



The Nursing Experience of ECMO Treatment for a Patient with Drug Poisoning after Swallowing a Large Amount of Antidepressants

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Abstract

Objective: To summarize the nursing experience of Extracorporeal Membrane Oxygenation (ECMO) in treating a patient with antidepressant poisoning.

Methods: A retrospective analysis was made on the ECMO treatment of a patient with depression after drug poisoning in 2022, and the specific measures for emergency care were summarized.

Results: The patient's consciousness of survival was weak, and the heart and lung function were seriously exhausted. The ECMO was launched late, and the final rescue of the patient was invalid.

Conclusion: The patients with severe poisoning caused by high-dose antidepressants are critically ill. After other treatment methods are ineffective, ECMO treatment can provide cardiopulmonary support for the patients. The professional ability of the ECMO medical team, the correct evaluation of the patients and the prevention of complications are the key to the success of treatment.

Keywords: Extracorporeal membrane oxygenation; Critical patients; Depression; Poisoning; Nursing

Introduction

Depression is a common mental disorder that seriously endangers the physical and mental health of individuals [1], mainly manifested as fatigue, pain, sleep disorders and other physical symptoms, while causing the affected individuals to have strong sadness and pain, unable to maintain normal work, life and labor, and has become one of the mental diseases that seriously endangers the physical and mental health of young people. Patients with depression need to rely on antidepressants for long-term maintenance treatment, but studies have found that antidepressants can be used as a way of spontaneous drug poisoning suicide in patients with depression and emotional disorders [2]. Currently, new antidepressants mainly include Selective Serotonin Reuptake Inhibitors (SSRIs) [3]. However, severe SSRIs poisoning will be manifested as seizures, rhabdomyolysis, Stevens-Johnson syndrome, and even heart failure. Currently, there is no specific antidote for SSRIs poisoning, and symptomatic and supportive treatment is mainly used to reduce the damage of drugs to the body [4]. Studies have shown that Extracorporeal Membrane Oxygenation (ECMO) can provide hemodynamic and respiratory support for poisoned patients, promote toxic metabolism or eliminate toxic substances [5]. Recent literature shows [6,7] that the utilization rate of ECMO in the treatment of acute poisoning patients has increased significantly, and the mortality rate of poisoned patients treated with ECMO is significantly lower than that of patients not treated with ECMO. Therefore, this study aims to report a case of depression patients treated with drug intoxication by ECMO, and summarize the implementation of ECMO, in order to provide reference for the treatment of a large number of patients with antidepressant drug intoxication by ECMO.

Case Presentation

General information

The patient, a 26-year-old female, was admitted to the First Clinical Affiliated Hospital of Shanxi Medical University at 16:06 on December 20th, 2022 due to "the specific time of swallowing excessive drugs (including 20 oxazepam tablets and unknown quantity of Butrin)". Upon admission, the patient had palpitation, confusion, body temperature 36.2°C, heart rate 169 times/min, breathing 22 times/min, blood pressure 122/99 mmHg (1 mmHg = 0.133 kPa), and blood Oxygen Saturation (SpO₂) of 96%. Electrocardiogram suggests sinus tachycardia. Asthma for more than 10 years and

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depression for 8 years were treated with intermittent and irregular oral oxazepam, Wellbutrin tablets (LINGYIWEI) and Escitalopram. Blood routine tests showed that white blood cells were $12.9 \times 10^9/L$, neutrophil percentage was 77.3%, red blood cells $5.84 \times 10^{12}/L$, hemoglobin 151 g/L and potassium 3.25 mmol/L. The diagnosis was drug poisoning, depression, epilepsy and hypokalemia.

Treatment and outcome

At 17:00 on December 20th, 2022, the patient developed convulsions, loss of consciousness, and blue complexion, which was considered to be caused by the toxic effects of drugs. Anti-epileptic treatment, tracheal intubation, and artificial nasal oxygen inhalation were immediately given. Consult the psychiatry department and nephrology department, and proceed with hemoperfusion + hemodialysis after family discussion; At 19:41:27, December 20th, 2022, the patient was conscious, the intermittent convulsions relieved after 3 sec to 5 sec each time, the blood pressure was 92/52 mmHg after maintenance of vasoactive drugs, and the light reflex disappeared. The patient once again told the patient's family that the patient's condition was critical, the prognosis was poor, the current vital signs were unstable, and cardiac arrest might occur at any time; At 20:14 on December 20th, 2022, the patient's heart rate dropped to 38 beats/min, blood pressure was 78/36 mmHg, bilateral pupil dilation was fixed, and emergency treatment was immediately given with continuous external chest compression, atropine, dopamine, epinephrine, norepinephrine, isoproterenol and other drugs. At 22:12 on December 20th, 2022, the patient had intermittent ventricular fibrillation and was given electric defibrillation, continuous chest compression, epinephrine and other drugs. At 22:24, December 20th, 2022, conservative treatment could not maintain the patient's vital signs, and the intensive care department recommended ECMO support treatment immediately after consultation; December 21st, 2022 02:00:27 patient's vital signs are untenable; At 02:15, December 21st, 2022, the rescue was stopped with the consent of the family, the electrocardiogram was in a straight line, and the doctor declared the patient dead.

Nursing Measures

Care for gastric lavage

For Selective Serotonin (SSIRs) reuptake inhibitors, moderate doses cause mild or asymptomatic toxic reactions, while large doses cause severe seizures, electrocardiogram changes, and decreased consciousness may occur [8]. The patient underwent gastric lavage immediately after admission. Before gastric lavage, the patient's condition, vital signs, state of consciousness, and whether there are contraindications to gastric lavage were assessed, and the purpose, precautions, methods, and coordination points of gastric lavage were explained to the patient and his family. In this case, automatic gastric lavage machine was used for gastric lavage: SC-II automatic gastric lavage machine was selected to check the good performance of the instrument, and various pipes were connected. The patient was assisted in lying on the left side, the front end of the gastric tube was lubricated with paraffin oil, and the tube was placed gently. After implantation, the gastric tube was verified by air-through hydroacoustic method, and the gastric tube was finally placed about 55 cm, the patient's stomach was washed with water at 36°C. About 12,000 ml of gastric lavage fluid, properly fixed, start gastric lavage. During gastric lavage, the vital signs of patients were closely observed until the effluent was clear and odorless.

Care at ECMO

At 22:24 on December 20th, 2022, the patient could not maintain the vital signs of the patient after conservative treatment. After consultation with the department of intensive care medicine, it was suggested that ECMO treatment was feasible, and the patient's family members were told about the critical condition, treatment feasibility and risks. The family members signed informed consent for ECMO support treatment. Before treatment, doctors in the ECMO team had carried out relevant examinations and assessments on the patient, pre-filled the pipeline with heparin saline in advance, and performed left femoral static and femoral artery puncture catheterization guided by ultrasound at the bedside. During the whole process, ECG monitoring was continued, skin disinfection was strictly performed, and puncture points were located by bedside ultrasound. Finally, left femoral vein 45 cm and left femoral artery 15 cm were placed. The initial blood flow was 0.5 L/min, which was gradually adjusted to 2.0 L/min. The skin temperature, color and peripheral blood flow of the patient's left lower limb was observed.

Vital sign monitoring: During ECMO, closely observe the changes of patients' vital signs: (1) Continuously monitor the changes of patients' body temperature [9,10]: Low body temperature will lead to coagulation dysfunction, metabolic dysfunction, cardiovascular dysfunction, and aggravate the disease; Excessive body temperature will cause increased myocardial oxygen consumption and increase the body burden. In this case, the temperature of the ECMO water tank was adjusted to 37°C and the patient's body temperature was maintained at 36°C to 37°C. (2) Closely monitor changes in heart rate and blood pressure [11]: Due to the low blood pressure caused by the initial operation of ECMO, blood dilution, and the release of inflammatory factors, the average arterial pressure of adults should be maintained at 50 mmHg to 60 mmHg. If the blood pressure continues to decrease, vasoactive drugs can be used to maintain blood pressure according to the doctor's advice. The patient's heart rate was 40 beats/min to 60 beats/min during ECMO treatment. (3) Keep the patient's respiratory tract free [12]: In this case, the patient was assisted by mechanical ventilation with ventilator parameters set as VC-SIMV, tidal volume 400 ml, respiratory rate 20 times/min, pressure support 10 cmH₂O, PEEP 5 cmH₂O, oxygen absorption concentration 100%, blood gas analysis was performed regularly, and PaCO₂ 35 mmHg to 45 mmHg was maintained. SpO₂ is 85% to 90%. (4) Pay close attention to the changes in the patient's nervous system, such as consciousness, pupil, nerve reflex, etc., which are closely related to the changes in the patient's condition.

Pipeline care: Due to the critical condition of the patient, there are many pipelines in the rescue, which is easy to cause accidental disconnection and other abnormal pipeline problems. Therefore, the focus of pipeline care is to avoid disconnection: (1) The joint joints of the pipeline should be closely connected and properly fixed, and the precision equipment such as pump and membrane lung should be sorted out and properly placed aside; when replacing the lying position for the patient, carefully check the pipeline, pay attention to whether there is entanglement and knot, and restrain and calm the patient if necessary to prevent the pipeline from breaking free accidentally; (2) Avoid air entering the pipeline: Strictly check whether the pipe joints and collateral are tightly connected, and whether there is leakage, blood seepage, bubbles, etc.; At the same time, the membrane lung device should be placed lower than the patient to ensure that the air pressure at the membrane lung is less than the blood pressure on the other side. (3) Keep the pipeline unobstructed: regularly check

whether the pipeline is folded, twisted, compressed, blocked, and whether the pipeline is thrombosis. If the pipeline is abnormal, it should be handled in time [13].

Anticoagulant care: During ECMO treatment, blood is exposed to the non-physiological surface of the ECMO machine circuit, and its mechanical force is prone to activate platelets, causing thrombosis and bleeding [14,15]. Relevant guidelines point out that [16] ECMO should be treated with continuous systemic anticoagulant therapy, and when conditions permit, it is recommended to continuously pump heparin (dose 4 U/(kg·h), speed 4-30 U/(kg·h)) in a single channel, in order to reduce the risk of thrombosis and bleeding. In this case, the patient was treated with heparin for anticoagulant therapy, while platelet count was monitored to maintain platelets not less than $50 \times 10^9/L$, Active Coagulation Time (ACT) was 180s to 200s, and heparin dose was adjusted in time according to ACT. Closely observe the bleeding at the puncture point of the patient, extend the pressing time >5 min after the puncture, and reduce unnecessary puncture. At the same time, observe whether the patient's mouth, nasal cavity, skin mucosa and other bleeding points and bleeding tendency.

Anti-infection nursing: ECMO treatment, as an invasive procedure, is prone to infection [17]. (1) Due to the serious condition of ECMO patients, they need to be assisted by ventilators for a long time, and the entry of foreign bodies such as tracheal intubation and tracheotomy is easy to cause bacterial growth, leading to respiratory infection and respiratory camera-associated pneumonia; (2) Multiple vessel intubation during ECMO treatment resulted in increased risk of blood infection; (3) The use of central venous catheter, tracheal intubation, catheter, etc. at the same time to give a large number of antibiotics to prevent bacterial infection, easy to cause fungal infection; (4) The more serious the condition of the patient, the longer the ECMO treatment time, and the greater the trauma to the skin caused by various types of catheter indentation, which is easy to cause skin infection. (1) Therefore, in order to control infection to the maximum extent, nursing staff should be familiar with ECMO related intubation treatment knowledge, strictly abide by aseptic operation norms during catheter placement, use of medical devices must reach the level of sterilization, timely change the sterile gauze covered by the puncture point after catheter placement, and strictly disinfect the hand. (2) After transfusion, blood products and fat emulsion, the infusion pipeline should be replaced in time, and the tube should be flushed with normal saline or heparin to prevent thrombosis; (3) When the patient is suspected to have related infection or phlebitis, the pipeline should be removed and replaced in time; (4) Do a good job of disinfection and sterilization of bed units, wards, instruments and equipment every day, and do a good job of basic care of patients' mouth, skin, urethra and so on.

Complication nursing

Hemorrhage: Studies have shown that bleeding is the most common complication during ECMO treatment [18,19]. The systemic inflammatory response caused by respiratory failure and heart failure will lead to the disorder of blood clotting mechanism; Platelet and coagulation factors in the blood activate and accumulate on the non-physiological surface of the ECMO pathway, which will also increase the bleeding tendency of patients. At the same time, some intubation complications also easily cause local hemostasis difficulties. Therefore, during ECMO treatment, unnecessary invasive procedures should be avoided, heparin anticoagulant therapy should be used rationally, ACT and platelet function should be monitored in

time, and coagulation status of the body should be assessed.

Central nervous system complications: Studies have shown that the damage of the central nervous system is one of the important reasons for the failure of ECMO treatment [20,21]. During ECMO treatment, emboli such as air, blood clot and foreign body may enter the patient's systemic circulation through intubation, causing vascular embolism and thus irreversible brain tissue injury. Blood dilution and non-physiological circulation of ECMO can also lead to chronic hypoxic brain injury. Therefore, the blood oxygen saturation of patients should be closely observed during ECMO treatment to correct hypoxemia in time and maintain effective tissue perfusion. Timely monitor the ACT and platelet function status of patients, and report the abnormal situation to the doctor for treatment; At the same time, the changes of the patient's nervous system were closely observed, the central nervous function of the patient was timely evaluated, and the abnormal nervous system was detected early and targeted.

Pulmonary inflammatory complications: Patients with ECMO are in critical condition and usually use ventilators to assist mechanical ventilation. However, due to prolonged assisted breathing, or patients are often sedate, airway secretions such as a large amount of sputum are easily produced, leading to lung infection [22]. Therefore, patients should be helped to clear airway secretions in time, regularly turn over for patients, sputum aspiration, and reduce the accumulation of airway foreign bodies.

Air embolism: Air embolism is likely to cause circulatory failure and multiple organ ischemia and hypoxia, ultimately leading to sudden death [23,24]. During the operation of ECMO, poor drainage or the folding of the drainage tube will lead to increased negative pressure at the venous end, or excessive oxygenation will cause excessive partial pressure of PaO_2 , resulting in the release of small air embolism from the blood, resulting in serious air embolism, which will endanger the life of patients. Therefore, it is necessary to regularly check the ECMO pipeline situation, closely observe the drainage situation, and fully exhaust the gas entering the ECMO before resuming the machine operation.

Psychological nursing

Most drug poisoning patients are due to emotional disorders or their own cannot think and take poison. In the process of treatment, family members can be allowed to accompany the patient, give the patient care and support, stimulate the patient's desire to survive, while the medical staff should take the initiative to communicate with the patient's family, understand the patient's medical history and give the family psychological comfort, so as to facilitate the smooth progress of the rescue process.

Analysis of Causes of Death

The patient had severe depressive symptoms and visited the mental health department of our hospital from 2018 to 2022 for several times, and her mental state was poor on normal days. After drug poisoning, the patient was not sent to the gastric lavage in time, a large amount of poison had been absorbed, the cardiopulmonary function was seriously failed, and the consciousness of saving life was weak. At the same time, due to the late time on the ECMO machine, the urgency of rescue, and the insufficient preparation before operation, the patient may miss the best time for rescue and other situations and rescue failure.

Discussion

In this case, the patient was intoxicated by large-dose antidepressant drugs, complicated with epilepsy, hypokalemia, lactic acidosis and other symptoms. The onset was acute, the condition was critical and the progress was rapid, and the patient's cardiopulmonary function was serious. The treatment of ECMO was relatively complicated, which required high professional requirements for the team members. Nurses play an important role in the ECMO team, and they should be routinely trained in professional knowledge and skills. In the course of treatment, nurses should fully assess the condition of patients, improve various nursing measures, closely observe the changes in the condition, and deal with the symptoms, so as to promote the discharge of poisons and reduce the occurrence of complications. At the same time, we should also do a good job of psychological care for patients and their families, strengthen humanistic care, give patients and their families confidence in the rescue process, improve the survival consciousness of patients, reduce tension and anxiety, in order to achieve the ideal treatment effect.

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