Observation on the Effect of Percutaneous Tracheotomy (PT) + Early Progressive Activity Training in Promoting the Recovery of Neuromuscular Function in Mechanically Ventilated Patients in the Intensive Care Unit

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Abstract: Objective: To observe the role of percutaneous tracheotomy (PT) + early progressive activity training in helping the recovery of neuromuscular function in mechanically ventilated patients in the unit. Methods: intensive care Sixty-six ventilated patients in mechanically the intensive care unit of our hospital from February to December 2024 were selected as the research subjects and randomly divided into two groups by a digital table. One group (33 cases) received conventional rehabilitation training based on PT treatment (control group), and the other group received PT + early progressive activity training (33 cases, observation group). The changes in neuromuscular function and Barthel index of the two groups of patients were observed. **Results:** The neuromuscular function assessment of the observation group was higher than that of the control group after treatment, with P<0.05. The Barthel index of the observation group was also higher than that of the control group after treatment, with P<0.05. **Conclusion:** Early progressive activity training for mechanically ventilated patients in the intensive care unit is helpful for improving the patients' neuromuscular function and activity ability, which is beneficial to the patients' rehabilitation.

Keywords: PT; Early Progressive Activity Training; Intensive Care Unit; Mechanical Ventilation; Neuromuscular Function

1. Introduction

Mechanical ventilation is the most commonly used treatment measure in the intensive care unit. It can rapidly improve the ventilation function of patients, relieve the symptoms of hypoxia in the body, and prevent carbon dioxide accumulation, which plays an important role in stabilizing the patients' condition. However, the conditions of these patients are relatively severe, the treatment cycle is long, and under the effect of relevant analgesic and sedative treatments, patients need to stay in bed for a long time, and their neuromuscular function is likely to be damaged to varying degrees, which is not conducive to recovery [1-2]. In order to comprehensively ensure the treatment effect on mechanically ventilated patients in the intensive care unit, it is necessary to take effective rehabilitation treatment measures in a timely manner to help improve the patients' neuromuscular function. This study mainly observed the role of early progressive activity training for these patients while they were receiving PT treatment.

2. Materials and Methods

2.1 General Information

Sixty-six stroke patients with abnormal lower Sixty-six mechanically ventilated patients in the intensive care unit of our hospital from February to December 2024 were selected as the research subjects and randomly divided into two groups by a digital table. One group (33 cases) received conventional rehabilitation training based on PT treatment (control group), and the other group received PT + early progressive activity training (33 cases, observation group). In the observation group, there were 17 males and 16 females, with an age range of 41-66 years and an average age of (52.34 ± 1.88) years. The body mass index (BMI) ranged from 21 to 25 kg/m², with an average of (22.73 ± 1.03) kg/m². In the control group, there were 18 males and 15 females, with an age range of 40-65 years and an average age of (52.85 ± 1.74) years. The BMI ranged from 21 to 25 kg/m², with an average of (22.35 ± 1.15) kg/m². There was no significant difference in the basic data between the two groups (P > 0.05).

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2.2 Methods

Both groups of patients underwent PT surgery. The specific surgical plan and incision site were determined by doctors according to the specific conditions of the patients. Patients in the control group received conventional rehabilitation training during the treatment period. Their limbs were promptly assisted in passive activities. For patients with clear consciousness, they were promptly guided to carry out active exercises. At the same time, the respiratory tract management of the patients was done well, and the secretions in the nasal cavity and oral cavity were promptly cleared to ensure that the patients' respiratory tract was unobstructed.

Patients in the observation group carried out early progressive activity training:

(1) Early endurance training: The patients were guided to lie in the supine position, and the head of the bed was appropriately raised to make the patients' legs in the most comfortable state. The patients were then guided to perform a simulated cycling exercise with their lower limbs. The single-training time was controlled at 5-10 minutes, and the activity volume could be appropriately increased according to the specific conditions of the patients. If the patients' heart rate and respiratory rate increased during the training, they needed to rest promptly.

(2) Early resistance training: The patients were guided to actively carry out knee extension, hip abduction, and shoulder external rotation activity training. During the training, resistance was appropriately added to the patients in an increasing order. The single-training time was 10 minutes, twice a day.

(3) Early activities: After the patients' vital signs were basically stable, they were guided to start sitting-up. In the early stage, this was carried out with the assistance of rehabilitation physicians or nursing staff, and then the patients were gradually guided to perform independent sittingup training, about 3 times a day. Or the patients were guided to perform bedside sitting training.

(4) Activities in the ward: For patients who met the conditions for getting out of bed, they were promptly assisted to move in a small range in the ward. Attention was paid to reasonably controlling the activity volume and range.

2.3 Observation Indicators

(1) Neuromuscular function assessment: The Functional Independence Measure (FIM) was used to assess the recovery of the patients' neuromuscular function before and after rehabilitation treatment, including sphincter control, transfer, locomotion, and self-care ability.

(2) Barthel index: The Barthel index was used to assess the activity ability of the patients before and after rehabilitation treatment. The score range was 0-100 points. The higher the score, the better the recovery of the patients.

2.4 Statistical Methods

SPSS 26.0 was used to analyze the relevant data in the study. Measurement data were expressed as mean \pm standard deviation and tested by t-test. Count data were expressed as percentage and tested by chi-square test. P<0.05 indicated that the difference was statistically significant.

3. Result

3.1 Neuromuscular Function Assessment

The neuromuscular function assessment of the observation group was higher than that of the control group after treatment, with P<0.05, as shown in Table 1.

3.2 Comparison of Barthel Index

The Barthel index of the observation group was higher than that of the control group after treatment, with P < 0.05, as shown in Table 2.

Group	Number	Sphincter Control		Transfer		Locomotion		Self-care Ability	
		Before	Before	Before	Before	Before	Before	Before	Before
	of Cases	After	After	After	After	After	After	After	After
		Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment	Treatment
Observation Group	33	4.63 ± 1.02	7.69 ± 1.02	10.45 ± 1.45	16.78 ± 1.12	6.04 ± 1.12	10.34 ± 1.42	18.45 ± 1.35	31.45 ± 1.44
Control Group	33	4.71 ± 1.11	5.36 ± 1.11	10.63 ± 1.35	13.04 ± 1.32	6.06 ± 1.22	8.15 ± 1.35	18.62 ± 1.45	22.66 ± 1.85
t	-	0.235	19.699	0.174	10.999	0.257	15.045	0.258	18.452
р	-	0.811	0.000	0.863	0.000	0.711	0.000	0.811	0.000
Table 2 Comparison of Parthal Index between the Two Croups $(\overline{x} + z)$									

Table 1. Neuromuscular Function Assessment ($\overline{x} \pm s$)

Table 2. Comparison of Darther Index between the 1 wo Groups $(x \pm s)$								
Crown	Number of Cases	Ashworth Score						
Group	Number of Cases	Before Treatment	After Treatment					
Observation Group	33	43.63 ± 2.85	74.45 ± 2.35					

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Control Group	33	43.55±2.98	60.36±2.15
t	-	1.857	22.758
р	-	0.615	0.001

4. Discussion

Most of the mechanically ventilated patients in the intensive care unit have relatively severe conditions. Timely implementation of PT treatment can further improve the patients' ventilation function, regulate the blood oxygen level of the patients' bodies, help stabilize the patients' conditions, and assist in their recovery. However, during the long - term treatment process of these patients, due to long - term bed rest and reduced daily activity, their neuromuscular function will be damaged to varying degrees, which is not conducive to rapid recovery [3 - 4].

Early progressive activity training guides patients to carry out various aspects of rehabilitation training in a step - by - step manner according to the changes in their conditions, which can help restore the neuromuscular function of the patients' limbs and other parts. It can prevent the continuous decrease of muscle strength in patients during long - term bed rest due to lack of activity [5]. Under the effect of progressive activity training, the activity of muscle fiber structure can be improved, muscle fiber atrophy can be prevented, and neuromuscular function can be improved. According to the observations of this study, the patients in the observation group carried out early progressive activity training in a timely manner during the treatment period, and both their neuromuscular function and Barthel index were rapidly improved, indicating that this treatment measure can help restore the neuromuscular function of patients.

In conclusion, during the treatment of mechanically ventilated patients in the intensive care unit, while receiving PT treatment, early progressive activity training can be carried out to

promote the recovery of patients.

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