CASE REPORT

Anesthetic management of a case of a large atrial septal defect with mild pulmonary hypertension for emergency cesarean section

V. R. R Chari, MD*, Chhaya M. Suryawanshi, MD*, Preety Sahu**

**Professor, **Postgraduate Resident*
Dept of Anesthesiology, Padm. Dr. D. Y. Patil Medical College College & Research Centre, Sant Tukaram Nagar, Pimpri,Pune-18, Maharashtra-411018 (India)

Correspondence: Dr. Preety Sahu, Dept of Anesthesiology, Padm. Dr. D. Y. Patil Medical College College & Research Centre, Sant Tukaram Nagar, Pimpri,Pune-18, Maharashtra-411018 (India); Phone: 08087582578; E-mail: preety.sahu@yahoo.com

ABSTRACT

Atrial septal defect (ASD) is the most common congenital acyanotic heart disease in adults and accounts for 10% of congenital cardiac defects in adults. . It is the most commonly seen congenital cardiac lesion in women of child-bearing age and the pregnancy is usually well tolerated. Pulmonary hypertension is defined as a mean pulmonary arterial pressure greater than 25mm Hg at rest or greater than 30mm Hg during exercise. We report a case of a large ASD with mild pulmonary hypertension in a patient who underwent emergency caesarean section under general anaesthesia for failure to progress. During the general anaesthesia for the procedure our objectives were to to avoid hypotension, hypoxaemia, hypercarbia, hypothermia, reversal of shunt (Eisenmenger's syndrome) and fluid overload. The patient had an eventful perioperative course and discharged from the hospital on the 8th postoperative day in good physical condition. .

Keywords : Atrial septal defect; Pulmonary arterial hypertension; Caesarean section; hypotension; hypoxemia; hypercarbia; Eisenmenger's syndrome

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INTRODUCTION

Atrial septal defect (ASD) is the most common congenital acyanotic heart disease in adults and accounts for up to 10% of cases of congenital acyanotic cardiac defects in adults (you need a reference here). There are three distinct types of ASD namely, osteum primum, osteum secundum and sinus venosus defect. The osteum secundum accounts for 70% of ASD cases, with a male:female ratio 1:2[1]. ASD causes left to right intra- cardiac shunt with right ventricular volume overload, increased pulmonary blood flow (PBF), pulmonary hypertension, right ventricular hypertrophy and eventually congestive heart failure (CHF). We present a parturient mother known to have osteum secundum type of ASD since childhood and who underwent emergency caesarean section under general (intra venous) anaesthesia for failure to progress. Anaesthetic management and perioperative strategies are discussed.

CASE REPORT

A 26-years- old primigravida, in labor at 37 weeks of gestation with failure to progress during labor was transferred from a private hospital and emergency cesarean section was planned. Patient was a known case of osteum secundum type of ASD since childhood with the medical history of repeated upper respiratory infections (URTI), moderate breathlessness (NYHA II), but no history of chest pain, palpitation, or fatigue. On physical examination pulse was 88/min (Regular), BP was 130/90 mmHg, bilateral pitting pedal edema was present, but the jagular venous pressure (JVP) was not raised on clinical examination. CVS examination revealed pansystolic murmur in the pulmonary and mitral area (suggesting mild mitral regurgitation), wide split and fixed second heart tone (S2). The rest of the physical examination was unremarkable. All the biochemical, haematological and coagulation tests were within normal limits. . ECG showed right axis deviation, incomplete RBBB. 2D ECHO revealed grossly dilated left and right atrium and right ventricle, large osteum secondum ASD (24 mm in Diameter), left to right shunt, mild pulmonary hypertension with an estimated right ventricle systolic pressure of 40 mmHg and ejection fraction of 60%.

Anesthetic management:

The patient was transferred to the operating room; a peripheral intravenous (IV) catheter was inserted and lactated ringer's solution was started at maintenance. Hear rate, non-invasive BP, ECG, SpO_2 and $EtCO_2$ were monitored throughout the anaesthesia. As it was an emergency situation, invasive monitoring was not done and fluid assessment was done clinically.

Patient was premedicated with IV glycopyrrolate 0.2 mg, metoclopramide 20 mg, ondansetron 4 mg, ranitidine 150 mg. The patient was then preoxygenated with 100% oxygen for 3 mins and then induced with propofol 50 mg , ketamine 50 mg, and suxamethonium chloride 100 mg. The patient was intubated orally with a size 7.0 mm cuffed endotracheal tube. Rocuronium 40 mg was given as a neuromuscular blockade agent. The right hip was elevated with a soft pillow in order to prevent supine hypotension syndrome. Anesthesia was maintained with oxygen 40%, N_2O 60%, isoflurane (0.6-0.8%), and controlled ventilation. $EtCO_2$ was maintained around 32-35 mmHg.

After the delivery of a 2.8 kg female baby with an Apgar scores of 8 (1min) and 10 (5min), oxytocin infusion (15 Units in 500ml saline) was administered over 20 minutes followed by fentanyl (50 mcg) by slow IV push. The procedure lasted 45 minutes. Intraoperatively pulse was 90-110 beats/min, BP was 110/60-140/90 mm Hg, SpO_2-100%. Lactated ringer solution 500 ml and 0.9% sodium chloride were given during the anesthesia and the urine output was 150 ml during the 45 min procedure. The estimated blood loss during the procedure was 400ml.

For reversal of neuromuscular block neostigmine (2.5 mg)+glycopyrrolate (0.5 mg) given. To have adequate spontaneous respiratory efforts neostigmine (0.5 mg) was repeated. This was done to avoid residual neuromuscular block and to improve recovery. Post extubation patient was conscious, responding to verbal commands, normal muscle power, stable BP, HR and SpO_2. Patient was monitored in recovery room for 1 hour and then transfered to ICU and managed with ICU protocols and discharged on 8th postoperative day. Her hospital stay was uneventful.

DISCUSSION

We present a case of secondum ASD in a parturient patient who successfully underwent emergency caesarean section for failure to progress. We employed the usuall anaesthetic approach with particular attention to control of factors that may lead sudden pulmonary hypertension with resultant hypoxemia and the potential for the development of acute heart failure, which would have been detrimental to the mother and the fetus.

There are three types of ASD. The sinus venosus type occurs high in the atrial septum near the entry of superior vena cava (SVC) into the right atrium(RA) and is frequently associated with anomalous pulmonary venous connection from the right lung to SVC/RA. Osteum primum anomalies lie adjacent to AV valves either of which may be deformed / regurgitant. Osteum secundum ASD,which accounts for 70% of cases of ASD, involves the fossa ovalis and is midseptal in location.[11]

It enables blood flow between the left and right atria via the inter-atrial septum, which may not be clinically significant. Patients are usually asymptomatic during childhood. However, symptoms appear later in life and by age 40, 90% of untreated patients have symptoms of exertional dyspnea, fatigue, palpitation or sustained arrhythmia.[3] Complications of uncorrected secundum type of ASD include pulmonary arterial hypertension, right sided heart failure, atrial fibrillation/flutter, stroke and Eisenmenger's syndrome.[4]

Large ASD (>9mm),may result in a clinically remarkable left-to-right shunt. This extra blood from the left atrium may cause a volume overload of both the right atrium and ventricle. If untreated, it can result in enlargement of the right side of the heart and ultimately heart failure. Changes in SVR during the perioperative period have important implications for patients with ASD.[5] The magnitude of left to right shunt depends on size of ASD, ventricular diastolic properties and the relative impedance in pulmonary and systemic circulation.[6]

The echocardiography can establish the size and location of the ASD, magnitude and hemodynamic impact of the left to right shunt, and the presence and the degree of pulmonary hypertension.[7,8] Pulmonary hypertension is classified as mild (36-49 mm of Hg systolic), moderate (50-59 mm of Hg), severe (>60 mm of Hg) based on the estimated right ventricular systolic pressure gradient calculated from Doppler Echocardiography.[4]

Anticipated problems during general anaesthesia include, Air embolism during vascular access, dysrhythmias (5-10%) , heart failure, heart block and infective endocarditis.

Anaesthetic techniques commonly used for lower segment caesarean section (LSCS) include regional anaesthesia i.e spinal / epidural anesthesia. However, these techniques carry the risk of sudden and uncontrolled hypotension and unstable hemodynamics with the possibility of reversal of intra cardiac shunt.

We preferred general anesthesia (GA) with controlled ventilation because our patient had arrived in emergency and patient was in labour and in agony. GA provides better haemodynamic stability,

100% oxygen can be given, as the patient had mild pulmonary hypertension. Hypercarbia can be avoided by mechanical ventilation and adjusting tidal volume and respiratory rate. Inflation of the lungs with intermittent

positive pressure ventilation (IPPV) leads to release of endogenous nitric oxide and prostaglandins which cause pulmonary vasodilatation.[10] IPPV of lungs is well tolerated when there is increased pulmonary blood flow.[5] Intraoperatively we reamained vigilant to avoid hypothermia, hypercarbia and hypoxaemia were avoided as these factors can cause reversal of shunt.

Our aim during GA was to maintain adequate preload, avoid increase in the shunt fraction, maintain optimum cardiac contractility, maintain normal SVR and PVR (achieved in this case by administration of IV ketamine), near normal heart rate and close monitoring to detect atrial arrhythmias.

Balanced GA in this clinical scenario is unlikely to cause drastic changes in SVR / PVR with minimum effect on shunt. GA will maintain systemic blood flow within normal limits so that pharmacokinetics of inhaled anesthetic is not altered. Intravenously administered medications may be diluted due to increased pulmonary blood flow, however this is s unlikely to alter the clinical response to these medications because the pulmonary circulation time is very short. Perioperative antibiotic cover was provided to prevent sub acute bacterial endocarditis.

CONCLUSION

In patients with ASD we should tailor anesthesia technique to avoid increase in pulmonary vascular resistance, decrease in systemic vascular resistance, hypotension, tachycardia, hypoxia, hypercarbia and hypothermia.

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