mechanism was evaluated by the Medical Coping Questionnaire (MCMQ), including confrontation (8 items), submission (5 items), and avoidance (7 items). Adverse reactions such as constipation, nausea, palpitation, drowsiness, and dizziness were observed.

2.4. Efficacy evaluation criteria

The HAMD-17 score was used to measure the therapeutic effect. A score reduction of 75% without clinical symptoms was considered a full recovery, a score reduction of 50% to 75% with mild symptoms indicated significant improvement, and a score reduction of 25% to 49% with apparent symptoms indicated slight improvement. If the HAMD-17 score was reduced by less than 25% with severe symptoms, the treatment was deemed ineffective.

2.5. Statistical analysis

The data were processed using SPSS 28.0 software. The measurement data were analyzed by a *t*-test, and the count data were analyzed by a χ^2-test. $P < 0.05$ indicated statistical significance.

3. Results

3.1. Total efficacy

The total efficacy of Group A was significantly higher than Group B ($P < 0.05$).

Table 1. Comparison of the total efficacy between the two groups (*n* [%])

Group	Number of cases	Full recovery	Significant improvement	Slight improvement	No effect	Total efficacy
Group A	38	18 (47.37)	11 (28.95)	7 (18.42)	2 (5.26)	94.74 (36/38)
Group B	37	12 (32.43)	10 (27.03)	6 (16.22)	9 (24.32)	75.68 (28/37)
χ^2	-	-	-	-	-	5.442
P	-	-	-	-	-	0.020

3.2. Depression scores

There was no difference in depression scores between the groups before treatment ($P > 0.05$). After six weeks of treatment, the depression score of Group A was lower than that of Group B ($P < 0.05$).

Table 2. Comparison of depression scores between the two groups (mean ± standard deviation /min)

Group	Number of cases	Somatization of anxiety		Body weight		Cognitive impairment		Retardation		Insomnia	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Group A	38	14.21 ± 1.36	8.02 ± 1.04	3.04 ± 0.31	0.76 ± 0.12	9.15 ± 1.84	6.15 ± 1.05	13.98 ± 1.86	7.42 ± 1.61	9.02 ± 1.33	5.12 ± 0.84
Group B	37	14.15 ± 1.34	10.15 ± 1.08	3.06 ± 0.28	0.99 ± 0.15	9.42 ± 1.80	8.13 ± 1.07	13.91 ± 1.83	9.42 ± 1.64	9.04 ± 1.28	7.16 ± 0.89
t	-	0.192	8.701	0.293	7.343	0.642	8.088	0.164	5.329	0.066	10.211
P	-	0.848	0.000	0.770	0.000	0.523	0.000	0.870	0.000	0.947	0.000

3.3. Coping mechanisms

There was no difference in coping mechanism scores between the groups before treatment ($P > 0.05$). After six weeks of treatment, Group A's coping mechanism score was higher than Group B's ($P < 0.05$).

Table 3. Comparison of coping style scores between the two groups (mean ± standard deviation /min)

Group	Number of cases	Confronting		Submission		Avoidance	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Group A	38	21.26 ± 2.41	28.12 ± 2.49	11.26 ± 1.95	16.54 ± 1.83	18.33 ± 1.67	23.48 ± 2.25
Group B	37	21.29 ± 2.32	25.04 ± 2.43	11.28 ± 1.92	14.02 ± 1.80	18.39 ± 1.65	20.14 ± 2.23
t	-	0.055	5.420	0.045	6.011	0.156	6.455
P	-	0.956	0.000	0.964	0.000	0.876	0.000

3.4. Adverse reaction rate

Group A's adverse reaction rate was lower than Group B's ($P < 0.05$).

Table 4. Comparison of adverse reaction rates between the two groups (*n* [%])

Group	Number of cases	Constipation	Nausea	Palpitation	Drowsiness	Dizziness	Incidence rate
Group A	38	0	1 (2.63)	0	1 (2.63)	0	5.26 (2/38)
Group B	37	1 (2.70)	3 (8.11)	1 (2.70)	2 (5.41)	1 (2.70)	21.62 (8/37)
χ^2	-	-	-	-	-	-	4.341
P	-	-	-	-	-	-	0.037

4. Discussion

Geriatric depression is a condition in which people aged 60 and above suffer from persistent, severe depression, and present behaviors that affect their daily life [3]. The number and functionality of neurons decrease with age, and the secretion of various neurotransmitters also changes, so the probability of suffering from depression is higher. The onset of the disease is relatively slow, with no obvious symptoms in the initial stages. As time passes, the symptoms gradually increase, such as negative emotions, loss of interest, fatigue, insomnia, etc [4]. Clinically, this disease is managed through medications. However, many types of drugs can be used, with different therapeutic effects

VEN is a new type of antidepressant. It reduces depressive symptoms by inhibiting the reuptake of norepinephrine and serotonin [5]. Compared to traditional antidepressants, VEN has fewer adverse reactions in elderly patients. Besides, it does not affect their cognitive abilities and balance. The medicine can regulate neurotransmitter levels, improve nervous system function, and stimulate the release of endogenous opioids, making the patients feel happier and more comfortable [6]. However, the efficacy of the drug alone is mediocre, but it can be used together with ASP. ASP is an antidepressant that works differently from other antidepressants. ASP increases the release of dopamine receptors (D2 and D3) and 5-hydroxytryptamine, which help restore the physiological functions of the nervous system [7]. In addition, ASP can increase the release of dopamine and serotonin and their concentration in the nervous system, which will help relieve depression. The drug can also improve patients' cognitive ability, attention, and learning ability, and reduce various complications caused by depression, which will lead to an improvement in their quality of life [8].

The results showed that Group A's treatment was more effective. Group A had a lower depression score and a higher coping mechanism score. Besides, the adverse reaction rate of Group A was lower than Group B ($P < 0.05$). The combination of ASP and VEN proved to be more effective in treating geriatric depression as it better relieved the patients' symptoms, and improved their disease coping mechanism. Besides, it also resulted in fewer adverse reactions. The two drugs complement each other, regulating patients' nervous system function comprehensively and relieving their symptoms. Therefore, combining medications these two results in improved efficacy and reduced toxicity, demonstrated by the fewer side effects.

5. Conclusion

In summary, ASP combined with VEN is more effective in managing geriatric depression. Besides, this treatment is safe and comes with many benefits.

Disclosure statement

The authors declare no conflict of interest.

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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.

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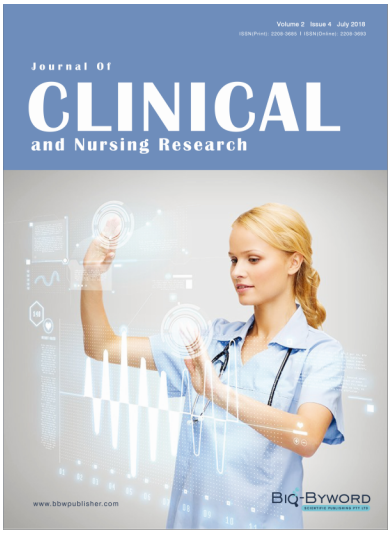

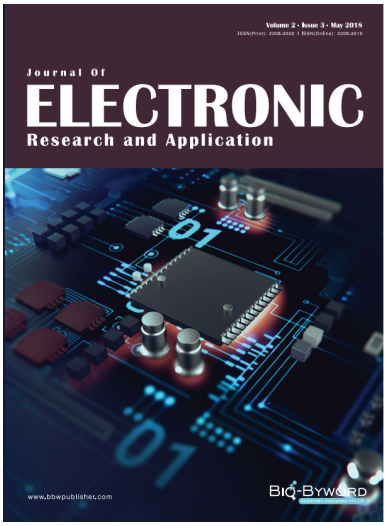

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