

Experience of Nursing and Pipeline Maintenance before and after Implantation ECMO in Patients with Acute Respiratory Distress Syndrome (A Case)

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ABSTRACT

Objective: experience in post-implantation care and pipeline maintenance in patients with acute respiratory distress syndrome. **Methods:** 2020 Admitted on 27 July 1 Cases of severe pneumonia were transferred to severe ventilator on August 6 and to critical ECMO on August 10. **Results:** after active treatment, especially for the late stage of ECMO pipeline, the vital signs of the patients improved obviously and the condition gradually stabilized. **Conclusion:** The nursing care before and after the establishment of ECMO pipeline in patients with acute respiratory distress syndrome, the matters needing attention and the working experience after the establishment, It can provide a reference for the treatment of severe infectious diseases in the future.

1. Introduction

Acute respiratory distress syndrome (ARDS) is an acute diffuse inflammatory lung injury that can lead to increased pulmonary vascular permeability, increased lung weight, and reduced lung tissue involved in ventilation. It is characterized by hypoxemia, decreased lung radiometry, intrapulmonary shunt, increased physiologically ineffective lumen, and decreased lung compliance. ARDS is one of the most common causes of acute respiratory failure.

Extracorporeal membrane oxygenation (Extracorporeal Membrane Oxygenation, ECMO) is one of the life support systems in vitro. It is used to oxygenate venous blood by artificial lung and then inject carbon dioxide

into human body^[1] ECMO can replace cardiopulmonary function.

Long patient treatment time window, for the patient's follow-up treatment to win valuable time. Severe NCP patients with effective ECMO life support, can win treatment time for patients. The nursing report of a critical NCP patient combined with ECMO treatment is as follows:

2. Clinical Data

Patients, Women, 50. Fever 2 d, Dyspnea 1 d, Admitted on 27 July 2020, 37.7°C after admission, IgG, of virus antibodies IgM positive, Nucleic acid test positive, Lung CT examination suggests multiple glazing chang-

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es in both lungs. PO₂ is 47.6 mmhg, after antiviral and symptomatic treatment, the PO₂ is still 50 mmhg body temperature is 38 degrees, so invasive mechanical ventilation. Eleven days later, Dyspnea aggravated lung CT massive consolidation in both lower lungs, The patient was in high oxygen condition, The oxygen saturation can be maintained at 92%, FiO₂ 70 mmhg more than six hours, After unanimous discussion, the standard of ECMO adjuvant therapy was met. The patient successfully underwent jugular and femoral vein catheterization on August 10, ECMO, connection Adopt VV mode. The operation was smooth, the patient's oxygen saturation rose rapidly to 100.

3. Care before ECMO Line Implantation

(1) Standard operating procedures (Standard Operating Procedure SOP) were introduced ECMO, because of the critical condition of the patients, long treatment time, and the coexistence of multiple pipelines, the ECMO nursing process is complex, many problems, difficult, at the same time less nursing experience, domestic and foreign related nursing norms, lack of procedures and other problems. Therefore, the establishment of detailed SOP ECMO adequate preparation before implantation is particularly critical.

(2) Set up a ECMO medical treatment team composed of respiratory experts, cardiologists, anesthesiologists, cardiopulmonary bypass doctors, cardiac ultrasound doctors, hemodialysis doctors and nursing staff. In the course of treatment, the medical staff and instruments are clearly positioned and divided. It greatly improves the organization and effectiveness of rescue.

(3) ECMO pre-punching of pipeline ECMO pre-punching of pipeline are speed-limiting steps and key to ECMO normal operation. Through the flow design of ECMO pipeline pre-flushing in SOP, the concrete operation steps are refined. Before starting to set the pipe, the nurse needs to complete the pipeline pre-flushing, which wins the time for the successful rescue.

(4) Pre-production ECMO patient care plan sheet. ECMO the preparation and use of patient care plan, omissions or errors can be avoided. First, the responsible nurses check the contents of the nursing plan in the plan form (see Table 1) according to the patient's condition, and fill in the start and modification time. Then each class nurse carries out the observation and nursing of the patient according to the plan. In case of abnormal situation, the nurse notifies the doctor in time. According to the implementation of nursing plan, the head nurse arranges the nurse's work as a whole to improve the efficiency of ECMO treatment.

Table 1. ECMO Pipeline Management Plan

No. No. No. No. No. No. No. No

Content of the plan	Start time	Modification time
<input type="checkbox"/> incision bleeding observation		
<input type="checkbox"/> piping fixed		
<input type="checkbox"/> speed, flow, water temperature		
<input type="checkbox"/> oxygen concentration and gas flow rate (L/min)		
<input type="checkbox"/> anticoagulant monitoring		
<input type="checkbox"/> Heparin Application		
<input type="checkbox"/> ACT monitoring Q2h (2 mL blood samples)		
<input type="checkbox"/> APTT monitoring Q4 <input type="checkbox"/> APTT 6 h		
<input type="checkbox"/> limb ischemia		
<input type="checkbox"/> dorsal artery pulsation		
<input type="checkbox"/> lower extremity skin colour, temperature and leg circumference		
Signature of nurse		
Signature and Time of Head Nurse		

(5) ECMO Alarm, troubleshooting and timely identification and handling ensure the normal operation of the ECMO and patient safety^[2]. The ECMO team summarized the common alerts as follows:

- ① Abnormal flow monitoring
- ② Abnormal pump operation
- ③ Abnormal pipe jitter

Common failures are:

- ① Centrifugal pump fault
- ② Thrombosis in centrifugal pump
- ③ Intrapulmonary thrombosis
- ④ Broken pipe/joint, loose
- ⑤ Water tank temperature anomaly

4. Care after ECMO Line Implantation

4.1 Pipeline Care

(1) ECMO pipeline management can be carried out by nurses, cardiopulmonary bypass perfusion division, respiratory therapists and other personnel, can be full-time management, but also cross-management.

(2) Fixed ECMO pipeline position, closely observe and protect arteriovenous intubation and pipeline, avoid pulling, discounting, displacement, ensure the normal operation of the ECMO.

(3) Pay attention to intubation (puncture) position bleeding.

Do not mop the floor 3.1.4 the pipe is too long.

(4) Do not inject drugs or draw blood in the ECMO system.

4.2 Basic Care for ECMO Patients

(1) The patient's comfortable posture and rest, quiet environment, reduce pain and anxiety, prevent restlessness.

(2) A certain period of time to maintain the patient's awake and normal reaction state.

(3) Prevent complications, especially bleeding, infection, pressure sores, etc.

(4) Respiratory care: regular clearance of respiratory secretions, regular oral care, maintenance of respiratory safety.

(5) In the nursing ECMO patients have greater movements such as changing posture, wipe clothes and pat back need more than 2 nursing staff cooperation, pay attention to the protection of intubation and pipe, to prevent pipe discount or patients restless pipe.

(6) Due to heparinization, avoid the establishment of new venous channels, avoid subcutaneous, intramuscular injection.

(7) ECMO skin care:

① Change of patient's posture (1-2 hours), especially protect the skin of posterior head, heel and sacrococcygeal, reduce edema and promote peripheral circulation.

② Venous access puncture dressing to keep clean.

③ Arteriovenous intubation surface regular inspection, disinfection, avoid infection, reduce bleeding.

④ Avoid new venous access.

⑤ Avoid damage to oral, respiratory and esophageal mucosa.

4.3 Monitoring of Care

(1) Important indicators and parameters related to ECMO are regularly recorded, such as turnover time, urine volume and color, body temperature, ACT value, blood oxygen saturation, hemodynamic parameters, lower extremity blood flow on the side of femoral arteriovenous catheterization, Skin color and temperature at extremities.

(2) Regularly monitor ACT and coagulation indicators, HCT、platelet count, arterial blood gas, electrolytes, and check whenever necessary.

(3) Simple ECMO equipment observation: plasma leakage of membrane lung, color change of circulating pipe, abnormal jitter of pipe, alarm of machine, alarm of anaerobic, etc.

(4) Report the abnormal situation to the ward supervisor and the perfusion doctor on duty in time.

(5) Monitoring and nursing of complications.

① Bleeding: common bleeding sites include intubation sites, surgical incisions, etc.

② Embolism: pay attention to observe whether the

affected limb is stiff, pale and swollen; dorsal foot artery pulsation; foot temperature. If there is any abnormality, report to the doctor in time.

③ Hemolysis: check the urine color and monitor the plasma free hemoglobin concentration every 4-6h, if the naked eye hematuria or dark brown urine should immediately notify the doctor; if there is hemolysis should immediately replace the oxygenator and pipeline, Plasma exchange is feasible in severe hemolysis.

4.4 ECMO Notes

(1) Maintain ACT > 150-180s, hourly monitoring ACT, ACT stable every 2-3 h monitoring.

(2) Heparin 125-200 U/h (1 12500 U heparin with 500 ml saline)

(3) Observation of the supply vessel and drainage tube, the excessive jitter of the drainage tube indicates distortion or insufficient capacity.

(4) Pay attention to observe oxygen supply.

(5) Centrifugal pump abnormal situation, first clamp centrifugal pump outlet (A), pump speed down to 1500 rpm after clamping centrifugal pump inlet end (V).

(6) Flow calibration, flow sensor reapply coupling agent, arteriovenous clamping, calibration "0".

When 3.4.7 do ACT, use a common syringe.

4. summary

ECMO is more and more widely used in patients with severe pneumonia. Fine and efficient nursing cooperation is the key to ensure ECMO diagnosis and treatment results^[3]. However ECMO in the course of treatment, there will also be a variety of complications, once occurred, will lead to a sharp deterioration of the patient's condition, mortality significantly increased. Therefore, the medical staff should master the ECMO operation technology skillfully, cooperate skillfully, observe the various parameters of the machine closely during the operation of the machine, observe the change of the patient's condition, and have the ability to find the change of the condition and give timely and emergency treatment at the same time. It is very important to strengthen personal protection and block the iatrogenic transmission of the virus. Make emergency plan in advance to ensure the normal and effective operation of the machine during treatment, avoid the occurrence of adverse events as far as possible, and pay attention to other kinds of management nursing. Close monitoring and skilled and meticulous nursing are important guarantees for ECMO successful rescue of patients with severe pneumonia.

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