

Continuous blood purification in patients with pheochromocytoma crisis: A case report

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INTRODUCTION

Pheochromocytoma, arising from the chromaffin cells of the adrenal medulla, can cause excessive catecholamines secretion and trigger pheochromocytoma crisis, characterized by high mortality rate up to 13%¹. Pheochromocytoma crisis induced catecholaminergic cardiomyopathy may lead to multiple organ system damage or dysfunction, myocardial infarction, acute left ventricular failure, cardiogenic shock, and other fatal outcomes, commonly in undiagnosed or well-controlled pheochromocytoma². Surgical resection is the primary treatment; however, the instability of perioperative hemodynamics poses a high risk of anesthesia and poses great challenges in treatment³. Currently, research on the diagnosis, treatment, and nursing care of such patients is mainly based on case reports. Venous-arterial extracorporeal membrane oxygenation (VA-ECMO) has been reported to stabilize circulation and extend the surgical window for patients with severe myocardial injury or circulatory failure⁴. In June 2021, we successfully treated a patient with pheochromocytoma presenting with cardiogenic shock as the first manifestation of multiple organ failure. This case report presents our experience in diagnosis, treatment, and nursing care of pheochromocytoma with various severe complications.

CASE PRESENTATION

Case data

A previously healthy 32-year-old woman experienced a sudden choking cough while eating ice cream on May 8, 2021, which caused progressive chest tightness, shortness of breath, and dyspnea. This patient was diagnosed with severe pneumonia, acute left heart failure, cardiogenic shock, and giant pheochromocytoma (Figure 1). Initial treatment in local hospital included tracheal intubation, VA-ECMO combined with CRRT treatment, α -blockers (phentolamine), β -blockers (propranolol), and other support care. After 10 days of treatment, the left ventricular EF increased from 8% to 67%, and ECMO support was withdrawn. Right femoral vein vascular repair was performed (Figure 2), and CRRT was reserved, while the patient developed sepsis. The patient was then transferred to our hospital on June 3 for further treatment. Subsequent treatment at our hospital involved anti-infection, anti-heart failure, volume expansion, CRRT, phentolamine, propranolol, lyophilized recombinant human brain natriuretic peptide, and morphine, alongside meticulous wound care. CRRT treatment was suspended on June 9. On June 15, patient was transferred to the general ward for further preparation, but experienced another pheochromocytoma crisis during the bumpy transfer, resulting in multiple organ failure and malignant arrhythmia. Prompt intervention including nasal high-flux oxygen therapy, CRRT, and other treatments stabilized patient's condition. On June 18, laparoscopic left adrenal giant pheochromocytoma resection was successfully performed under general anesthesia with CRRT support. Postoperatively, the patient exhibited favorable wounds healing, significant reduction in plasma catecholamine metabolites to nearly normal level, and was subsequently discharged. All treatments described were administered with the patient's informed consent. During a six-months follow-up, the patient remained asymptomatic, with normal hormone levels.

CRRT treatment strategy

The patient underwent dialysis catheter insertion via the internal jugular vein. Continuous blood purification was conducted using Prismaflex (Gambro, Jinbao, Sweden). The supporting hemodialysis filter and the hemofiltration replacement base fluid was provided by Chengdu Qingshan Likang Pharmaceutical Co.,Ltd., National Medicine Zhunzi H20080452. The treatment was set to continuous venous-venous hemodiafiltration mode (CVVHDF) at a rate of 25-45 ml/kg/h, with a blood flow rate of 120-150 ml/min. Citric acid anticoagulation for CRRT was administered during June 4-9 at a dose of 180-220 ml/h, adjusted based on the serum calcium levels. On June 15, due to impaired liver function and D-dimer exceeding 20ug/ml, the anticoagulation method was switched to low molecular weight heparin sodium at a dose of 0.4 ml every 8 hours. Surgical intervention was performed on June 18 without anticoagulation to reduce bleeding risk. The efficacy of CRRT treatments were recorded in Table 1-3.

DISCUSSION

This patient experienced cardiogenic shock due to pheochromocytoma crisis. Early administration of ECMO treatment in the local hospital with other subsequent treatments were crucial in saving the patient's life and improving their survival rate. Unfortunately, ECMO had to be discontinued because of secondary severe bloodstream infection, possibly caused by emergency catheterization. To address this, CRRT was used as it has demonstrated effectiveness in removing toxins and inflammatory mediators, regulating internal environment and improving circulatory function in cases of multiple traumas and acute kidney injury⁵. Given the high technical requirements, cost, and patient limitation associated with ECMO, CRRT was continued even after the patient was transferred to our hospital. The results in Table 1 show that prolonged CRRT treatment gradually decreased norepinephrine level in the patient's body. In this case report, CRRT effectively eliminated catecholamines metabolites. However, the patient developed sepsis, along with toxins and inflammatory cytokines in the circulation. During the acute attack, the patient experienced heart, liver, and kidney damaged, leading to circulatory failure, hemodynamic fluctuations, and inflammatory cytokine secretion. Table 2-3 reveals a rapid onset of acid-base imbalance in the internal environment. After the CRRT treatment, the patient's serum sodium, potassium, electrolyte ions, pH, as well as heart, liver, and kidney function gradually improved. Those improvements may be attributed to the removal of toxins, inhibition of the patient's inflammatory response, and gradually elimination of catecholamines, related substances, and their metabolites.

CONCLUSION

CRRT can be able to effectively eliminate catecholamines and their byproducts from plasma as well as promote hemodynamic stability in patients. It notably enhances heart, liver, and kidney functions, reduces inflammatory cytokine levels; and extends therapeutic window for patients.

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Footnotes :Availability of data and material:The data and pictures designed in this case report can be found in the information system of the Third Affiliated Hospital of Sun Yat-Sen University and the Jinyu Institutional Inspection Report.

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