

Analysis on the Effect of Yiqi Huoxue Decoction Combined with Neuromuscular Electrical Stimulation in Improving ICU-Acquired Debility in Mechanically Ventilated Patients

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Abstract: *Objective:* To investigate the effect of Yiqi Huoxue decoction combined with neuromuscular electrical stimulation on improving intensive care unit (ICU) acquired debility in mechanically ventilated patients. *Methods:* 50 patients who were admitted to the ICU and received mechanical ventilation treatment in our hospital from June 2022 to June 2023 and were complicated with ICU-acquired neurasthenia were selected, and randomly grouped using the randomized envelope method into two groups: control group with 25 patients who received neuromuscular electrical stimulation alone; observation group with 25 patients who received the traditional Chinese medicine Yiqi Huoxue decoction. Comparison indexes: treatment efficiency, degree of emotional recovery (APACHE II score), muscle strength status (MRC score), motor status (FAC rating), and self-care ability (BI index score). *Results:* The treatment efficiency of patients in the observation group patients was higher as compared to those in the control group ($P < 0.05$). There was no significant difference in the comparison of the results of the scores (ratings) of each index between the two groups before treatment ($P > 0.05$). After the treatment, the APACHE II scores of patients in the observation group were significantly lower as compared to those in the control group, while the MRC scores, FAC ratings, and BI index scores were higher in the observation group than those of the control group patients ($P < 0.05$). *Conclusion:* The combined application of Yiqi Huoxue decoction and neuromuscular electrical stimulation in the treatment of patients with ICU-acquired neurasthenia complicated by mechanical ventilation significantly enhanced the clinical efficacy, the patient's muscle strength, motor status, and ability of self-care. Hence, it has high application value and is worthy to be popularized.

Keywords: Yiqi huoxue decoction; Neuromuscular electrical stimulation; Mechanical ventilation; ICU-acquired neurasthenia

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1. Introduction

Patients admitted to the intensive care unit (ICU) will likely receive mechanical ventilation treatment, during which ICU-acquired debility can easily occur, resulting in prolonged off-boarding time, and may even be

fatal. Currently, the prevention and control of ICU-acquired debility has become a key research topic for ICU staff^[1]. In the past, this complication was usually treated with transcutaneous neuromuscular electrical stimulation, using neuromuscular electrical stimulation equipment to output low-frequency pulses to the muscle continuously, which can improve muscle strength and endurance. This method has played an important role in the prevention and treatment of ICU-acquired debility^[2]. Recently, the culture of traditional Chinese medicine (TCM) has received widespread attention, and TCM has the unique advantage of multi-target therapy in the treatment of diseases, especially in the treatment of various critical illnesses and their complications. There is no record of ICU-acquired debility in TCM, but according to the clinical symptoms of this disease and the patient's physical signs, it can be categorized as "impotence." The occurrence of impotence is closely related to the patient's deficiency of qi and blood, and the dysfunction of the spleen and gastric system^[3]. In the treatment of impotence, the main idea is to strengthen the spleen and stomach and replenish qi and blood. The Yiqi Huoxue decoction is a commonly used formula in TCM to replenish qi and blood and strengthen the spleen and stomach. To further investigate this, this study extracted 50 cases of patients admitted to the ICU who received mechanical ventilation treatment, and developed ICU-acquired debility. This study analyzed the application effect of the joint application of Yiqi Huoxue decoction and neuromuscular electrical stimulation in treating this condition.

2. Information and methods

2.1. General information

A total of 50 patients were included in this study, all of them being patients who received mechanical ventilation treatment in the ICU of our hospital from June 2022 to June 2023 and developed by ICU-acquired debility. The patients were randomly grouped into two groups using the randomized envelope method, with 25 cases each. The control group consisted of 13 males and 12 females ranging from 35–69 years old with an average age of 52.28 ± 8.12 years. There were 14 cases of respiratory disease, 6 cases of coronary heart disease, 2 cases of post-fracture surgery, and 2 others. The mechanical ventilation treatment time was 1–5 days with an average of 3.11 ± 0.69 days. The observation group patients consisted of 15 males and 10 females ranging from 35–70 years old with an average age of 52.94 ± 8.49 years. There were 16 cases of respiratory disease, 7 cases of coronary heart disease, 1 case of post-fracture surgery, and 1 other. There were significant differences when comparing the baseline data of the two groups ($P > 0.05$). This study was conducted after obtaining approval from the ethics committee. Inclusion criteria: (1) Meets the diagnostic criteria of this disease in Chinese and Western medicine^[4,5]; (2) voluntary enrollment and consented; (4) compliant. Exclusion criteria: (1) patients with Barthel index (BI) index less than 70 points 2 weeks before admission into the ICU; (2) patients with fractured limbs; (3) risk of bleeding or active bleeding; (4) history of neurological diseases; (5) at final stages of life; (6) contraindications to neuromuscular stimulation such as installation of cardiac pacemakers.

2.2. Methods

The control group received only neuromuscular electrical stimulation therapy, and a neuromuscular electrical stimulation therapy instrument was used. The stimulation site included the biceps/triceps muscle group, gastrocnemius muscle group, tibialis anterior muscle group, and quadriceps muscle. The instrument was set to a frequency of 30–40 Hz. Patients were treated twice a day for 30 minutes until the patient was off the machine or transferred to the general ward. The patients in the observation group adhered to the above treatment along with the addition of Yiqi Huoxue decoction. The decoction formula is as follows: astragalus (60 g), *Angelica sinensis* (10 g), chaihu (10 g), ascending flax (10 g), chenpi (10 g), *Atractylodes macrocephala* (15 g), *Codonopsis* (30 g),

and licorice (5 g). This decoction was taken warmly at 150mL, twice a day, for 14 days.

2.3. Observation indexes

2.3.1 Comparison of the treatment effectiveness of the two groups of patients

According to the relevant guidelines to evaluate the treatment effect^[6], the criteria are as follows: (1) “Clinical recovery” indicated complete disappearance of clinical symptoms with a TCM evidence point of more than 95%. Limbs could be controlled freely and the results of laboratory and neurological tests were normal; (2) “apparent” when clinical symptoms improved significantly, the decrease in TCM evidence points was between 70–94%, the limb impotence was significantly improved, and the results of laboratory were normal; (3) “effective” when the clinical symptoms have improved, the decrease of TCM evidence points was between 30–69%, and the laboratory and neurological test results showed improvement; (4) “ineffective” when patients do not meet the above criteria. The effective rate of treatment = $(1 - \text{number of invalid cases}/35) \times 100\%$.

2.3.2. Comparison of relevant indicators between the two groups of patients

Comparison indexes include: (1) The Acute Physiology and Chronic Health (APACHE II) score was used to evaluate the degree of the patient’s recovery and includes a total of three dimensions: acute physiology, chronic health status, and age. The range of scores for each dimension was 0–60 points, 2–5 points, and 0–6 points in turn, with the total score between 2–71 points. The higher the score, the greater the severity of the patient’s condition. (2) Muscle strength status was assessed using the Medical Research Council (MRC) scale. This scale includes 12 indicators, such as shoulder flexion, elbow flexion, hip flexion, etc., where each indicator score ranged from 0–5 points, and has a total score between 0–60 points. The higher the score, the better the patient’s muscle strength. (3) Motor status was evaluated using the Functional Ambulation Capacity Scale (FAC), which was divided into five grades from 0–5. Grade 0: unable to walk/can walk with the assistance of two people; Grade 1: can walk with the assistance of one person; Grade 2: needs intermittent assistance from one person; Grade 3: can walk on his/her own under their supervision; Grade 4: can walk independently but needs assistance from other people when walking up and down the steps or going up and down the slopes; Grade 5: can walk completely independently. (4) The self-care ability was evaluated by the BI index, which contains 10 entries. Each entry ranged from 0–10 points with a total score from 0–100 points. The higher the score, the better the patient’s self-care ability.

2.4. Statistical methods

The data were analyzed using the SPSS 24.0 statistical software. The treatment effectiveness rate was expressed as n (%); the APACHE II score, MRC score, FAC rating, and BI index were expressed as mean \pm standard deviation, and the data were compared and analyzed using the t -test and chi-square (χ^2) test. Results were considered statistically significant at $P < 0.05$.

3. Results

3.1. Comparison of the treatment efficiency of the two groups of patients

As shown in **Table 1**, the treatment effective rate of patients in the observation group (96%) was significantly higher than that of the control group ($P < 0.05$).

Table 1. Comparison of the treatment effective rate of patients in the two groups (*n*, [%])

Group	Cases, <i>n</i>	Clinical recovery	Significantly effective	Effective	Ineffective	Treatment efficacy rate
Control Group	25	6 (24.00)	5 (20.00)	6 (24.00)	8 (32.00)	17 (68.00)
Observation Group	25	8 (32.00)	9 (36.00)	7 (28.00)	1 (4.00)	24 (96.00)
χ^2						4.878
<i>P</i>						0.027

3.2. Comparison of relevant indexes between the two groups of patients

As shown in Table 2, the APACHE II score, MRC score, FAC rating, and BI index before treatment were compared, and there were no significant differences in the results between the two groups ($P > 0.05$). After treatment, results showed that the APACHE II score of the patients in the observation group was lower, and the scores (ratings) of the rest of the indicators were higher than that of the control group ($P < 0.05$).

Table 2. Comparison of relevant indexes between the two groups of patients (mean \pm standard deviation)

Group	Cases, <i>n</i>	APACHE II (Score)		MRC (Score)		FAC (Grade)		BI-index (Score)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control Group	25	22.64 \pm 2.11	16.85 \pm 1.46 [△]	38.01 \pm 3.08	46.23 \pm 2.95 [△]	2.15 \pm 0.35	3.00 \pm 0.41 [△]	39.03 \pm 4.52	61.89 \pm 3.74 [△]
Observation Group	25	22.79 \pm 2.15	14.52 \pm 1.17 [△]	37.59 \pm 3.15	51.78 \pm 3.14 [△]	2.06 \pm 0.27	4.24 \pm 0.29 [△]	38.26 \pm 4.54	72.12 \pm 4.25 [△]
<i>t</i>		0.248	6.226	0.476	6.440	1.018	12.345	0.600	9.035
<i>P</i>		0.804	< 0.001	0.635	< 0.001	0.313	< 0.001	0.550	< 0.001

Note: Δ is the significant difference compared with the group before treatment ($P < 0.05$).

4. Discussion

ICU-acquired debility mostly occurs in hours or days after the patient receives mechanical ventilation. This complication is associated with an increased risk of delirium, pressure injury, and pulmonary lesions, which adversely affects the patient's safety. Transcutaneous neuromuscular electrical stimulation therapy utilizes continuous stimulation of muscles with low-power pulses to effectively increase muscle strength and endurance. Recently, the effect of Chinese medicine in the treatment of critical illnesses and their complications has received more and more attention. Although there is no ICU-acquired debility in TCM, it can be categorized according to its signs and symptoms and is classified under the category of "impotent disease". According to Chinese medicine, dysfunction of the spleen and stomach and deficiency of qi and blood are the main causes of this disease. Poor function of the spleen and stomach can lead to the insufficiency of essences derived from food, which can result in qi and blood deficiency along with nourishment loss within muscle, resulting in impotence and weakness^[7,8]. The treatment should be based on strengthening the spleen and stomach and tonifying qi and blood. Therefore, in this study, the traditional Chinese medicine tonic Yiqi Huoxue decoction was chosen for treatment. The idea of combining Chinese and Western medicine in the treatment of diseases has received widespread attention in recent years and has also become a new direction for researchers to study. In this study, this theory was utilized in the treatment of the patients in the observation group, who were treated with neuromuscular electrical stimulation along with the use of the Yiqi Huoxue decoction. The results showed that all the comparative indexes of the patients in the observation group were significantly better

than those in the control group. Neuromuscular electrical stimulation is a non-invasive non-pharmacological treatment method, which is simple to operate and has a wide range of applications. It stimulates the passive contraction of muscles through the conduction of electrical impulses, which preserves the elasticity and extensibility of muscles, and also promotes local blood circulation, and improves the nutrient metabolism of muscle tissues^[9,10]. The ingredient, astragalus, found in the Yiqi Huoxue decoction, has the effect of elevating yang and consolidating the surface, tonifying the middle qi. Other ingredients including *Codonopsis pilosula*, *Rhizoma Atractylodis macrocephalae*, and *Glycyrrhiza uralensis* can regulating the function of the spleen and stomach and benefits the qi^[11,12]. The combination of Chinese and Western medicine can be applied in different treatments to better enhance the therapeutic as compared to using neuromuscular electrical stimulation therapy alone.

5. Conclusion

When treating ICU-acquired debility complicated by mechanical ventilation, the combined application of Yiqi Huoxue decoction and neuromuscular electrical stimulation therapy significantly enhanced the clinical efficacy, and improved patients' muscle strength, motor ability, and self-care ability.

Disclosure statement

The author declares no conflict of interest.

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