

Case Report

Anaesthetic management of a patient with severe aortic stenosis for caesarean section: a case report

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Received: 03 August 2015

Accepted: 03 September 2015

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ABSTRACT

Aortic stenosis (AS) is an uncommon valvular heart disease presenting during pregnancy. Mild to moderate AS is associated with favorable pregnancy outcome but severe AS can worsen the hemodynamics during the peripartum period and precipitate heart failure, pulmonary edema, thus carrying significant maternal and fetal morbidity and mortality. Percutaneous balloon valvuloplasty can be used as a palliative procedure that allows for completion of pregnancy before definitive repair. We present a case of severe AS posted for caesarean section who was successfully managed under general anaesthesia and had an uneventful recovery.

Keywords: Aortic stenosis, Caesarean section, General anaesthesia

INTRODUCTION

Pregnancy and its associated changes in cardiovascular physiology present a unique challenge in a woman with underlying valvular heart disease. Mitral stenosis of rheumatic etiology continues to be the most common valvular heart disease in pregnant woman. Aortic valve is affected only during the later stages of the disease along with the other valves.

Aortic stenosis in pregnancy is very rare and the most common cause is a congenital bicuspid aortic valve. Bicuspid aortic valve, the most common congenital heart defect, occurs in 0.5-2% of the population with a male predisposition.¹ Bicuspid aortic valve is associated with accelerated and premature valve stenosis as well as regurgitation. The severity of aortic stenosis affects maternal risk during pregnancy. Mild and moderate aortic stenosis are associated with favorable pregnancy outcomes.^{2,3} Woman with severe aortic stenosis

experience frequent cardiac complications during pregnancy and peripartum period which include worsening dyspnea, pulmonary edema, congestive heart failure and arrhythmias.¹

CASE REPORT

A 23 year old primigravida, with 38 weeks of gestational age was admitted with history of pain abdomen and mucoid discharge. She was a known case of aortic stenosis and was asymptomatic and not on any medications at the time of admission.

Patient was diagnosed with bicuspid aortic valve and aortic stenosis at the age of 8 years. Although patient was advised surgery at the time of diagnosis, she underwent balloon aortic valvotomy only 10 years later owing to financial constraints. Five years later she conceived and was on regular follow up with cardiologist; balloon aortic valvotomy was planned in case of worsening symptoms.

Cardiologist's opinion was sought and labor was induced for this patient but failure to progress and worsening dyspnoea prompted the obstetrician to take up the patient for emergency caesarean section. On pre-anaesthetic evaluation, she was found to be breathless in propped up position (New York Heart Association class 4). Patient's vitals record showed a pulse rate of 110/min, blood pressure of 106/60 mm Hg, respiratory rate of 30/min. On auscultation, ejection systolic murmur of grade IV was heard all over the precordium and conducted to the carotids. She also had basal crepitations.

Her routine blood investigations were within normal limits. The ECG showed sinus rhythm with left axis deviation. Echocardiography showed severe AS (aortic valve area 0.8 cm) with mild AR, peak pressure gradient - 88.7 mmHg, mean pressure gradient - 48.6 mmHg, PASP - 37 mmHg, jet velocity of 4.36 m/sec and a good left ventricular function.

Patient was posted for emergency caesarean section after obtaining high risk consent and ICU ventilator bed was arranged as back up for both mother and the newborn. She had received injections (Inj.) cefazolin, ranitidine and metoclopramide intravenously (IV) in the ward. In the operating room, ECG and pulse oximeter were connected and radial artery cannulated for invasive blood pressure monitoring. Patient was pre-oxygenated with 100% oxygen in propped up position for 3 minutes and premedicated with inj. ondansetron 4 mg. Rapid sequence induction was performed with inj. fentanyl 100 microgram (mcg), thiopentone 50 mg and succinylcholine 100 mg IV while applying cricoid pressure. The patient was intubated with a 7.5 mm size oral cuffed endotracheal tube and ventilated. The ventilator settings were adjusted to maintain normocapnia. Anaesthesia was maintained with oxygen/air mixture (50:50), isoflurane (0.4-0.6%) and atracurium. After delivery of the baby, oxytocin 20 units infusion was started and two doses of inj. carboprost 0.25 mg intramuscular route were administered to achieve adequate uterine contraction. Analgesia was achieved with additional doses of inj. Fentanyl 100 mcg, 5 mg morphine IV and paracetamol 1 gm IV. Bupivacaine 0.25% was infiltrated at the incision site.

Intraoperatively hemodynamics were monitored, BP remained stable throughout but there was tachycardia (140-150/min) following delivery which persisted even after supplementing with analgesics and midazolam. Inj. metoprolol IV (3 mg in titrated doses) was subsequently administered to control the heart rate. Estimated blood loss was around 600 ml and patient received 750 ml of crystalloids. Patient also received inj. furosemide 10 mg IV intraoperatively.

At the conclusion patient was reversed with 2.5 mg Neostigmine and 0.4 mg glycopyrrolate, she was extubated and shifted to the ICU for hemodynamic monitoring. The newborn had an APGAR score of 8 and

10 at 1 and 5 minutes respectively, and shifted to NICU for observation.

The patient was hemodynamically stable in the ICU and was started on Low molecular weight heparin, 12 hours after the surgery. She was shifted to the ward the next day and the baby was breast fed. Further course in the hospital was uneventful and the patient was discharged 5 days later and advised to follow up with the cardiologist.

DISCUSSION

Aortic stenosis in pregnant patient is a unique challenge to the obstetrician and anesthesiologist and requires a thorough understanding of the impact of pregnancy on the hemodynamic response to the stenosed valve.

Asymptomatic women with mild obstruction and normal LV systolic function before conception will tolerate pregnancy well and can be managed conservatively, while those with symptoms and severe AS (Aortic valve area $<1 \text{ cm}^2$, mean gradient $>40 \text{ mmHg}$)⁴ are at higher risk. The major maternal concern in the pregnant patients with congenital AS is deterioration in their cardiac status due to physiological changes of pregnancy in the form of increased blood volume, heart rate, cardiac output, and decreased systemic vascular resistance. Also, decrease in the venous return because of hypovolemia, vasodilatation or aorto-caval compression especially in the peripartum period can lead to low cardiac output, myocardia and placental ischemia, pulmonary congestion and sudden death.⁵

Symptomatic patients with critical AS should be appropriately counselled for delaying conception until treated by valve replacement or balloon valvotomy.⁶ Aortic stenosis diagnosed for the first time during pregnancy, percutaneous balloon valvuloplasty is a palliative procedure that allows for completion of pregnancy and should be considered as early as possible in the gestation.

Labor and assisted vaginal deliveries are preferred. Caesarean delivery is reserved for obstetric indications.¹ The choice between neuraxial and general anaesthesia has been a matter of debate.^{7,8} Historically, neuraxial anaesthesia has been thought to be relatively contraindicated in patients with AS considering the hazards of simultaneous decrease in preload and afterload associated with it. In patients with severe AS, general anaesthesia remains the gold standard. The goals of anesthetic management include maintenance of a normal heart rate, sinus rhythm and adequate systemic vascular resistance; to maintain intravascular volume and venous return; avoidance of myocardial depression during general anaesthesia and avoiding aorto-caval compression.¹ Securing arterial line for invasive blood pressure monitoring before induction is very useful in such conditions associated with compromised cardiac output, anaesthetic drugs can be titrated with beat to beat

arterial pressure monitoring. Despite the risk of fetal depression, in the interest of maternal safety opioid based induction can be used.⁹ We used fentanyl and titrated low dose of thiopentone for induction to achieve hemodynamic stability. Tachycardia is deleterious in these patients as it decreases diastolic filling time and should be treated promptly using beta blockers. Fluids should be administered cautiously in these patients to maintain adequate intravascular volume but one should refrain from administering excess fluids, considering the auto-transfusion of blood via uterine contraction and relief of aorto-caval compression following delivery¹⁰. Oxytocin should be administered judiciously as infusion and bolus should be avoided, considering its vasodilatory effects.¹¹ Adequate analgesia is equally important in achieving the goals. Post-operative monitoring in a high dependency unit is of paramount importance in detecting the early complications.

CONCLUSION

Pregnancy with severe AS mandates a meticulous planning before taking up for the surgery. It requires a thorough pre-operative work up in association with obstetrician and cardiologist to make a rational choice of management. General anaesthesia is preferred in such cases to provide hemodynamic stability. Identifying potential intra-operative problems and timely intervention is important in achieving the desired goals.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Dsouza MC, Shivappagoudar VM, Kedlaya A, Gonsalvez GJ. Anaesthetic management of a patient with severe aortic stenosis for caesarean section: a case report. Int J Res Med Sci 2015;3:2854-6.