Anaesthetic Management Of A Patient With Atrial Septal Defect with Pulmonary Hypertension Posted For Vaginal Hysterectomy

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Summary:
A 40 year old female patient posted for vaginal hysterectomy was diagnosed to have ostium secundum Atrial Septal Defect (ASD) with mild tricuspid regurgitation with moderate pulmonary hypertension with mild essential hypertension. We report the successful management of the case using combined general anaesthesia with epidural analgesia.

Key words:
Atrial septal Defect, Pulmonary arterial hypertension, General Anaesthesia, Epidural analgesia.

Introduction:
Atrial septal defect is a common cardiac anomaly that may be first encountered in the adult & occurs more frequently in females. 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 associated frequently with anomalous pulmonary venous connection from the right lung to SVC or RA. Ostium primum anomalies lie adjacent to AV valves either of which may be deformed or regurgitant. The most common ostium secundum type ASD involves the fossa ovalis & is midseptal in location. Patients with ASD are usually asymptomatic in early life, although there may be some physical underdevelopment & an increased tendency for respiratory infections. Complications of uncorrected secundum type of ASD include pulmonary arterial hypertension, right sided heart failure, atrial fibrillation or flutter, stroke & Eisenmenger's syndrome. Changes in systemic vascular resistance during the perioperative period have important implications for patients with atrial septal defect. Literature on these patients is very limited. The following case describes a patient with ostium secundum type of ASD with moderate pulmonary hypertension with mild essential hypertension who successfully underwent vaginal hysterectomy under combined approach of general anaesthesia with epidural analgesia.

Case Report:
A 40 year old female weighing 50 kgs was admitted with history of vaginal bleeding for the past 6 months. Patient was a mother of three children, all, apparently being uncomplicated hospital deliveries.

There was history of recurrent respiratory infection and mild limitation of physical activity; after admission, she was referred to cardiologist, when she was diagnosed to have ASD ostium secundum type. She was also a known case of essential hypertension diagnosed two years back and on oral nifedipine (slow release 20mg, twice a day) and Torsemide with Spironolactone. No additional drugs were advised for the ASD by the cardiologist.

On examination her pulse rate was 88/min (Regular) and arterial blood pressure was 130/90 mm of Hg. Jugular Venous Pulse was normal. Cardiovascular system examination revealed a loud P2, Ejection Systolic Murmer gr. IV/VI in pulmonary area. Respiratory system evaluation was normal. All biochemical, haematological & coagulation tests were normal. Chest X-Ray revealed prominent of central pulmonary vessels & cardiomegaly. EKG revealed Right Bundle Branch Block & Right Axis Deviation. Echocardiogram showed – OS type ASD (18mm) with Left to Right (L to R) shunt, RA & RV dilated, Mild Tricuspid Regurgitation, Systolic pulmonary artery pressure of 51mm Hg and Ejection Fraction of 65%. Ultrasound revealed bulky uterus with thickened endometrium. Patient was diagnosed to have Dysfunctional Uterine bleeding with OS type ASD with L to R shunt with moderate pulmonary arterial hypertension with mild essential hypertension & was posted for vaginal hysterectomy.

Morning dose of oral Nifedipine was given 2 hours prior to shifting to OT with sip of water. Inj. Ceftriaxone 2gm & Inj. Gentamicin 80 mg IV were given preoperatively as matter of institutional protocol. Patient was preloaded with 500 ml of Ringr Lactate. Basal BP was 126/84 mm Hg and Pulse 88/min. Patient was premedicated with Inj. Glycopyrrrolate 0.2mg, Inj. Diazepam 5mg, Inj. Ondansetron 4mg, Inj. Ranitidine 50mg, Inj. Butorphanol 1mg IV. An 18G epidural catheter was placed in L2-3 interspace with loss of resistance to saline technique. Right side internal jugular vein was cannulated using 16G catheter under local anaesthesia by Seldinger technique & Inj. Nitrogly
Discussion

1) Type- Simple : ASD, VSD, PDA, anomalous venous return.
   - Combined: describe combination & define prevalent defect if any.
   - Complex: Truncus arteriosus, Single ventricle, AV septal defects.

2) Dimensions: Small (ASD < 2cm, VSD < 1cm) or large (>2cm).

3) Associated cardiac abnormalities

4) Correction status: non, partially or totally corrected.

WHO classification of pulmonary arterial hypertension functional status.5

I - No limitation of usual physical activity : Ordinary physical activity does not cause increased dyspnoea, fatigue, chest pain or presyncope.

II - Mild limitation of physical activity. There is no discomfort at rest, but normal physical activity causes increased dyspnoea, fatigue, chest pain or presyncope.

III - Marked limitation of physical activity. There is no discomfort at rest, but less than ordinary activity causes increased dyspnoea, fatigue, chest pain or presyncope.

IV - Unable to perform any physical activity at rest and may have signs of RVF. Dyspnoea &/or fatigue may be present at rest and symptoms are increased by almost any physical activity.

Pulmonary hypertension is classified as mild (36-49 mm of Hg systolic), moderate (50-59 mm of Hg), severe (>60 mm of Hg) according with right ventricular systolic pressure calculated by Echocardiography.6 70% ASDs are of OS type. Female to Male ratio is 2:1. There is a tendency for familial involvement: significant ASD is associated with PR prolongation or forearm & hand abnormalities (Holt-Oram Syndrome).

Perioperative mortality rate is 1%. Life expectancy without repair is 40yrs.7 Risks of death increase with age.8 The two major complications of ASD are pulmonary arterial hypertension & right ventricular failure. In about 15% of cases, elevated PVR develops after adolescence. As a result of chronic volume overload, patients older than 40 years may develop RVF leading to atrial dysrhythmias, TR & eventually CCF.7 Our patient was in the vulnerable age group & had mild TR.

Anticipated problems are :- 6 Air embolism during vascular access, Dysrhythmias (5-10% if no prerepair dysrhythmia.), Heart failure, Heart block and in some situations, Infective Endocarditis. The current recommendations does not warrant preoperative antibiotics in our case for prophylaxis against infective Endocarditis. Preloading with RL was done to avoid any drastic fall in blood pressure with IV induction as the patient was on Nifedepine and because we decided to give bupivacaine by epidural catheter. We preferred combined approach of general anaesthesia with controlled ventilation with epidural analgesia because it provides better haemodynamic stability. 100% oxygen could be given as the patient had moderate pulmonary hypertension. Halothane, Diazepam and Butorphanol with benefits of amnesia and analgesia permitted the use of 100 % oxygen. Isoflurane could be a practically useful agent and so would be sevoflurane. Since we did not have both agents, we went ahead with use of halothane. Butorphanol, a mixed
agonist antagonist opioid is relatively cardio stable. However, we have to guard against respiratory depression by proper monitoring. Hypercarbia can be avoided by mechanical ventilation. In addition, by stretching the lungs, positive pressure ventilation leads to release of prostaglandins which cause pulmonary vasodilatation. Regional anaesthesia with desired level of analgesia will cause marked reduction in SVR. Positive pressure ventilation of lungs is well tolerated in increased pulmonary blood flow. PAH may be treated with vasodilators & oxygen. Nitroglycerin used in low doses is desirable in patients with pulmonary hypertension as it helps to decrease pulmonary vascular resistance & improves transpulmonary filling of LV. Low dose NTG infusion is very useful; inhaled NO is expensive, needs specialized delivery system and it is associated with increased bleeding time and negative inotropic effect. Systemic effects of NTG is beneficial in our patient as patient had mild essential hypertension. Incidence of hypertension due to laryngoscopy & intubation is less in patients receiving continuous infusion of NTG. Morning dose of nifedipine was given, as Ca2+ antagonists reduce PVR & PAP. We used epidural catheter insertion with loss of resistance to saline technique to avoid air embolism. Epidural analgesia was preferred for the benefit of excellent analgesia, to avoid tachycardia and sympathetic stimulation. Theoretically IV induction may be slowed by presence of L to R shunt. Nitrous oxide may increase PVR & may increase the size of air bubble. Ketamine can increase PVR. So we avoided the use of nitrous oxide & ketamine. Vecuronium and butorphanol are relatively cardiostable. Monitoring of PAP & PCWP was not possible at our institute so we resorted to 2D echocardiographic evaluation of pulmonary arterial pressure. Intraoperative hypothermia, hypercarbia & hypoxaemia were avoided as these factors are known to cause shunt reversal. Steep head end down and excessive lithotomy position was avoided to prevent dangerous alterations in hemodynamics. The magnitude of left to right shunt depends on ASD size, ventricular diastolic properties & the relative impedance in the pulmonary & systemic circulation. Therefore the goals of anaesthetic management were to avoid further increase in PVR, to avoid marked reduction in SVR and to avoid myocardial depression.

**Conclusion:**

It can be concluded from the case report that patients with ASD with pulmonary hypertension can undergo non cardiac surgery if adequate precautions are taken keeping in mind the pathophysiological changes.

**References:**

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