

Case Report

Anesthetic Management for Non-Cardiac Surgery in an Adult with Uncorrected Tetralogy of Fallot and Interatrial Defect

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Abstract

Anesthetic management of patient with uncorrected tetralogy of Fallot is a major challenge, especially in developing countries. In these countries, congenital heart diseases are often diagnosed when complications occur. Diagnostic and treatment equipments and medicines are not easily available. We present a case of 30 years old male adult who was scheduled for elective surgical repair of left femoral fracture. He presented with 3 months history of a neglected femoral fracture, associated with language disorder, right hemiparesia due to cerebral abscess and severe hypoxia. During pre anesthetic check-up, an assessment with echocardiography diagnosed a tetralogy of Fallot with interatrial defect. A multidisciplinary discussion involving cardiologists, trauma surgeons, intensivists, anesthesiologists was held. Patient was successfully operated under general anesthesia. After 24 hours of post operative intensive care, he was shifted to the trauma and orthopedics ward and discharged from hospital on 22nd post operative day.

INTRODUCTION

Tetralogy of Fallot is a congenital cardiac disease that consists of combination of four abnormalities: ventricular septal defect, aortic overriding, pulmonary stenosis and right ventricular hypertrophy [1]. It is the most common cyanotic congenital cardiac disease, accounting for 7–10% of all congenital cardiac diseases [2]. In developed countries, congenital cardiac diseases are early diagnosed and repaired [3]. More than 85% of patients reach adulthood [2]. However, in many developing countries, there still delays in diagnosis and treatment [4].

Anesthetic management in tetralogy of Fallot is often described in patients with known cardiac disease [5-8]. In this paper, we report a rare case of adult patient with unknown tetralogy of Fallot who was scheduled for a major surgical procedure of femoral fracture. We obtained approval of hospital's ethics committee and patient's daughter to make this report.

CASE REPORT

A 30 years old motorcycle taxi driver presented for pre

anesthetic check-up on July 2016. He was hospitalized in trauma and orthopedics department of Sylvanus Olympio University Hospital of Lomé for 1 week. He had 3 months history of a neglected left femoral diaphysis fracture, with large vicious callus.

Patient history revealed complaints of stress dyspnea since he was ten 10 years and that were considered as asthma without medical reports. His physical examination showed normal consciousness, aphasia and right hemiparesia. His weight was 52 kg, blood pressure at 110/70 mm Hg, heart rate at 96 beats/minute, respiratory rate at 17/minute and SPO₂ between 65 and 70% on room air. He had a central cyanosis, grade 4 long midsystolic murmur at all sites, clubbing of fingers and toes.

Brain computed tomography revealed a left capsulo-lenticular cerebral abscess. ECG showed a normal sinus rhythm with tachycardia and biventricular hypertrophy. Haemoglobin and haematocrit were increased: 22 g/dl and 68.5% respectively. Arterial blood gases showed severe hypoxemia (PO₂ = 33.3 mm Hg, SO₂=62.1%), hypercarbia (PCO₂ = 48.5 mm Hg), normal pH

(7.39) and serum bicarbonate (28,6mmol/l). Transthoracic echocardiography diagnosed a tetralogy of Fallot with interatrial defect (Figure 1). The infundibular flow was increased (mean pressure gradient 58 mm Hg and maximal pressure gradient 84 mm Hg) with low right-left shunt. The systolic ventricular function was normal. Patient was accorded American Society of Anesthesiologists grade risk class 4 (ASA 4) and general anesthesia was planned. He was given intravenous antibiotics for the brain abscess (ceftriaxone 2 g daily and ciprofloxacin 200 mg twice a day). He was seen by the cardiologist and received beta-blocker (propranolol 20 mg daily). Surgery was performed 2 weeks later. Three preoperative normovolemic hemodilution sessions were performed, decreasing the haematocrit to 61.5%. Each session consisted in removing 300 ml of patient's blood and replacing with 100 ml of normal saline solution, 100 ml of 10% glucose solution, 50 ml of bicarbonate solution and 50ml of allogeneic fresh frozen plasma.

During pre operative fasting period, a peripheral venous catheter (16 gauges) was inserted and patient was given lactated ringer (150 ml/hour).

In operating theatre, a double lumen central venous catheter was inserted into the left subclavian vein. Standard monitoring was started. It included electrocardiogram, pulse oxymetry, non invasive blood pressure (NIBP) and partial end-tidal carbon dioxide pressure (PetCO₂). Prior induction, vital signs were: NIBP 132/80 mm Hg, heart rate 71 beats/minute, respiratory rate 15/minute and SpO₂ 73%; improved to 86% after pre-oxygenation.

Anesthesia was induced with intravenous (IV) fentanyl 150 µg, midazolam 5 mg and etomidate 20 mg. Patient was intubated after rocuronium 30 mg was given. A Foley urinary catheter was used to monitor urine output. Ceftriaxone 2g and tranexamic acid 1 g were given after induction. Anesthesia was maintained with continuous infusion of midazolam (8 to 10 mg/hour), inhaled isoflurane (minimum alveolar concentration 0.2-0.6),

intermittent bolus doses of rocuronium (10 mg) and fentanyl (50 µg). An IV infusion of phenylephrine was implemented. Patient was ventilated with 100% oxygen at a rate of 15-20/minute depending on his Pet CO₂. Per operative vital signs variations were recorded: heart rate 51-96 bpm (mean=69.4 ± 9.2), SPO₂=54%-99% (mean=85.7 ± 10), systolic arterial pressure 79-150 mm Hg (mean=119 ± 12), mean arterial pressure 61-121 mm Hg (mean=94.2 ± 9), diastolic arterial pressure 51-108 mm Hg (mean=81.9 ± 8.9). Hypoxia, hypotension, bradycardia and haemorrhage were the main peroperative complications. Diuresis was 2200 ml. Blood loss was estimated at 1200 ml and replaced with normal saline serum 1.5 liter, lactated ringer 1 liter, gelofusine 1 liter, 2 units of fresh frozen plasma and 1 unit of red blood cell. Surgery lasted for 4 hours and 15 minutes. At the end of the surgery, patient still required phenylephrine and ventilation. He was shifted to intensive care unit (ICU). Post-operative care in ICU included mechanical ventilation, multimodal analgesia (paracetamol 1 g/6 hours, nefopam 20 mg/6 hours, tramadol 100 mg/8 hours and ketoprofen 100 mg/12 hours), phenylephrine and midazolam infusion, fluid expansion with 1 liter of gelofusine and transfusion of 4 packed red blood cells units. He was given one liter of normal saline serum and one liter of glucose solution with electrolytes daily, antibiotic prophylaxis (ceftriaxone 2 g daily) and low molecular weight heparin (4000 IU/day). Four hours post operatively, patient was stable without phenylephrine, and was extubated when fully awake. He was then shifted to the trauma and orthopedics ward 24 hours later. Post operative haemoglobin and haematocrit were 13.8 g/dl and 36.2% respectively. He was successfully discharged from the hospital on 22nd post operative day with appointment for follow-up in the trauma and cardiology departments.

DISCUSSION

The physiopathology of tetralogy of Fallot associates an increased right ventricle postload and an intracardiac right-left

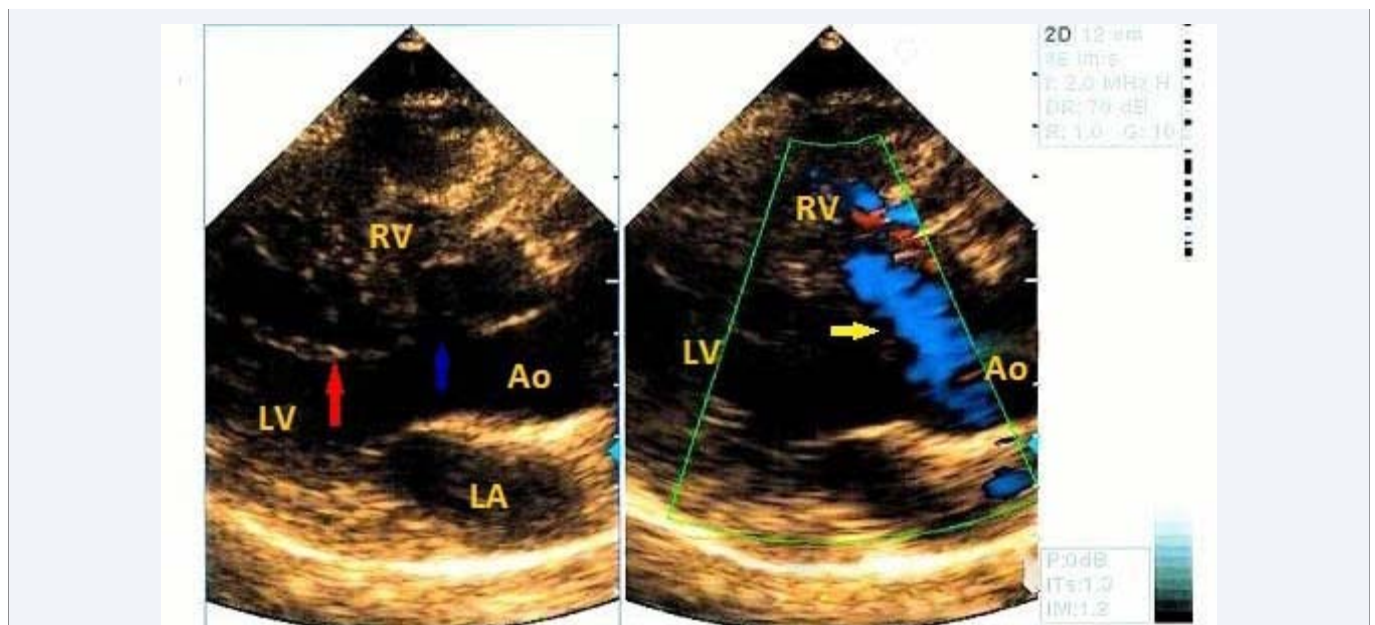


Figure 1 Transthoracic echocardiography image. Ventricular septum (red arrow), ventricular septal defect (blue arrow), right-left shunt (yellow arrow).

Abbreviations: AO: Aorta, LA: Left atrium, LV: Left ventricle, RV: right ventricle with a thickened wall.

shunt. It results in a decreased pulmonary artery flow, chronic hypoxemia, hypercarbia, respiratory alkalosis and cyanosis, polycythemia and hyperventilation. Complications include cardiac arrhythmias; right and left heart failure, venous and arterial thrombosis, infections (endocarditis and cerebral abscess) and hypercyanotic spell [9]. The association with an atrial septum defect leads to a clinical form also called pentalogy of Fallot [10]. In this reported case, patient had complication such as cerebral abscess. In developing countries such as ours, delays in diagnosis of these diseases are related to the lack or difficult access to qualified health care.

Anesthetic management of patient with uncorrected tetralogy of Fallot must respect an imperative: prevention of worsening right-left shunt. Therefore, anesthetic techniques should prevent dehydration; avoid decreasing systemic vascular resistance and increasing pulmonary vascular resistance [11]. Although polycythemia improves tissue oxygenation, it is at risk of vascular thrombosis and stroke [9,11]. We performed normovolemic hemodilution in order to reduce it and prevent its complications. Palliative surgery could improve hemostasis, but no cardiac surgery was available in Togo and patient had no financial capability for medical transfer.

Peripheral nerve blocks are preferred when applicable. Neuroaxial anesthesia techniques are not suitable, especially in single dose spinal anesthesia due to sympathetic system block with decrease in systemic vascular resistance and reflex tachycardia. In our case, surgery was potentially haemorrhagic and patient presented with cerebral abscess and hemiparesia. Therefore neuroaxial anesthesia was not recommended. General anesthesia was the preferred technique. Using safe anesthetic agents and doses, and suitable ventilation, general anesthesia had advantage of allowing better maintenance of hemodynamic stability, airway control, better hemostasis and respiratory monitoring [11,12]. Etomidate was the most appropriate hypnotic drug. Ketamine could also be used at hypnotic dose of 1–2 mg/kg IV without significant changes in heart rate and pulmonary arterial pressure [11,12]. Opioids and benzodiazepines such as fentanyl and midazolam provide sedation and amnesia with excellent hemodynamic stability. Dexmedetomidine is potentially useful as induction and maintenance agent for general anesthesia [7,8]. As patient was not in a stable hemodynamia, propofol was not suitable. We used midazolam and low isoflurane concentrations to maintain anesthesia and thus to minimize its effect on systemic vascular resistance. Hemodynamic shock was related to the effect of anesthetic drugs and especially to hypovolemia induced by bleeding due to important bony callus. Phenylephrine increases systemic vascular resistance without tachycardia. Thus, it was preferred to maintain hemodynamia. Post-operative resuscitation aimed to improve hemodynamia and hemostasis and observe patient. All complications were prevented by medication, and then patient was early stable and shifted to the ward.

CONCLUSION

Tetralogy of Fallot is a congenital cyanogenic heart disease

that is a challenge for anesthetist. General anesthesia is the best suitable anesthetic technique in instable patient. Etomidate, ketamine, midazolam are the most appropriate anesthetic drugs in our area. Vasopressors infusion improves hemodynamic stability. If available, dexmedetomidine and noradrenalin would allow better management of this kind of patient.

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