

# The Study of Prevent Pulmonary Infection by Pulmonary Rehabilitation in Patients with Cerebral Hemorrhage

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## Abstract

**Objective:** To explore the nursing effect of pulmonary rehabilitation in patients with cerebral hemorrhage. **Methods:** 326 patients with cerebral hemorrhage who were hospitalized in our hospital from June 2019 to June 2021 were selected as the research objects (experimental group), and 273 patients with cerebral hemorrhage who were hospitalized in our hospital from May 2017 to May 2019 were selected as the control group, the control group with routine nursing measures, and the experimental group combined with pulmonary rehabilitation measures on the basis of routine nursing measures. The incidence of pulmonary infection, average hospital stay and patient satisfaction were compared between the two groups. **Results:** The incidence of aspiration pneumonia in the two groups: there were 12 cases of aspiration pneumonia in the treatment group (incidence rate 12/326, 3.8%), and 35 cases in the control group (incidence rate 35/273, 12.8%), there was a statistical difference between the two groups ( $P < 0.05$ ). Comparison of the average hospitalization days: the average hospitalization days in the treatment group were  $13.6 \pm 3.1$ , and the average hospitalization days in the control group were  $18.4 \pm 5.3$ . There was a statistically significant difference between the two groups ( $P < 0.05$ ). Comparison of hospitalization satisfaction: the rehabilitation hospitalization satisfaction in the treatment group was 98.52%, and the inpatient satisfaction in the control group was 93.47%. There was a statistically significant difference between the two groups ( $P < 0.05$ ). **Conclusion:** Effective early pulmonary rehabilitation in patients with cerebral hemorrhage can significantly reduce the incidence of complications and improve clinical efficacy.

## Keywords

Cerebral Hemorrhage, Pulmonary Infection, Pulmonary Rehabilitation

## 1. Introduction

Hypertensive intracerebral hemorrhage (HICH) is one of the common complications of hypertension, which can lead to disability or even death in severe cases. In the third national cause of death survey report, cerebrovascular disease has become the first cause of death in my country (22.45%) [1]. HICH accounts for 15% of all strokes, with rapid onset, rapid progression, and high mortality and disability [2]. In addition to cerebral hemorrhage itself, the cause of death was partly due to complications such as lung infection. Therefore, taking effective measures to prevent pulmonary infection in the early stage of cerebral hemorrhage can reduce the incidence of complications and improve the quality of life of patients. Domestic guidelines believe that pulmonary rehabilitation as soon as possible after stroke can prevent aspiration and hypostatic pneumonia, reduce tracheostomy, reduce hospitalization costs and shorten hospital stays [3]. Pulmonary rehabilitation refers to a kind of rehabilitation treatment method that increases respiratory muscle resistance and improves respiratory function during breathing [4]. Therefore, we selected patients with cerebral hemorrhage admitted to our hospital from June 2019 to June 2021 as the research subjects to explore the preventive effect of pulmonary rehabilitation measures on their pulmonary infection. The report is as follows.

## 2. Materials and Methods

### 2.1. General Information

A total of 326 patients with cerebral hemorrhage who were hospitalized in our hospital from June 2019 to June 2021, aged 16 to 83 years [average ( $56.45 \pm 12.33$ )] years, were selected, including 113 females and 213 males. Inclusion criteria: 1) cerebral hemorrhage confirmed by head CT or MRI; 2) unconscious disorder; 3) no mental disorder; 4) patients and their families voluntarily receive treatment and care, and sign informed consent. Exclusion criteria: 1) patients with respiratory tract infection or history of cardiopulmonary disease before admission; 2) patients with impaired consciousness; 3) patients with mental disorders who do not cooperate with the examination; 4) patients with severe malnutrition. A total of 273 inpatients with cerebral hemorrhage in our hospital from May 2017 to May 2019 were selected as the control group, and there was no statistical difference in gender, age and condition between the two groups. Diagnostic criteria for pulmonary infection: At least one of the following criteria must be met: fever (body temperature  $\geq 38^\circ\text{C}$ ), or abnormal white blood cell count ( $\leq 4 \times 10^9/\text{L}$ ) or ( $\geq 10 \times 10^9/\text{L}$ ), or unexplained changes in consciousness in elderly patients. Additionally, two of the following criteria must be met: new purulent sputum, new cough, or changes in sputum character and volume within 24 hours, shortness of breath or breathing difficulty, obvious rales heard on lung auscultation, or a decrease in oxygenation index ( $\text{PaO}_2/\text{FiO}_2 \leq 300$ ). One of the following must also be met: new or progressive infiltrates, consolidation, or ground-glass

opacities.

## 2.2. Methods

1) The control group was given routine specialist nursing measures, such as close monitoring of the patient's condition and vital signs, medication guidance, dietary care, psychological counseling, and routine oral health education. On the basis of the control group, the observation group adopted early pulmonary rehabilitation training, including respiratory function exercise, effective cough training, postural drainage and expectoration, and limb function exercise, etc. The specific measures are as follows.

2) Contents of early pulmonary rehabilitation intervention

a) Respiratory function training

① Breathing with pursed lips: The patient relaxes his body, closes his lips, and inhales through his nose. When the inhalation reaches the maximum, he exhales slowly by pursing his lips (whistle-like), and at the same time shrinks his abdomen, so that the distance between the lips is 15 - 20 cm. It is advisable to tilt the flame of a candle with a high level, such as the lips and not to extinguish it. The ratio of inhalation and exhalation time is 1:2 or 1:3; each training is 5 minutes, 2 or 3 times a day. ② Abdominal breathing: The patient is in a supine position, his hands are placed on the front chest or upper abdomen, and the knee and hip joints can be slightly flexed. A sandbag is placed on the abdomen, and the weight of the sandbag is gradually increased according to the patient's tolerance. Slowly inhale through the nose, bulge the abdomen, feel the abdomen lift up with the hands, purse the lips and do a slow exhalation, so that the abdomen sinks and the abdominal muscles are contracted; each training is 10 minutes, 3 or 4 times a day. ③ ACBT technology: breathing control, the patient is relaxed and semi-recumbent on the bed, and a pillow is placed under the popliteal fossa to relax the lower limbs and abdomen. Hold your hand halfway on your upper abdomen, and breathe at a normal tidal volume and an inspiratory-to-breath ratio of about 1:2. Inhale slowly through your nose and let your belly bulge slowly; then slowly exhale through your mouth, retract your belly, and let your palms follow the upper belly. Do 5 - 6 training sessions. Thoracic expansion exercises in which the patient lies in a relaxed semi-recumbent bed with a pillow under the popliteal fossa to relax the lower extremities and abdomen. Place your hands on the collapsed lung, inhale through your nose, hold your breath for 3 seconds and exhale through your mouth, while assisting with your hands. Do 2 - 3 training sessions. In the forced expiration technique, the patient is relaxed in a semi-recumbent position on the bed, and a pillow is placed under the popliteal fossa to relax the lower extremities and abdomen. Place the hand about 10cm in front of the face, inhale moderately through the nose, and exhale forcefully after opening the mouth. At this time, the palm can clearly feel the air flow. The patient can imagine that there is a mirror in front of him and exhale forcefully in front of the mirror. Usually training 1 - 2 times is enough.

#### b) Effective cough training

The patient takes a relaxed and comfortable position, inhales slowly and deeply for 5 or 6 times, holds the breath for 3 s at the end of inspiration, and exhales 3 times to feel the contraction of the abdominal muscles; Close the glottis and contract the abdominal muscles; quickly open the glottis, forcefully contract the abdominal muscles for 2 or 3 bursts of coughing, or press the upper abdomen with one's own hands to help the sputum cough out, followed by a sharp double cough; finally Stop coughing, pursing your lips and exhaling the rest of your breath.

#### c) Postural drainage

For patients with a lot of sputum, postural drainage is used when the condition permits. Postural drainage works by gravity to make secretions reach the bronchioles from the lobes of the lungs, and then reach the main bronchioles [5], and finally the sputum is drawn out. After evaluating the patient's lungs, the doctor determines the location of the lesion, and adopts the correct posture for drainage according to the lesion.

#### d) Physical function exercise

Correctly measure the patient's tolerance level and formulate an "individualized" activity plan, taking into account the training time, frequency, intensity, type, etc., to maximize the patient's subjective initiative. The training content includes fisting with both hands, resistance with ten fingers, arm lifting and muscle exercise, and lower limbs "bicycle" training on the bed, 3 or 4 times a day for 5 minutes each time.

### 2.3. Evaluation Indicators

On the day of discharge, members of the pulmonary rehabilitation team evaluated the incidence of pulmonary infection, average length of stay and hospitalization satisfaction.

### 2.4. Statistical Processing

The incidence of pulmonary infection and hospitalization satisfaction were expressed as rate, the comparison between groups was performed using the  $\chi^2$  test, the average hospitalization days were used as mean  $\pm$  standard deviation ( $X \pm S$ ), and the comparison between groups was performed with t test,  $P < 0.05$  is statistically different.

## 3. Results

1) The treatment group included 326 cases, and the control group included 273 cases, with no omissions.

2) Incidence of pulmonary infection: There were 12 cases of aspiration pneumonia in the treatment group (incidence rate 12/326, 3.8%), and 35 cases in the control group (incidence rate 35/273, 12.8%), the difference between the two groups was statistically significant ( $P < 0.05$ ).

3) Comparison of the average hospitalization days: the average hospitalization days in the treatment group were  $13.6 \pm 3.1$ , and the average hospitalization days in the control group were  $18.4 \pm 5.3$ . There was a statistically significant difference between the two groups ( $P < 0.05$ ).

4) Comparison of hospitalization satisfaction: the hospitalization satisfaction of rehabilitation was 98.52% in the treatment group, and the hospitalization satisfaction in the control group was 93.47%, and there was a statistically significant difference between the two groups ( $P < 0.05$ ).

#### 4. Discussion

In addition to the factors affecting the prognosis of cerebral hemorrhage, complications are also an important factor. The most important complication after cerebral hemorrhage is pulmonary infection. Pulmonary infection will not only aggravate the patient's condition, but also affect the lung function. Restricted oxygen intake further aggravates brain tissue hypoxia, which can easily lead to various organ failures. How to reduce the pulmonary infection rate of patients after cerebral hemorrhage is a challenge for nursing staff. The early implementation of pulmonary rehabilitation after stroke can prevent aspiration and hypostatic pneumonia, promote recovery, and improve quality of life. Therefore, we selected patients with cerebral hemorrhage admitted to our hospital from June 2019 to June 2021 as the research subjects to explore the preventive effect of pulmonary rehabilitation measures on their pulmonary infection.

Our bedside pulmonary rehabilitation techniques include pursed lip breathing, abdominal breathing, ACBT techniques, effective cough training, postural drainage and limb function exercises. These measures can enhance the patient's pulmonary ventilation ability, promote sputum discharge, improve the patient's respiratory symptoms, relieve respiratory muscle damage and fatigue, and effectively improve the patient's pulmonary function [6]; effectively improve the patient's cardiovascular function, increase respiratory muscle endurance, promote the muscle strength of the limbs is improved, laying the foundation for the patient's continuous exercise. Due to our effective pulmonary rehabilitation technology, compared with the control group, the pulmonary infection rate of the experimental group was significantly reduced, the average hospital stay was shortened, and the satisfaction rate was significantly improved, and it promoted the early recovery of the patients, improved the quality of life, and relieved the family and society burden.

#### 5. Conclusion

In conclusion, effective early pulmonary rehabilitation in patients with cerebral hemorrhage can significantly reduce the incidence of complications and improve clinical efficacy. Of course, we used a historical control group. Changes in hospital care methods, operating procedures or other factors during this period may have had some impact on the results. We will further adopt a prospective study in the

next step of our work to verify this.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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