

A Case of Severe Pulmonary Stenosis for Planned Caesarean Section with Epidural Anaesthesia

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Background: Pulmonary stenosis (PS) is a congenital heart defect that can present in a variety of clinical settings, depending on the severity. To ensure both maternal and fetal well-being, the management of PS in pregnant patients requires careful multidisciplinary coordination and consideration of both normal changes in maternal physiology and abnormal changes related to comorbidities.

Case Presentation: We present a 40-year-old female with a history of severe congenital pulmonary stenosis, hypertension, and diabetes mellitus, who underwent an elective caesarean section with tubal ligation under regional anaesthesia. She was diagnosed with PS in early childhood but was later lost to cardiology follow up. During antenatal assessment, trans-thoracic echocardiography revealed severe pulmonary stenosis with a gradient of 100mmHg, with severe right ventricular dilation. The patient maintained good exercise tolerance and had no symptoms suggestive of heart failure.

Intervention and Outcome: The caesarean section was conducted under lumbar epidural anaesthesia with careful monitoring of her cardiovascular status, including radial artery invasive blood pressure monitoring and CVP through a central venous catheter. Mild sedation was provided with boluses of midazolam. Postoperative recovery was uneventful, with stable blood pressure and mild improvement in the pulmonary gradient.

Conclusion: Epidural anaesthesia is a safe option for patients with severe PS undergoing Caesarean section provided that the block is achieved slowly to avoid rapid changes in blood pressure.

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Pulmonary stenosis (PS) is a congenital heart defect that involves obstruction to the right ventricular outflow tract. Severe PS, defined as a peak gradient >64mmHg, is often associated with right ventricular hypertrophy, dilation of the right atrium, and in extreme cases, heart failure. Pregnant women with PS are at increased risk due to the additional strain placed on the cardiovascular system during pregnancy and labour. A careful and coordinated approach involving multiple specialties, including cardiology, obstetrics, and anaesthesia, is essential in these cases to mitigate the risks to both mother and fetus.

CASE PRESENTATION

A 40-year-old female, referred to as Patient X, with a known history of congenital severe pulmonary stenosis (PS), hypertension, non-insulin dependent diabetes mellitus, and anxiety disorder, presented at 36 weeks of gestation for an elective caesarean section with tubal ligation. The patient has a significant smoking history. The patient's maternal family history includes cerebrovascular accidents (CVA). This was the second pregnancy for Patient X. Her first pregnancy, 12 years prior, resulted in a normal vaginal delivery with no complications.

The pulmonary stenosis was diagnosed in childhood, with early echocardiograms demonstrating mild PS, but no significant stenosis or post-stenotic dilatation. She was subsequently lost to cardiology follow-up. A few months prior, a trans-thoracic echocardiogram revealed severe pulmonary stenosis with a gradient of 100 mmHg, severe right ventricular dilation, and right atrial enlargement. She had a loud ejection systolic murmur.

Her regular medications included Aspirin, Sertraline and Enoxaparin.

The patient was classified as ASA 3. Her BMI was 42, she had a short neck, and a Mallampati score of 2. A loud ejection systolic murmur (ESM) was audible.

Epidural anaesthesia was selected as the mode of anaesthesia with careful build-up of the block to avoid the airway risks of general anaesthesia and minimise cardiac instability. The epidural was placed at the L2/3 interspace under sterile technique, with loss of resistance to saline. A test dose of 0.5% bupivacaine

was administered to confirm correct placement, followed by a total dose of 20 ml of 0.5% bupivacaine and 2 ml of 50 mcg/ml fentanyl by slow incremental boluses given over a period of 30 minutes.

Blood pressure was measured via a radial arterial line. A right jugular central venous catheter was placed with ultrasound guidance in case vasopressor infusions were needed.

Medications Administered in Theatre

- Midazolam IV 2mg upon arrival followed by 1mg 30 minutes later
- Tranexamic Acid 1g IV
- Co-Amoxiclav 1.2g IV
- Dexamethasone 8mg IV
- Syntocinon 2 units over 10 minutes after umbilical cord clamping, followed by an infusion of 2.88 units in 500 mL Ringer's lactate at 125 mL/hr.
- Misoprostol 1g PR

Surgical Procedure

The patient underwent a lower segment caesarean section (LSCS) with concurrent tubal ligation. Skin incision was performed after confirmation of adequate block to T4 and fetal delivery was at 17 minutes post-skin incision. A healthy female infant was delivered, who cried on initial stimulation, with an Apgar score of 9 at 1 minute and 9 at 5 minutes. The estimated blood loss by completion of skin closure was estimated at less than 200ml.

Postoperative Management

Patient X remained haemodynamically stable, with no signs of acute decompensated heart failure or bleeding or other complications. She was admitted to central delivery suite for monitoring for 24 hours after which the arterial line, central venous catheter and epidural catheter were removed. Postoperative echocardiography showed stable cardiac function despite the surgical stress.

She was discharged home after 8 days and advised to follow up with her obstetrician, cardiologist, diabetologist and psychiatrist. She was also followed up by outpatient community clinic nurse-led wound care for delayed wound healing.

DISCUSSION

In contrast to mitral and aortic stenosis, PS without other major cardiac abnormalities or symptoms of decompensation does not usually adversely impact maternal or fetal outcomes of pregnancy.¹

Factors that could contribute to cardiac decompensation in this setting include:

- The Epidural sympathetic block resulting in drop in SVR, preload and mean arterial pressure. In stenotic lesions, the cardiac output may not increase to compensate for reductions in SVR, resulting in a precipitous decline in MAP.⁽²⁾
- Patient Anxiety resulting in sympathetic-mediated tachycardia, increased myocardial oxygen consumption and coronary vasospasm
- Blood loss resulting in hypovolaemia and a drop in mean arterial pressure
- Uterotonic drugs affecting systemic and pulmonary vascular tone.

Other case reports suggest neuraxial anaesthesia for caesarean section in patients with PS is safe.³⁻⁵

Intraoperative management of patients with stenotic lesions such as pulmonary stenosis usually aims for a slower heart rate in the lower range of normal to allow adequate timing for ventricular filling and ejection.⁽⁵⁾ This is one benefit of the use of phenylephrine as a vasopressor over ephedrine in this case, as the former tends to lower the heart rate while the latter increases it.

Uterotonic Drugs

The adjustment of uterotonic agents to minimize impact on the pulmonary vasculature had to be weighed against the need to minimise post-operative blood loss which would adversely affect the mean arterial pressure.

Oxytocin/syntocinon results in systemic vasodilation, hypotension, tachycardia and increased cardiac output.⁶ Therefore, the minimum effective dose should be used.

Ergometrine⁷ and Carboprost (prostaglandin PGF₂-a)⁸ both cause increased pulmonary artery pressures and were therefore avoided. Carboprost is not recommended in the context of significant cardiac disease.⁹

Misoprostol is less effective than oxytocin in preventing postpartum haemorrhage, but its safety profile makes it a useful adjunct.⁹

Obstetric Planning

Planned caesarean section was decided over vaginal delivery to avoid Valsalva during labour which decreases preload and could lead to cardiac decompensation. Balloon valvuloplasty was not indicated as exercise tolerance was good. If decompensation occurred, the hospital is equipped to perform open heart surgery to correct the lesion. Fortunately, the mortality rates for pregnant women undergoing cardiac valvular surgery are similar to those of non-pregnant women, but the fetal mortality is high in those undergoing corrective cardiac surgery.¹⁰

Had patient X presented with acute heart failure before the planned Caesarean section, an urgent Caesarean section would be indicated to relieve aortocaval compression and eliminate the uteroplacental circulation which receives 10-20% of cardiac output. However, delivery does not guarantee haemodynamic improvement. In severe valvular lesions, cardiac decompensation may present or persist after delivery owing to autotransfusion of placental blood. Postoperative problems like bleeding and sepsis originating from wound infection could also lead to worsening heart failure after delivery.

CONCLUSION

Regional anaesthesia, specifically epidural anaesthesia, provides a safe alternative to general anaesthesia by maintaining hemodynamic stability and minimizing the risks such as acute right heart failure. Management strategies such as controlled fluid balance, judicious use of uterotonic drugs, and close monitoring of cardiac function are critical in preventing complications. This case reinforces the importance of individualized care and multidisciplinary collaboration among anaesthesiologists, obstetricians, and cardiologists in managing pregnant patients with congenital heart disease for Caesarean section.

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