



Anesthetic Management for a Parturient With Calcified Subaortic Membrane and Pulmonary Hypertension Undergoing Cesarean Delivery: A Case Report

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Abstract

Physiological changes in the cardiovascular system during pregnancy present unique problems to the parturient with underlying heart disease. Anesthetic management for cesarean delivery in parturient with subaortic stenosis and pulmonary hypertension is a challenging task. Both general and regional anesthesia has been used and both have significant risks. In this report we describe the anesthetic management of a parturient having calcified subaortic membrane with pulmonary hypertension requiring elective cesarean delivery under general anesthesia.

Keywords: Cesarean delivery; Subaortic stenosis; Pulmonary hypertension; General anesthesia

Introduction

Pregnancy is associated with significant cardiovascular changes [1], which in the setting of underlying maternal cardiac disease is a leading cause of non-obstetric maternal mortality [2]. Subvalvular aortic stenosis is accounting for 14% of left ventricular outflow tract obstruction [3]. Pulmonary hypertension due to left-sided heart disease is secondary to left ventricular systolic dysfunction, left ventricular diastolic dysfunction, or valvular heart disease [4]. In this case report we describe the anesthetic management of a parturient with Calcified Subaortic Membrane and pulmonary hypertension requiring elective Cesarean delivery under general anesthesia.

Report

A 39 year old female, primigravida with a height of 161cm and a weight of 85kg (BMI=32.81 kg/m²) with a known history of epilepsy and complex congenital heart disease. Previous medical records revealed that patient was diagnosed as a case

of Ventricular septal defect (VSD) and subaortic membrane on bisoprolol 2.5mg tablet once daily and levetiracetam one gram every 12 hours for epilepsy. The patient was submitted for open heart midline sternotomy for VSD closure and subaortic membrane resection.

The patient was presented to the maternity hospital for antenatal care and was first seen in obstetric clinic by 8 weeks. She was referred to cardiology clinic for assessment by cardiologist expertise in the care of women with heart disease in pregnancy. The cardiologist assessment put the patient in a high risk group and the possible need for extracorporeal membrane oxygenation (ECMO) or opens heart emergency surgery. The physicians recommended low molecular weight heparin once-a-day dosing throughout the entire pregnancy. The patient was advised by obstetrician and cardiologist about the risk of continues the pregnancy and she choose to continue pregnancy and agreed to take the risk.

Anesthesia services were only involved in the third trimester, the patient was presented to the anesthesia clinic for preoperative evaluation and preparation for elective cesarean delivery with 36 weeks of gestation. Clinical Assessment of the patient revealed she was New York Heart Association (NYHA) Functional Classification II with dyspnoea during exertion, regular pulse rate 88/min, blood pressure (BP) 150/80mmHg, respiratory rate (RR) 20/min and bilateral lower limb edema. On chest auscultation systolic and diastolic murmur was heard over the base and chest radiograph showed enlargement of the main pulmonary artery and its major branches. The electrocardiogram showed right bundle branch block with right ventricular hypertrophy. Non-enhanced CT scan showed a mosaic pattern of variable attenuation compatible with irregular pulmonary perfusion. Haematological and biochemical investigations were within normal limits. Follow up echocardiography revealed, mild

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dilatation of the left ventricle, mild dilated left atrium, calcified discrete subaortic membrane very close to the aortic valve (AV) which looks also calcified with restricted opening, moderate aortic regurge (AR) and severe left ventricular outflow tract pressure gradient across membrane (LVOTO-MPG) 76 mmHg with mild pulmonary hypertension (PASP) 50mmHg.

After multidisciplinary approach from anesthesiologist, cardiologist, obstetrician and interventional cardiologist, the decision was elective cesarean delivery at 37 weeks of gestation in the cardiac centre theatre. By 36 weeks gestation, the patient was admitted to cardiology ward of the cardiac centre for preoperative optimization of cardiac condition. Five days later she presented in labour with rupture of membranes. The obstetrician planned an urgent cesarean delivery in view of foetal distress.

Anesthetic Management: Sodium Citrate 30ml oral, 10mg metoclopramide IV and 50mg Zantac IV was given 30 minutes preoperative. Upon arrival to the theatre, the parturient was connected to five-lead ECG, non-invasive blood pressure, pulse oximetry, bispectral index and defibrillation pads. Intravenous access was secured with two 18-gauge cannulae. Right radial artery 20-gauge cannula was inserted for invasive monitoring of arterial blood pressure. Right internal jugular triple lumen central line was inserted under ultrasound guided. Preoxygenation for 3 minutes and modified rapid sequence induction with IV midazolam 2 mg, fentanyl 150 microgram, etomidate 20mg and 100mg succinylcholine with cricoid pressure then cuffed endotracheal tube size 7 was inserted by glidescope. The interventional cardiologist then inserted the ECMO lines sheath in the femoral artery and femoral vein under ultrasound guided. Anesthesia was maintained by sevoflurane and cisatracurium. The patient received 10 units' oxytocin slow intravenous infusion and one litre Ringer's lactate. Furosemide 20mg IV was give after delivery of the baby. She was hemodynamically stable and did not need inotropic or vasopressor support. The patient was extubated on table after reversal of muscle relaxant by neostigmine and glycopyrolate then she was shifted to coronary care unit for close observation. Blood loss was about 800ml and urine output was 300ml. The neonatologist was informed preoperative that we will use fentanyl and midazolam. Apgar scores of the baby were 8 at 1 min and 10 at 5 min.

Postoperative care: The patient was monitored in coronary care unit for 48 hours. Intravenous morphine was administered through patient controlled analgesia (PCA). Six hours postoperative, the patient was connected to non-invasive mechanical ventilation (CPAP) and furosemide 10 mg IV was given due to hypoxemia (SaO_2 84%) as she went to pulmonary edema. Next day she was weaned from CPAP mask and shifted to the ward, then discharged home after 4 days.

Discussion

Changes in the cardiovascular system during pregnancy to meet the increase in the metabolic demands of the mother, and the foetus present unique problems to the parturient with underlying heart disease [5]. Congenital obstruction of the left

ventricular outflow tract (LVOT) can be caused by subvalvular, valvular, or supra valvular lesions [6]. Subvalvular aortic stenosis presents as a membranous or fibromuscular ring below the aortic valve, either in isolation or in association with other congenital anomalies such as ventricular septal defect [7]. There is a substantial recurrence rate among patients who have undergone surgical resection of the membranous subaortic stenosis [8].

Pulmonary hypertension is secondary to elevated left ventricular end diastolic pressure (LVEDP), and/or left atrial pressures, which is transmitted to the pulmonary vasculature, raising pulmonary artery pressure (PAP)[9]. In many cases not just the surgeon and the anesthesiologist is involved but consultation is required from cardiologists, obstetricians, psychiatrists, neurologists or other specialists. It is therefore essential to form a multidisciplinary team for antenatal care to ensure safe practice. The cardiac surgery team in such cases is present during the cesarean delivery and may take over in case of an emergency [10].

The principles for managing subvalvular LV outflow tract obstruction are the same as those for valvular aortic stenosis (AS) [11]. All symptomatic patients with severe AS or asymptomatic patients with impaired LV function or a pathological exercise test should be counselled against pregnancy, and surgery should be performed pre-pregnancy [12]. In severe symptomatic AS, cesarean delivery should be preferred [13]. Pregnancy in PAH patients is a high-risk condition and a proactive approach should be taken to commencing advanced therapies. Therefore, the recommendation to avoid pregnancy remains and, when pregnancy occurs, termination should be discussed [11].

Several studies show that cesarean delivery is performed more often in women with heart disease than in a healthy population [14]. The peripartum period constitutes an extra risk, since during and after delivery cardiac demand increases due to uterus contractions, anxiety, pushing, autotransfusion of the contracting uterus post-delivery, and blood loss [15].

Anesthetic management for cesarean delivery in parturient with subaortic stenosis and pulmonary hypertension is a challenging task. Both general and regional anesthesia has been used and both have significant risks. Adequate cardiovascular invasive monitoring is essential and should be maintained in the postpartum period with the same criteria that reduce morbidity and mortality in cardiac patients undergoing general surgery [16].

The goals of anesthetic management are avoidance of myocardial depression, maintaining normovolemia, avoiding overdose of drugs during induction as the circulation time is slow and to avoid sudden hypotension when regional anesthesia is the choice [17]. Hypotension reduces coronary blood flow and results in myocardial ischemia and further deterioration in left ventricular function and cardiac output. Aggressive treatment of hypotension is mandatory to prevent cardiogenic shock and/or cardiac arrest. Cardiopulmonary resuscitation is unlikely to be effective in patients with aortic stenosis because it is difficult, if not impossible, to create an adequate stroke volume across a stenotic aortic valve with cardiac compression [18].



General anesthesia is often selected in preference to epidural or spinal anesthesia because the sympathetic blockade produced by regional anesthesia can lead to significant hypotension [19]. Anesthetic management during the perioperative period is based on the likely effects of drug induced changes in cardiac rhythm, heart rate, preload, afterload, myocardial contractility, systemic blood pressure, systemic vascular resistance and pulmonary vascular resistance relative to the pathophysiology of the heart disease [20].

Induction of anesthesia can be with an intravenous induction drug that does not decrease the systemic vascular resistance. An opioid may be useful if left ventricular function is compromised. Maintenance of anesthesia with a combination of volatile anesthetic and opioid or by opioid alone [21]. Maintenance of anesthesia with opioids alone in high doses is recommended for patients with marked left ventricular dysfunction. Neuromuscular blocking drugs with minimal hemodynamic effects are best used. Intravascular volume should be maintained at normal levels [22].

A detailed delivery plan, including the optimal mode and timing of delivery, should be decided by the pregnancy heart team. This should include the post-partum need for intensive care and mechanical support. Patients remain at high risk for many months post-delivery and individualized counselling is needed to discuss the need for on-going therapies and the avoidance of future pregnancies [11].

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