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Case Report

Anesthesia management of surgery for sigmoid perforation and acute peritonitis patient following heart transplantation: case report

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Abstract: Here we described a case in which a patient underwent emergency laparotomy for acute peritonitis and sigmoid perforation under general anesthesia with a history of heart transplantation. A good knowledge in the physiology of the transplanted heart is critical for effective and safe general anesthesia. We chose etomidate that have a weaker impact on cardiovascular function plus propofol for induction, and propofol plus cisatracurium for maintenance with intermittently analgesics and vasoactive drugs to facilitate the anesthesia. In addition, fluid input, electrolyte and acid-base balance were well adjusted during the whole procedure. The patient was in good condition after the surgery. In this case report we are aiming to provide some guidance for those scheduled for non-cardiac surgery after heart transplant.

Keywords: Anesthesia management, heart transplantation, sigmoid perforation, acute peritonitis patient

Introduction

Over the past 40 years, almost 85,000 heart transplantation (HT) surgeries have been performed worldwide [1]. Heart transplantation provides a second life opportunity for numerous patients suffering from end-stage heart diseases. Abdominal complications like colon perforations in organ transplant recipients are common. Early-onset colon perforations occurs secondary to increased intraluminal pressure from narcotics, perioperative hypoperfusion, high-dose immunosuppressant, whereas late-stage perforations are usually associated with invasive fungal or viral colonic disease and acute diverticulitis [2-5]. With the emerging of symptoms such as acute peritonitis, emergency laparotomy is the appropriate way for definite diagnosis and treatment [5-8]. Admittedly, for these patients needing surgical intervention, the physiology of the transplanted heart and the effect of immunosuppressant agents require consideration for effective and safe management of general anesthesia. Here, we report a case of general anesthesia management for non-transplant surgery in patient suffering from sigmoid perforation and acute peritonitis following heart transplantation.

Case report

A 52-year old man checked in the Department of Cardiology of our hospital with complaints of 2-days of consistent chest distress, over ten-year asthma and over one-year diarrhea accompanied by fatigue in July 8, 2014. His medical history included dilated cardiomyopathy (DM), heart transplantation, colonitis, IV period of chronic renal disease, severe anemia, drug-induced hypothyroidism, chronic hepatitis B and gout.

The pathology report of bone marrow showed that proliferate level of bone marrow was decreased. Doppler echocardiography exhibited enlargement of left atrial and left ventricular diastolic dysfunction. Intraperitoneal echocardiography showed intra-abdominal fluid. Blood counts showed that neutrophil percentage was higher than normal while erythrocyte and hemoglobin decreased. The patient began to appear severe abdominal pain with signs of peritonitis

on August 24, and he was transported to District 8B for emergency laparotomy.

In the operating room, the patient was subject to left radial artery catheterization under local anesthesia and oxygen saturation. Noninvasive blood pressure, electrocardiogram (ECG) and urinary catheter were monitored with oxygen intake. The initial vital signs were listed below: BP 119/85 mmHg; HR 103 bpm; SPO_2 96%. Arterial blood gas showed: PH 7.43; PCO_2 26 mmHg; PO_2 175 mmHg; Na^+ 127 mmol/L; K^+ 3.4 mmol/L; Ca^{2+} 1.08 mmol/L; Glu 10.2 mmol/L; Lac 1.0 mmol/L; Hct 26%; BE -7.0 mmol/L; Hb 8.6 g/L. ECG showed sinus tachycardia of 103 bpm and incomplete right bundle branch block. Rapid induction of general anesthesia for intubation was conducted with midazolam 2 mg, fentanyl 0.2 mg, etomidate 10 mg, 1% propofol 60 mg, ephedrine 5 mg and vecuronium 8 mg. After intubation, another shot of fentanyl 0.2 mg and midazolam 2 mg were given. Continuous infusion of 2% propofol 4-8 mg/kg/h and cisatracurium 10 mg/h intraoperative, with intermittent bolus of fentanyl, dopamine and phenylephrine were performed to maintain the depth of anesthesia and hemodynamic. The patient was steady during the surgery; arterial blood gas index was intermittent obtained to ensure the electrolyte balance and hemoglobin. The total amounts of intraoperative transfusion were LPRC 400 ml, plasma 200 ml, lactated ringer's solution 500 ml, succinylated gelatin 500 ml, and $NaHCO_3$ solution 500 ml. Sigmoid perforation and acute peritonitis were finally confirmed, and sigmoid colon resection and sigmoid colostomy were performed which lasted four hours and twenty minutes. The total urine output was 950 ml and blood loss was 200 ml.

After the surgery, the patient was safely transferred to the Intensive Care Unit (ICU) to receive further treatment and later extubated after fully awake. With a follow-up in August 27 in ICU, he was conscious and in good condition without complaints of pain or vomiting. Vital signs were as follows: body temperature 36.5°C, BP 145/90 mmHg, HR 103 bpm, SPO_2 maintained at 96% by nasal oxygen 1-2 L/min.

Discussion

Recently, HT has been increasingly considered as a reliable option for treatment of end-stage heart failure and congenital heart disease (CHD) with a 5.5 years overall median survival following heart-lung transplantation [9]. The post-transplantation complications were mainly resulted from existing vascular diseases, acute rejection or infection, immunosuppression and chronic use of hormones, some of which often need operations to be solved [10, 11].

Colon perforations is a common post-transplantation complication which occurs resulted from perioperative hypoperfusion, high-dose immunosuppressant, invasive fungal or viral colonic disease and other Influence factors [2-5]. Acute colonic perforation can quickly lead to severe abdominal contamination which soon developed into a severe diffuse peritonitis. It results in a large number of body fluid extravasations and high fever, which induce severe dehydration and electrolyte or acid-base imbalance. Furthermore, absorption of toxins can even lead to septic shock. Given these, when acute peritonitis appears, emergency laparotomy is the appropriate way for definite diagnosis and treatment [5-8]. Before surgery we are supposed to maintain fluid balance, correct the acidosis and restore the effective circulating blood volume based on the electrolyte and circulatory function status. Application of corticosteroids will improve microcirculation perfusion and maintain cell function. Naloxone, dopamine and dobutamine and other drugs also have a role in the reversal of shock. In addition, it is recommended to give the right amount of adjuvant drugs to control visceral reaction before probing into the abdomen. Attention should be paid to the synergistic adverse reactions (such as breathing delayed recovery) of muscle relaxants with streptomycin, neomycin, kanamycin or polymyxin and others. Multiple clean of colon hydrotherapy is required, so the changes in blood volume and serum potassium should be noted.

Before general anesthesia, a full review of patient's general status, medications and the physiology of transplanted heart must be considered. As we know, transplanted heart loses the original neural connections, and sympathetic nervous system could gradually re-dominate the heart over time, while not the parasympathetic nervous system. The basic rate of heart after transplantation is faster, but the cardiac pacing and conduction function are

normal. Frank-Starling mechanism increases the stroke volume and blood catecholamine speeds up the heart rate [12]. The increased extent of cardiac output of the denervated heart is limited when suffered from the stress from surgery and anesthesia, so adequate blood pressure and SPO_2 should be maintained in these patients in order to ensure the supply of oxygen. Moreover, the transplanted heart is more prone to atherosclerosis and cardiac ischemia. We should carefully assess the patient's activity and athletic ability, and perform the echocardiography and catheterization to evaluate the potential cardiovascular diseases which manifests as cardiac dysfunction, arrhythmias and other symptoms. 12-lead ECG can help to detect the presence of a plurality of P-wave and right bundle branch block. Chest X-Ray and related LAB are also needed.

At first, anesthesia induction is the most challenging stage in the entire anesthesia process. In principle, we should avoid the use of myocardial depression drug and ensure adequate oxygen supply and sufficient coronary perfusion pressure. Because of possible long-term use of immunosuppressive agents, strict aseptic is required. If necessary, IBP should be obtained and the right internal jugular vein be reserved for the heart muscle biopsy if possible.

During the entire anesthesia procedure, blood pressure of the patients should be maintained through expansion of blood volume or using potent vasoactive drugs if a sudden drop of blood pressure occurs. Drugs acting through the autonomic nervous system such as atropine and digoxin are invalid, while those directly acting on the heart are available. Isoproterenol can be used to increase the heart rate, while norepinephrineand phenylephrine for blood pressure maintenance. Adrenergic receptor density may increase with its functions uncompromised.

In this case, we used etomidate and propofol for rapid anesthesia induction without hemodynamic instability. In addition, ephedrine was used to avoid significant blood pressure decline. Neuromuscular blocker Vecuronium Bromide was appropriate for muscle relaxation and intubation. In the maintenance phase, propofol plus cisatracurium were continuous infused and intermittent bolus fentanyl and vasoactive drugs dopamine or phenylephrine to facilitate optimal hemodynamic stability. Because our patient had a history of heart transplantation with a limited cardiac decompensation function, additional attention should be paid to the management of fluid and vasoactive drugs, including the inputs of blood products, colloid and crystalloid. Moreover, blood gas analysis was carried out intermitted to adjust the fluid electrolyte and acid-base balance and maintain the hemoglobin within a relative normal level.

With the increase of patients receiving heart transplantation, those who need general anesthesia for non-cardiac surgery are also climbing. A scrutinous assessment of patient's preoperative basis status and well-prepared vasoactive drugs are required. The anesthesia should start with small doses to minimize the negative effect, maintain the normal heart rate and intravascular volume to avoid the decrease of systemic vascular resistance to ensure the stability of hemodynamic and airway ventilation during the induction and maintenance periods. In addition, reduced risk of infection resulting from the narcotic operations, appropriate antibiotics may be needed during the surgery. The patients must be closely monitored after being transferred to the Intensive Care Unit (ICU) after surgery.

Disclosure of conflict of interest

None.

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