

Experience of prone position ventilation in clinical nursing application

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Abstract: To understand the effect of supine ventilation in clinical nursing. Application method: 15 cases of respiratory failure and ARDS patients in ICU of our department were treated with recumbent ventilation and nursing measures in recent two years. Effect evaluation: after treatment, 12 patients showed significant improvement of symptoms, and 9 patients were successfully transferred to the department for further treatment. Conclusion: supine ventilation can improve the patient's hypoxia symptoms, increase functional residual air volume, improve ventilation blood flow ratio, reduce mediastinal and cardiac pressure on the lungs, and improve the compliance of the thoracic cavity.

Keywords: Prone position ventilation; Respiratory failure; ARDS; Clinical nursing

1. Introduction

Acute Lung Injury (ALI) and acute respiratory distress syndrome (ARDS) are acute hypoxic respiratory insufficiency directly or indirectly caused by various factors inside or outside the lung. It is mainly characterized by progressive hypoxemia and respiratory distress. The latter as a serious stage of the former. The high mortality rate has drawn much attention. Due to different etiological factors, the prevalence of ARDS is also significantly different. The prevalence of ALI/ARDS in severe is as high as 25%–50%, that in massive blood transfusion is up to 40%, that in multiple trauma is up to 11%–25%, and that in severe aspiration is up to 9%–26%. When two or three risk factors exist at the same time, the prevalence of ALI/ARDS increases further. In addition, the longer the risk factors last, higher the prevalence of ALI/ARDS is, 76%, 85% and 93% at 24, 48 and 72h, respectively. ^[1]

Prone position mechanical ventilation was first used by Bryant ^[2] in 1974, and Piehl ^[3] first reported the efficacy of prone position ventilation in respiratory failure, thus making prone position ventilation attract attention in the treatment of ARDS. Studies ^[4] have shown that the mortality of ALI/ARDS is 15%–72%, with an average mortality of 43%. As an adjuvant treatment for patients with ALI/ARDS, prone position ventilation has been applied to a certain extent in clinical practice. A meta-analysis showed that ^[5,6] prone position ventilation could improve the oxygenation index of patients. Both observational studies and randomized controlled trials ^[7] have found that 70%–80% of patients with ARDS have significantly improved oxygenation when they were in the prone position. In the case of mortality, early implementation of prone position ventilation for patients with ARDS is conducive to patient's lung rehabilitation. At present, prone position ventilation has gradually become a method for treatment of patients in ICU of most hospitals in China. Since the department was opened in April 2016, 15 patients with respiratory failure and ARDS have been treated with prone position ventilation, and most of them have achieved good results ^[8].

2. Data and Methods

2.1 General information

There are 15 patients in this group, including 13 males and 2 females. The age ranged from 19 to 88 years old, including 12 cases of ARDS and 3 cases of respiratory failure. After entering the infected breathing was assisted by ventilator, and prone position ventilation was the auxiliary treatment.

2.2 The practice of prone position ventilation

According to the patient's oxygenation index and disease progress, it is decided whether to

prone position ventilation, and the duration of each time can be determined according to the patient's tolerance and improvement of oxygenation.

Process: Generally, five people work together to complete the conversion from supine position to prone position. The first person is located at the bedside of the ventilator, responsible for proper fixation of the ventilator pipeline, head placement and password issuance; The second person is located on the left side of the bed, responsible for the lead wire of the monitor and the stomach tube; The third person is located at the end of the left bed and is responsible for observing the catheter and CRRT tube; The fourth person is located on the right bedside, responsible for placing internal jugular vein, closed thoracic drainage tube or abdominal drainage tube on this side; The fifth person is located at the end of the right bed, responsible for feet or other precautions. The distribution of personnel shall be determined according to the patient's condition and pipeline condition. **Operating steps:** the first person gives the password, and the other four people lift the patient at the same time, first move to one side of the bed, then turn the patient to lie on the side, and after giving the password, turn it to lie prone, and turn over: raise the head by about 20-30, put a soft pillow under the head, or put a horseshoe gel pad, so that the face is suspended, which can avoid the pressure of tracheal intubation and eyes. Patients' hands can be placed on both sides of their body or on both sides of their heads in parallel. Place ECG electrodes and leads on the back in the same position as in supine position.

3. Nursing

3.1 Patient Preparation

Explain to patients and their families the purpose and use of prone position, so as to reduce their anxiety and fear, better cooperate with the treatment and achieve the best treatment effect. Fully suck the secretions in the mouth, nose and trachea, stop nasal feeding for about 30 minutes before ventilation in prone position, suck back the stomach contents, and clamp the stomach tube to prevent accidental aspiration; To evaluate the sedation index of patients, appropriate muscle relaxants and sedatives can be given and observed for 10 minutes. Remove the ECG leads and electrodes, decide the direction of turning over, clamp the drainage tube, and place all the tubes on the opposite side of the bed to prevent the breathing machine tubes, deep vein tubes, monitoring wires, stomach tubes and urine tubes from falling off.

3.2 Monitoring of Vital Signs

All patients in intensive care unit have been continuously monitored by ECG monitor. It is necessary to record the vital signs, blood oxygen saturation and blood gas analysis results of patients before turning over, compare the parameters after turning over, and observe whether there is any improvement or other abnormal situation. If there is any special need, inform the doctor in time to cooperate with the emergency.

3.3 Pipeline Nursing

Check and fix the central venous catheter or peripheral venous catheter; If necessary, replace the dressing of chest and abdomen wound, tracheal intubation fixing belt or dressing of tracheotomy opening; In the process of turning over, attention should be paid to prevent the pipe from falling out. After turning over, open the clamped pipes in time, and sort out and check whether there is any displacement, distortion, emergence, etc.

3.4 Keep Respiratory Tract Unobstructed

After prone position, there are a lot of secretions escaping from the mouth and nasal cavity, so special care should be given, sputum should be sucked regularly, and the respiratory tract should be kept unobstructed, so as to effectively ventilate. Ventilation in prone position can assist mechanical sputum drainage, from bottom to top, from outside to inside, shaking the back, so as to facilitate the discharge of secretions and promote the expansion of alveoli.

3.5 Prevention of Complications

Complications include accidental catheter removal, temporary hypoxia, hypotension, facial edema,

and pressure sores. The major pressure sores include forehead, eyes, cheeks, nose and jaw, bilateral auricles, bilateral shoulders, bilateral anterior superior iliac spines, double elbow joints, patellar surface of knee joint and toes. Therefore, in order to reduce the pressure, decompression oil such as Saffron should be applied to the compressed parts, horseshoe gel pad should be placed on the head to protect the eyeball and prevent blindness, and foam dressing can be applied to other joints for decompression.

3.6 Nutritional Support

There are few literatures about nutritional support for patients in prone position, but most clinical experiments show that the gastric residual amount of patients with enteral nutrition has nothing to do with their body position, so the change of body position will not affect the patients' nasal feeding. However, long-term use of sedatives can lead to an increase in gastric retention and a decrease in intestinal peristalsis. Nursing patients should increase the frequency of monitoring gastric retention and adjust the speed and amount of enteral nutrition nasal feeding according to the actual situation of patients. It is necessary to pump back the stomach contents before turning over to avoid complications such as aspiration and suffocation caused by reflux and vomiting during turning over. In addition, jejunum tube can be retained to ensure enteral nutrition and greatly reduce reflux.

4. Results

Of the 15 patients, 11 cases were obviously improved, 9 cases were successfully transferred to other departments, 2 cases had no obvious effect on the condition, and 2 cases died due to the aggravation of the condition or family members giving up treatment.

5. Summary

5.1 Advantages of Prone Position Ventilation

Most ARDS patients have different lung damage. Due to gravity, the negative pressure from abdomen to back is gradually reduced under the influence of lung tissue, mediastinum, thorax, diaphragm and abdominal viscera in supine position, which leads to alveolar collapse in the back area leading to insufficient ventilation, and ineffective cavity ventilation is formed in the opposite chest area. In prone position, the chest pressure decreased, the lung pressure was close to the same, and the alveoli in the back area reopened. Using CT imaging technology, it was confirmed that after changing to prone position, inflammatory exudation moved to the ventral side and redistributed, alveoli collapsed in the back area re-expanded, lung capacity increased, and whole lung ventilation improved. In addition, the weight of the heart acts on the sternum in prone position, which improves the ventilation in the lung area under the heart.

5.2 Timing of Prone Ventilation

When the patient has a high concentration of oxygen, and the oxygenation index is still low after mechanical ventilation and excessive PEEP during mechanical ventilation, prone position ventilation should be considered. Other clinical research data have shown that when the oxygenation index of patients is less than 100mmHg, early application of prone position ventilation can reduce the mortality. The duration of continuous prone position ventilation should be determined according to the patient's condition, change of oxygenation index and tolerance. When the oxygenation index of patients is greater than 150-200mmH, it may be considered to stop ventilation in prone position. In case of sudden illness change or progressive decrease of oxygenation index during implementation, the prone position ventilation should be stopped immediately.

Although prone position ventilation is the first treatment that can reduce the mortality of ARDS patients, it needs further verification in the starting time, duration and ending time. At present, the attention of prone position ventilation mainly focuses on the fact that prone position can obviously improve the oxygenation index and reduce the mortality, but whether it can improve the prognosis of ARDS patients needs further verification. Moreover, complications related to prone position ventilation can not be ignored, and nurses should pay attention to it in clinical practice.

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