

CASE REPORT

Anesthesia for elective cesarean section in a patient with congenital acyanotic heart disease

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SUMMARY

We report a case of a pregnant lady with a ventricular septal defect (VSD) of 6 mm size and moderate pregnancy induced hypertension (PAH), with 34 weeks gestation, admitted to our hospital for delivery. She was prepared for Cesarean section under epidural anesthesia. Due to failure of epidural technique, we had to carry out the procedure under spinal anesthesia using 1.5 ml of 0.5% inj. bupivacaine heavy with 25 µg fentanyl. Ampicillin and gentamicin were administered for prophylaxis against bacterial endocarditis. Hypotension was treated with bolus doses of injection phenylephrine 100 µg along with titrated infusion of intravenous Ringer's lactate solution. Patient was monitored in PACU for 6 hour and then shifted to HDU. The recovery was satisfactory and postoperative stay was uneventful.

Key words: Ventricular septal defect; Cesarean section; Epidural anesthesia; Bacterial endocarditis

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INTRODUCTION

The prevalence of cardiac diseases in pregnancy has remained relatively constant over the past decades and ranges from 0.4-4.1%.¹ Pregnant patient with heart disease is a unique challenge to the obstetrician and the anesthesiologist, dealing with high-risk parturients and requires a thorough understanding of the impact of pregnancy on the hemodynamic response to the patient's cardiac lesion. VSD is one of the common congenital heart defects, and is present in 1.5 to 2.5 of 1000 women with a pregnancy resulting in a live birth.² An isolated VSD is usually well tolerated during pregnancy, but it may occasionally be associated with arrhythmias and congestive heart failure. A large reduction in blood pressure, which may occur either during or after delivery or anesthesia, can reverse the direction of shunt. We describe the successful management of a patient with small ventricular septal defect presented for Cesarean section.

CASE REPORT

A twenty-three years old primigravida with history of congenital cardiac disease was admitted in the hospital

for safe confinement of pregnancy and delivery after 34 weeks gestation.

Since childhood patient had recurrent episodes of breathlessness on exertion (NYHA grade-2) with palpitation and recurrent episodes of respiratory tract infections. Five years back she had few episodes of severe breathlessness during sleep for which she consulted a physician, was investigated and subsequently was diagnosed to be suffering from a ventricular septal defect. One and half year back she presented to our hospital with history of gradually worsening breathlessness. Echocardiography revealed ventricular septal defect of 6 mm size with left to right shunt and moderate pulmonary hypertension (right ventricular systolic pressure-50 mmHg) and moderate tricuspid regurgitation with preserved left ventricular systolic function (LVEF-65%). She was under regular treatment with injection benzathine penicillin 1.2G every 3 weeks, tablet furosemide 20 mg with spironolactone 50 mg once daily and tablet digoxin 0.125 µg daily. The course of this pregnancy had been uneventful.

On examination, the patient was thin build with height of 158 cm and weight 48 kg. Lying in left

lateral position she had pulse rate 76 per minute, blood pressure 110/70 mm Hg, respiratory rate 20 per minute and oxygen saturation was 99% with oxygen flow of 6 liters per minute by face mask. The jugular venous pressure and carotid pulse were normal. There was no pallor, clubbing, pedal edema, icterus, lymphadenopathy or cyanosis and chest was bilaterally clear. The cardiac examination demonstrated no heave or thrill. On auscultation there was a grade 3/6 holosystolic murmur at the apex and left sternal border with no diastolic murmur. The patient's respiratory and neurological examinations showed normal results. Electrocardiogram showed poor progression of 'R' wave in V1-V3 leads with mild left axis deviation. Chest x-ray obtained after abdominal shielding was unremarkable. Preoperative investigations of the patient, including a hemogram, renal and liver function tests, coagulation profile and ultrasonography of the kidney-ureter-bladder, were within normal limits. The cardiologist advised her to continue with pregnancy, regular antenatal checkup, oxygen therapy and antibiotic coverage during labour.

It was decided to deliver the baby by Cesarean section using epidural anesthesia. In the operating room the patient continued to receive oxygen by facemask; ECG leads and pulse oximeter were attached for continuous monitoring. An 18G intravenous cannula was inserted and secured in left forearm vein. The baseline parameters were pulse rate: 70 min⁻¹, BP: 110/76 mm Hg and SpO₂ 98% on oxygen by facemask. Ampicillin and gentamicin were administered for prophylaxis against bacterial endocarditis. With patient in left lateral position, epidural needle 18G was inserted in L3-4 interspace observing aseptic precautions after local infiltration of skin with 2% lignocaine. Epidural space was located with loss of resistance to saline technique. Skin to epidural space distance was 3 cm. Careful aspiration was done through epidural catheter, which turned out to be positive for blood. The catheter with the needle was then removed, replaced in L2-3 interspace and again found to be positive for blood. Due to positive aspirate, we then opted for spinal anesthesia which was performed in L4-5 interspace after preloading with 250 ml of Ringer's lactate solution. We injected 1.5 ml of 0.5% bupivacaine heavy and 25 microgram fentanyl into L4-5 interspace. Patient developed hypotension (a fall of more than 25% of the baseline level) at 5 min after institution of spinal anesthesia and three more occasions, and it was successfully treated with bolus doses of injection phenylephrine 100 µg and titrated intravenous Ringer's lactate solution. A 2.6 kg baby was delivered with Apgar score of 8, 9 and 10 at 1, 5 and 10 minute respectively. Subsequently drip of

oxytocin 10 units in 500 ml of crystalloid was infused at a rate of 8-10 drops/min. After surgery, the patient was shifted to post anesthesia care unit for continuous hemodynamic and SpO₂ monitoring with oxygen via a face mask. After 6 hours she was shifted from PACU to HDU. Subsequent recovery was uneventful and satisfactory.

DISCUSSION

During a normal pregnancy, parturients undergo dramatic physiological changes in multiple organ systems. Changes in the cardiovascular system include decreased systemic vascular resistance (SVR), increased blood volume, and increased cardiac output secondary to increased heart rate and stroke volume. Major hemodynamic alterations occur during pregnancy, labor, and delivery and the postpartum period. In patients with preexisting cardiac disease, cardiac decompensation often coincides with this peak. Cardiovascular stress during pregnancy, labor, delivery and the post delivery period may induce different degrees of cardiac failure in cardiac patient; while concomitant cardiac medication may interfere with the anesthetic management.³

Young women with isolated VSD usually tolerate pregnancy well if the shunt is small to moderate and if pulmonary artery pressures are normal.⁴ It is unusual for women with such left to right shunts to develop pulmonary hypertension during the childbearing age; however, the presence of pulmonary hypertension due to a left to right shunt substantially increases the risk of complications during pregnancy. Problems like arrhythmias, ventricular dysfunction and progression of pulmonary hypertension occur in patients with shunts and/or pre-existing pulmonary hypertension.⁵

VSD is a common form of congenital heart disease. Unlike ASD, the majority will undergo spontaneous closure: 40% by the age of 2 years and 90% by the age of 10 years.⁶ The extent of shunting depends on the relative resistance of the pulmonary and systemic vascular beds and the size of the defect. If the defect is small, there is only a minimal increase in pulmonary blood flow. Large defects on the other hand are associated with equalization of ventricular pressures and initially a marked increase in pulmonary blood flow consequent on the low resistance of the pulmonary circulation. With time, pulmonary vascular resistance (PVR) starts to rise, accompanied by a reduction in shunt flow and, if left untreated, Eisenmenger's physiology will develop. Moderate shunts may increase if SVR increases due to pain and catecholamine release. If there is a large drop in SVR (e.g. following spinal block) then the shunt

may reverse in direction and may result in hypoxia. Patients with a small restrictive VSD who have a normal PVR have an excellent prognosis⁷ albeit with a considerable risk of endocarditis and the development of Eisenmenger's syndrome and hypoxaemia.⁸ Our patient had a ventricular septal defect of 6mm size with left to right shunt and moderate pulmonary hypertension (right ventricular systolic pressure-50mmHg) and the risks were moderately high.

In patients who have had pulmonary hypertension, significant problems can develop in the perioperative period even if they are undergoing non-cardiac surgery. The aim of the management of these patients is to avoid factors that predispose to pulmonary hypertension and to reverse any reversible factors like acidosis, hypercapnia, hypoxia etc. Therefore, we opted for regional anesthesia in our patient, because of the risk of alteration in pulmonary blood flow.

Major threat with use of regional anesthesia is reduction in systemic vascular resistance and reversal of left to right shunt, which may results in hypoxia. Thus in our patient we planned for epidural anesthesia, but as epidural anesthesia failed we had to opt for spinal anesthesia. In the management of Cesarian section of a patient with VSD with moderate PAH using spinal anesthesia, the primary goal is to minimize a fall in SVR and avoiding hypoxemia. Keeping in mind that spinal anesthesia may induce severe decrease in systemic

vascular resistance and reversal of left to right shunting of blood, we prepared injection phenylephrine in concentration of 100 µg/ml and used it as required.

When anesthetizing patients with congenital heart disease, under either a regional technique or general anesthesia, the following factors must be kept in mind; prevention of accidental intravenous infusion of air bubbles by using loss of resistance to saline rather than air to identify the epidural space⁹, a slow onset of epidural analgesia is useful, as rapid fall in SVR could result in reversal of shunt with maternal hypoxaemia. Supplemental O₂ should be given to the patient throughout the procedure if regional technique is used. It is advisable to monitor O₂ saturation as mild hypoxaemia may result in an increase in PVR and reversal of shunt flow. Although our patient had moderate pulmonary hypertension with VSD, we performed spinal anesthesia using bupivacaine and fentanyl after the failure of epidural anesthesia. We successfully treated the fall in SVR by using injection phenylephrine, which also prevents any reversal of left to right shunt and or any hypoxaemia.

CONCLUSION

Careful preanesthetic evaluation of the cardiac patients, a well thought of plan of anesthesia and adequate preparation would help us in the conduct of a safe anesthesia.

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