Case Report

Initial non-opioid based anesthesia in a parturient having severe aortic stenosis undergoing cesarean section with aortic valve replacement

Podder Subrata, Kumar Ajay, Mahajan Sachin[1], Saha Pradip Kumar[2]

Departments of Anaesthesia and Intensive Care, [1]Cardiothoracic and Vascular Surgery and [2]Obstetrics and Gynecology, Postgraduate Institute of Medical Education and Research, Chandigarh, India

ABSTRACT

Pregnancy in presence of severe aortic stenosis (AS) causes worsening of symptoms needing further intervention. In the advanced stages of pregnancy, some patients may even require aortic valve replacement (AVR) and cesarean delivery in the same sitting. Opioid based general anesthesia for combined lower segment cesarean section (LSCS) with AVR has been described. However, the use of opioid may lead to fetal morbidity and need of respiratory support for the baby. We describe successful anesthetic management for LSCS with AVR in a >33 week gravida with severe AS and congestive heart failure. We avoided opioids till delivery of the baby AVR; the delivered neonate showed a normal APGAR score.

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INTRODUCTION

Pregnancy in severe aortic stenosis (AS) can precipitate congestive heart failure (CHF) with associated maternal and fetal mortality.[1] Severe AS patients with a viable fetus developing CHF have been managed with lower segment cesarean section (LSCS) and aortic valve replacement (AVR). Literature search could locate three reports describing opioid-based anesthesia for LSCS with AVR in severe AS.[2,3] We report successful anesthetic management for LSCS with AVR, where we avoided opioids till the baby was delivered resulting in normal APGAR score for the baby.

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CASE REPORT

A 25-year-old primigravida weighting 47 Kg (height 165 cm) presented at 29+ week pregnancy with severe AS and New York Heart Association (NYHA) functional class IV. The patient responded to digoxin and furosemide, but with advancing pregnancy patient's condition worsened with episodes of arrhythmia. In view of worsening CHF and viable fetus of 33+ week's gestation, decision for LSCS with AVR was taken. Pre-anesthesia checkup revealed Mallampati class 1 airway, heart rate (HR) 120/min, blood pressure 80/50 mm Hg, respiratory rate (RR) 25/min and orthopnea. Arterial blood gas on ventimask with 0.4 FiO_2 showed pH 7.42, PaO_2 109 mmHg, $PaCO_2$ 24 mmHg, base deficit −6.9, and SaO_2 98%. Electrocardiogram revealed sinus rhythm and left ventricular (LV) hypertrophy. Transthoracic echocardiography (TTE) showed bicuspid aortic valve with severe AS and LV ejection fraction (LVEF) 32%. Doppler across the aortic valve revealed a peak velocity of 5.1 m/s. Obstetric examination confirmed a fundal height suggesting 33+ weeks of gestation and fetal heart rate (FHR) of 140/min. An elective LSCS was planned for the delivery of the fetus. The hemodynamics were planned to be maintained close to the baseline with vasoactive agents and emergency institution of CPB if hemodynamic deteriorates.

Address for correspondence: Dr. Ajay Kumar, Department of Anaesthesia and Intensive Care, Postgraduate Institute of Medical Education and Research, Chandigarh, India. E-mail: ajaymishra0701@gmail.com

On the day of surgery, aspiration prophylaxis was given, and furosemide and digoxin were stopped. The operating room (OR) temperature was maintained at 28°C and neonatologist was called for resuscitation. Patient was positioned supine with a left lateral tilt. After attaching routine monitors, left radial artery, a triple lumen central venous catheter and an 8.5 French sheath in right internal jugular vein were inserted under local anesthesia. The baseline hemodynamics was - HR 120/min, arterial blood pressure (ABP) 116/58 mmHg, RR 30/min, SpO_2 94%. Patient was pre-oxygenated with 100% oxygen with face mask for 5 min and infusions of adrenaline (0.05 μg/kg/min) and phenylephrine (0.1 μg/kg/min) was started to maintain contractility and ABP. During pre-oxygenation urinary bladder was catheterized and cleaning and draping for AVR and LSCS was done. The cardiac surgical and obstetrics team were ready to intervene if required. Anesthesia was induced with titrated dose of thiopentone (100 mg) till eyelash reflex was lost. Cricoid pressure was applied after loss of consciousness and vecuronium 0.1 mg/kg was administered after ensuring ventilation. ABP of the patient dropped to 80/50 mmHg, which responded to increases in infusions of phenylephrine (0.3 μg/kg/min) and adrenaline (0.08 μg/kg/min) and ABP stabilized at 90–100 mmHg with mean ABP of 60–70 mmHg. Saturation remained at 99% till the delivery of the neonate. LSCS was started while cricoid pressure was maintained, and patient ventilated with sevoflurane in oxygen. Patient was intubated after 3 min with 7 mm cuffed endotracheal tube (ETT). Intermittent positive pressure ventilation was established with sevoflurane in oxygen. The MAC value varied from 0.8 to 1.2. Nasopharyngeal temperature probe and transesophageal echocardiography (TEE) probe was introduced after securing ETT. By the time TEE probe was secured, the baby was delivered. Skin incision to delivery time was 8 min. APGAR score at one and 5 min was 8 and 9 respectively. The uterus was closed and post hemostasis, abdomen was packed with sponges and skin was stapled pending final closure post CPB. Clean sheet was kept below pelvis between the thighs to monitor uterine bleeding. Oxytocin infusion was started after delivery at 20 IU/h for 1st h, followed by 10 IU/h. Intramuscular prostaglandin 250 μg was administered to facilitate uterine contraction. Post-delivery sevoflurane was stopped and breathing system was flushed till gas monitor showed absence of sevoflurane. Post-delivery anesthesia was maintained with midazolam (1 mg), morphine (0.1 mg/kg), followed by propofol infusion (25–75 μg/kg/min), intermittent boluses of vecuronium (0.2 mg/kg) and morphine (every 15 min) before going on CPB. Post-delivery ABP stabilized to 110/58 mmHg probably due to uterine contraction induced auto-transfusion. Therefore, adrenaline was stopped, and phenylephrine was decreased to 0.1 μg/kg/min. Prebypass TEE showed [Figure 1] peak and mean aortic valve gradients of 126 and 82 mmHg, respectively, and LVEF of 31%. Heparin 300 IU/kg was administered before establishing CPB. Aortic valve was replaced with a 16 mm ATS aortic valve (mechanical). Patient was separated from CPB with the supports of adrenaline 0.1 μg/kg/min and milrinone 0.3 μg/kg/min, respectively. Heparin was neutralized. Sternal wound was packed, uterine contraction and intra-abdominal hemostasis was reassessed and abdominal wound was closed. Thereafter, sternal closure was done. Intra-operatively one unit of packed cell was added to the CPB prime. Two units of packed cells, 2 units of fresh frozen plasma and 2 units of platelets were administered after CPB. Total CPB and ischemia times were 100 and 62 min. Post-CPB, TEE showed peak and mean gradients of 31 and 19 mmHg, respectively. Patient was shifted to the intensive care unit for ventilation and was extubated after 9 h. The patient was transferred to ward after 5 days and healthy mother and baby were discharged after 9 days. TTE at discharge showed peak and mean gradients of 43 and 26 mmHg, pulmonary artery pressure of 44 mmHg and LVEF 25%.

DISCUSSION

Pregnancy in severe AS carries high risk of mortality reaching as high as 17%.[4] Pregnancy with severe AS is characterized by an increased (16.7%) incidence of heart failure, poor NYHA grade, premature labor (25%)

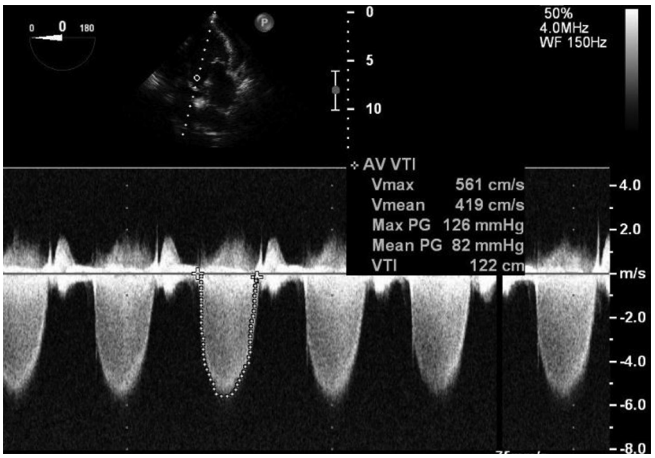

Figure 1: Preoperative peak (max PG) and mean gradient (mean PG) across aortic valve in deep transgastric view in transesophageal echocardiography

and shorter duration of pregnancy.[5] In one series, 65% of patients with AS complained of shortness of breath, palpitations, angina or dizziness in the peripartum period.[6] Pregnancy at 24th weeks causes 25–50% increases in cardiac output with a similar increase in blood volume.[7] Present patient complained of orthopnea around the same time. Severe AS patients have difficulty in the meeting pregnancy related increased metabolic demand, leading to CHF with possible fetal and maternal death.[4] Most women with mild to moderate degree of AS can be safely managed.[5] Only in advanced pregnancy with refractory NYHA class III or IV symptoms, intervention is advised.[7] Balloon aortic valvotomy (BAV) is seen as a bridge procedure to reduces the risk of gestation, labor, delivery.[8,9] In the present case BAV was not possible due to severe calcific aortic valve. Cesarean delivery is recommended in the presence of aortic aneurysm, dissection, or critical AS, to avoid risk of adverse cardiac event due to uterine contraction induced increased cardiac output.[10] The risk is very high immediately after delivery and in the early puerperium due to additional volume overload.[11] Present patient had three predictors (arrhythmia, NYHA >II and ventricular dysfunction) of adverse cardiovascular events risk score as suggested by Siu *et al*., according to them presence of >1 predictor increases risk of adverse cardiac events by >75%.[12]

In the current case, the fetus achieved 33+ weeks of gestation, sufficient to avoid neonatal respiratory distress syndrome.[13] A multidisciplinary team decided for LSCS and AVR in the same sitting in view of LV dysfunction with a progressive fall in blood pressure.[13] Anesthesia induced decrease of systemic vascular resistance in patients may lead to a severe decrease in ABP that can compromise myocardial blood supply of patients having severe AS. In the described case background infusion of phenylephrine was used to compensate expected fall in SVR. Infusion of adrenaline avoided sudden myocardial depression arising out of induction and surgery.

Opioids based anesthesia, heparinization and aortic cannulation increases the risk to the fetus.[3] We used sevoflurane because of its low solubility. Immediately after delivery, sevoflurane was washed out to avoid the slightest risk of uterine atony which may precipitate bleeding in the setting of heparinization and CPB.[14,15] Opioids, benzodiazepines and propofol were used after delivery of the baby. High Apgar score at 1 and 5 min justifies use of thiopentone and sevoflurane. Besides invasive monitoring, we used TEE to assess perioperative cardiac functional status. The present case demonstrates that it is possible to safely anesthetize patients with severe AS in CHF undergoing LSCS with AVR while avoiding opioids till delivery of the baby.

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