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CASE REPORT

ANESTHESIA FOR CAESAREAN SECTION IN A PATIENT WITH PULMONARY HYPERTENSION AFTER CORRECTED COMPLEX HEART DEFECT

Karadjova D[1], Sivevski A[1], Mehmedovikj N[2], Kjaev I[1], Naumovska R[1], Kochovski G[1]

[1]University Clinic for Gynecology and Obstetrics, Skopje, Republic of North Macedonia
[2]University Clinic of State Cardiac Surgery

Abstract

Advances in medicine, especially in the treatment of congenital heart disease, are making it possible for many women with severe congenital heart disease to reach childbearing age and, of course, if they want to become pregnant and become mothers.

3-10% of those registered with congenital heart disease will develop pulmonary hypertension, which is always a poor prognostic sign and has particularly high mortality and morbidity, especially when undergoing operative treatment and anesthesia.

We present a case of successful anesthetic management for the caesarean section in a patient with pulmonary hypertension after a complex congenital heart defect corrected in childhood. The anesthesiology approach is always challenging and requires an individual and multidisciplinary approach to each individual patient.

***Keywords**: anesthetic approach; caesarean section; pulmonary hypertension.*

Introduction

Nowadays, in obstetric's anesthesia, we meet more and more often patients who have cardiac diseases, patients who have undergone heart surgery, and who receive complex cardiac therapy.

Although in the developed world, the number of severe congenital heart diseases (CHD) is decreasing as a result of modern screening and consequent termination of pregnancy, the overall prevalence of patients with CHD is increasing, primarily as a result of modern surgical and technological development, so more than 90% of patients with CHD will now become adults, and many women will reach reproductive age and become pregnant[1].

But these conditions are associated tocomplications during pregnancy and childbirth and are one of the main causes of maternal morbidity and mortality.

Concomitant heart disease is the most common cause of non-obstetric morbidity and mortality in pregnant patients, accounting for 26.5% of all pregnancy deaths[2].

3-10% of patients with congenital heart disease develop pulmonary hypertension[3].

We present a case of successful anesthetic management for the cesarean section in a patient with pulmonary hypertension after congenital complex heart defect corrected in childhood.

Case Presenatation

A 34-years-old parturient, with first pregnancy, in 37thweek of gestation, cameatour clinic for labor and delivery.

The patient was born with dextrocardia, situs inversus and transposition of great blood vessels. At the age of 1, the patient underwent her first operation, the ASD and VSD were closed, and at the age of 24, the second RVOT-PA Conduit operation was performed. RVOT-PA Conduit is a surgical procedure in which the right heart is connected to the pulmonary artery through a conduit graft, while a different type of pulmonary valve is implanted. The second operation is the most frequent late operation in the treatment of congenital heart disease.

From the second operation until pregnancy, the patient subjectively feltwell, regularly wentfor check-ups, and didnot take any therapy.

During pregnancy, especially in the third trimester, the patient began to complain of shortness of breath and fatigue. Due to slightly elevated blood pressure, the patient received Methyl-Dopa 250mg every 8 hours and anticoagulant therapy every 12 hours. Before admission to the hospital, new cardiology and ultrasound examinationswereperformed.

To be able to assess the risk of cardiac complications in the mother during pregnancy, the best way is to use modified World Health Organization (mWHO) classification. This classification is currently the most accurate risk assessment system, and according to this scale, the patient was assessed as mWHO II/III.

Ultrasound examination showed a normal left ventricle, with orderly contractility and ejection fraction greater than 60%, normal left and right atrium; enlarged right ventricle; moderate mitral and tricuspid regurgitation. A conduit and a bioprostheticwere visualized on the pulmonary valve. A pulmonary arterial hypertension (PAH), that has not been registered before was registered, namely the mean pulmonary arterial pressure of (mPAP) 50mmHg.

Uponthe recommendation of a cardiologist, the patient was scheduled for an elective caesarean section.

On admission, the patient's blood pressure was 138/92, heart rate 98/min, saturation 98%. BMI is 26kg/m^2, Malampati 1. Antibiotic prophylaxis was given before entering the operating room. Gastroprotective and antiemetic prophylaxis werealso given. Anticoagulant therapy, therapeutic doses, was stopped 24 hours before. The patient was advised to drink clear liquids for up to 3 hours preoperatively.

Standard monitoring was set for the patient upon entering the operating room. Two large 16G cannulas were placed in a peripheral vein. In terms of hemodynamic parameters, shehad a normal heart rate of 84/min, mild hypertension of 146/92, normal saturation of 97% without an oxygen mask. 500ml of co-hydration was started with saline, and the phenylephrine solution was ready. For anesthesia, we decided on low dose spinal (low doses of Bupivacaine, with Fentanyl

and Morphine) in combination with general endotracheal anesthesia. 3mg isobaric Bupivacaine combined with 20mcg Fentanyl and 100mcg Morphine was applied at the L_3-L_4 level with a 27G Pencan needle. Our goal was to have good analgesia, but without the hemodynamic effect of spinal anesthesia. Before the induction of general anesthesia, Lidocaine 2% 1mg/kg and 50 micrograms of fentanyl were given. Preoxygenation with 100% O_2, slow induction with 2mg/kg Propofol, 20mg Ketamine, 1mg/kg Leptosuccinwas applied to the patient. Anesthesia was maintained with oxygen/air mixture at 50:50, sevoflurane and rocuronium 0.5mg/kg starting dose, with top-ups if needed.

The patient was stable during induction, and after induction low doses of phenylephrine were released continuously. A live newborn with Apgar 8/9 was delivered, 3mg Oxytocin was given as a bolus, 17mg was allowed to flow continuously at a rate of 5IU per hour. 10mg of furosemide was given immediately after extraction, delivery of the neonate (to prevent an increase in right atrial preload as a result of autotransfusion), and 10mg was given at the end of the intervention. The patient received a total of 1,000ml of crystalloids, had a total of 300ml of diuresis and 300ml of blood loss. Intraoperatively the patient received 100 micrograms of fentanyl, 50 micrograms before induction and 50 micrograms after the extraction of the baby. Postoperatively the patient received paracetamol and NSAIDs, double antibiotic therapy, anticoagulant therapy. The patient was cardiocirculatory stable all the time, with good diuresis, without pain. The mother and child were discharged home in stable general condition.

Discussion

Physiological changes that occur during pregnancy and childbirth are very specific and their understanding is very important to be able to predict all the complications that may occur in the peripartum period, as well as to determine the appropriate anesthetic technique, appropriate monitoring to minimize those complications and to provide the best care forthe patient.

Pulmonary hypertension (PH) is an important prognostic factor in patients with CHD, especially in pregnancy. It is defined as an increase in mean pulmonary arterial pressure PAP ≥20mmHg at rest[4]. It appears slightly more often in women and increases with biological age, as well as with the age when the defect is corrected. In terms of severity, it is divided into mild (20-40mmHg), moderate (40-55mmHg) and severe form (>55mmHg) of PH.

In pulmonary hypertension, the main component is elevated pulmonary vascular resistance. Because of this, the pressure in the right ventricle increases, and thus the work of the right ventricle. On the other hand, left ventricular output decreases. Therefore, it is very important to maintain the right ventricular filling, to maintain myocardial contractility, but also not to have excessive right ventricular preload because it can lead to right heart failure and arrhythmias. And thus, to maintain the output of the left ventricle. The goals of anesthesiologic management focus primarily on avoiding an increase in pulmonary vascular resistance, maintaining systemic vascular resistance, ensuring right ventricular preload and left ventricular afterload. Hypoxia, hypercarbia, acidosis, hypothermia and pain should be avoided and prevented.

The choice of anesthesia is a very important and delicate matter. Both general and regional anesthesia have been described in patients with pulmonary hypertension, each has its own disadvantages and advantages.

However, in relation to the little evidence we have from the literature, which are mostly case reports, no randomized controlled trials, epidural analgesia is recommended either alone gradually titrated with slow gradual administration of low doses or in combination with low-dose spinal anesthesia. The advantages of this type of anesthesia are reduced sympathetic activity and pain control, gradual onset of neuraxial block with the possibility of better maintenance of preload and afterload[6].

With respect to spinal anesthesia, neuraxial sympathetic blockade leads to a significant reduction in systemic vascular resistance, further preload can be reduced, and systemic hypotension, sometimes life-threatening can occur. That is why its use is debatable, in many recommendations it is even contraindicated[5,7].

And, of course, general anesthesia is occasionally required for cesarean delivery in patients with high-risk cardiovascular diseases. It is recommended in patients who require airway control, who require transesophageal echocardiography intraoperatively, who are on anticoagulant therapy and in whom the regional anesthesia is contraindicated. The advantage of ventilation control is primarily to prevent hypoxia and hypercarbia that precipitate an increase in pulmonary vascular resistance. On the other hand, the main disadvantages of general anesthesia are increased intrathoracic pressure and increased PVR. What is recommended during induction of general anesthesia is preoxygenation with 100% oxygen, slow, titrated induction, opioid or lidocaine to reduce the sympathetic response to intubation. It is important to note that during the induction of anesthesia, maintenance of hemodynamic stability is the most important and has priority over the risk of aspiration or neonatal sedation. During anesthesia, FIO_2>0.6, avoidance of NO_2 (increase PVR), hyperventilation, lung protective ventilation (Tv 6-8ml/kg) is recommended.

Comparedtoepidural anesthesia, general anesthesia is associated with increased mortality. Bedard et al. in their systematic review included all cases of pulmonary hypertension of various etiologies between 1997 and 2007 and compared them torelevant data published between 1978 and 1996. The review concluded that overall maternal mortality was significantly reduced and that the parturients who received general anesthesia were at greater risk of death, but the difference was not statistically significant.

We managed our parturient under low-dose spinal anesthesia with low doses of local anesthetic, but in combination with a short-acting and long-acting opioid. In this way, we obtained excellent analgesia, with an insignificant hemodynamic effect. Induction of general anesthesia was gradual and slow, with good preoxygenation. Fentanyl was given to reduce the stress response to intubation. General anesthesia remains a possible, even desirable, technique in many high-risk patients.

Conclusion

Patients with pulmonary hypertension have big morbidity and mortality risk. Anesthetic approach and management should be adapted individually to each patient. Slow titrated epidural analgesia or low dose combined spinal-epidural anesthesia is recommended. No conclusions can be drawn from this case report, but still it showed that cesarean sections can sometimes be performed under low dose single shot spinal combined with general anesthesia.

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