Anaesthesia Management of a Patient with Large Atrial Septal Defect with Moderate Pulmonary Hypertension for Total Abdominal Hysterectomy

Abstract

Atrial septal defect (ASD) is a common cardiac anomaly that may be first encountered in the adults and occurs more frequently in females. ASD accounts for 10% of congenital cardiac defects in adults. A 50 year old female patient posted for Total Abdominal Hysterectomy was diagnosed to have ostium secundum large ASD with mild tricuspid regurgitation with moderate pulmonary hypertension and mild essential hypertension. We report the successful management of the case using combined general anaesthesia with Bilateral Transversus Abdominis plane (TAP) block for postoperative analgesia. During the general anesthesia for the procedure our objectives were to avoid hypotension, hypoxemia, hypercarbia, hypothermia, reversal of shunt and fluid overload and postoperative analgesia by TAP block, The patient had an eventful perioperative course and discharged from the hospital on the 5th-postoperative day in good physical condition.

Keywords: Atrial septal defect; Pulmonary arterial hypertension; Abdominal Hysterectomy; Hypotension; Hypoxemia; Hypercarbia; TAP block

Case Report

Volume 2 Issue 6 - 2015

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Received: August 02, 2015 | **Published:** August 21, 2015

Abbreviations: ASD: Atrial Septal Defect; TAP: Transversus Abdominis Plane; SVR: Systemic Vascular Resistance; LOR: Loss of Resistance

Introduction

The most common acyanotic congential anomaly in adults is Atrial septal defect (ASD) with high prevalence in females. It accounts for 10% of acyanotic congential cardiac anomaly in adults. There are three different types of atrial septal defect. The Ostium primum type of defect occurs near the AV valve. The Sinus venosus type occur near the entry of superior venacava into the right atrium. The most common type is the Osteum secundum ASD which accounts for 70% of cases with a male: female ratio of 1:2 [1]. It is midseptal in location and involves the fossa ovalis. Patients with ASD are usually asymptomatic in early life although there may be some physical underdevelopment and increased tendency for respiratory infection. ASD causes shunting of blood from left to right causing right ventricular volume overload and hypertrophy, pulmonary hypertension, atrial fibrillation, congestive heart failure and Eisenmenger's syndrome. The changes in the systemic vascular resistance (SVR) have important implication in the perioperative period in patients with ASD. We report the successful management of a 50 year old female known to have osteum secundum type of ASD since childhood and who underwent Total Abdominal Hysterectomy under general anesthesia with transversus abdominis plane (TAP) block for postoperative analgesia. Perioperative anaesthesia management strategies are discussed.

Case Report

A 50 year old lady who is a known hypertensive with osteum secundum ASD with dysfunctional uterine bleeding for last 6 months was planned for Total Abdominal Hysterectomy. She also had a history of repeated respiratory tract infection and exertional dyspnea NHYA grade II. She was on Tab. Telmisartan 40mg once a day and Tab. Furosemide 40mg plus Tab. Amiloride 5mg once a day. On physical examination pulse was 78/min regular, good volume, non-invasive blood pressure was 130/80 mmHg and normal jugular venous pressure. CVS examination revealed loud P, ejection systolic murmur gr. IV/VI in pulmonary area. 12 lead ECG showed incomplete Right bundle branch block with right axis deviation. 2D Echo showed grossly dilated left and right atrium and right ventricle, large osteum secundum ASD (30 mm in diameter), left to right shunt, mild Tricuspid regurgitation, moderate pulmonary hypertension with an estimated right ventricle systolic pressure of 40 mmHg and ejection fraction of 70.11%. All blood investigations were within normal limits.

Anaesthesia Management

After detailed pre-anaesthesia check up, written informed consent was taken. Patient was kept nil orally for 6 hours. Morning dose of oral Telmisartan was omitted. Injection: Ceftriaxone 2 gm and Injection: Gentamicin 80 mg intravenously were given preoperatively. Venous access was secured using a 18G IV cannula in left hand and ringer lactate was started. Routine monitoring of NIBP, Heart rate, ECG, SpO_2, $ETCO_2$ CVP were done. Premedication with intravenous glycopyrrolate 0.2 mg, midazolam 1mg, dexamethasone 4 mg and fentanyl 100ug was done. She was preoxygenated with 100% oxygen for 3 minutes. Induction was performed with Inj. Etomidate 15mg slow i.v and Inj. Vecuronium bromide 4 mg i.v. Size-3 I-gel was inserted and patient was maintained on IPPV (Tidal volume-400ml, Respiratory rate-12/min and PEEP 6cm H_2O) with 100% oxygen and sevoflurane to maintain MAC around 0.9. The aim was to maintain end-tidal CO_2 ($ETCO_2$) around 32-35 mmHg. After induction Bilateral TAP block was performed by landmark approach using 22G blunt needle

through the Triangle of Petit by loss of resistance (LOR) technique. 20 ml of 0.2% Inj. Ropivacaine was injected in both sides.

Intraoperatively pulse varied between 60-80 beats/min, blood pressure between 100/60-120/80mm Hg and SpO_2-100%. During the 45 min procedure Lactated ringer's solution 500 ml and normal saline was given. The urine output was 100 ml and total blood loss was around 100 ml. Patient was reversed with neostigmine 2.5 mg + glycopyrrolate 0.5mg. After extubation patient was conscious, responding to verbal commands, with normal vitals and pain free. She was kept in recovery room for 1 hour and then shifted to ICU. Postoperative analgesia was maintained by Intravenous Injection Paracetamol and Injection Diclofenac for one day then by oral analgesics. Patient was pain free postoperatively. Patient was orally allowed on second postoperative day on return of bowel function. Patient cardiac medication was resumed on the second postoperative day. She was discharged on 5th postoperative day.

Discussion

Atrial septal defect (ASD) is a opening in the interatrial septum. It accounts for 6%-10% of all congential heart disease. ASD classification is based on ASD location relative to fossa ovalis, developmental anomaly and its size. Osteum secundum ASD accounts for 70% of cases which involves the fossa ovalis and is midseptal in location [2]. ASD is the most common congential heart disease with a female to male ratio of 2:1. It is progressive in nature so the patients are usually asymptomatic during childhood. However, with increasing age due to reversal of shunt 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. The adverse effect of persistently increased pulmonary blood flow leads to increased in pulmonary vascular resistance and subsequent pulmonary arterial hypertension, cardiomegaly, arrthymias and myocardial ischemia. Pulmonary hypertension is classified as mild (36-49mmHg), moderate (50-59mmHg), severe (.60mmHg) according with right ventricular systolic pressure calculated by echocardiography [5]. The echocardiography helps to 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 [6,7]. Perioperative change in SVR can have important implications in patients with ASD [8]. The magnitude of left to right shunt depends on size of ASD, ventricular diastolic properties and the relative impedance in pulmonary and systemic circulation [9]. The problems which are anticipated during general anesthesia in these patients are air embolism during vascular access, heart block, dysrhythmias (5%-10%), heart failure and infective endocarditis.

Our patient is a 50 year old lady, a known case of Osteum secundum ASD who underwent Total Abdominal hysterectomy. The anaesthesia techniques which are have been commonly used for abdominal hysterectomy in these types of patients are usually general anaesthesia with 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. So we employed a unique anaesthesia approach of General Anaesthesia with controlled ventilation and bilateral TAP block with particular attention to control of factors that may cause sudden pulmonary hypertension and resultant hypoxemia and the potential for the development of acute heart failure, which would have been detrimental to the patient. Our patient had moderate pulmonary hypertension 100% oxygen was beneficial for her. The use of fentanyl and sevoflurane with the benefits of amnesia and analgesia permitted us to use 100% oxygen. We used Injection Etomidate as induction agent for better haemodynamic stability. I-gel was used to avoid sympathetic stimulation during laryngoscopy and intubation which would have caused increased SVR, hypertension and detrimental effect on the left to right shunt. Hypercarbia can be avoided by adequate adjustment of tidal volume and respiratory rate. The use of mechanical ventilation causes stretching of lungs leading to release of endogenous nitric oxide and prostaglandins which cause pulmonary vasodilatation [10]. Intraoperatively we avoided factors that can increase the shunt, maintained adequate preload and cardiac contractility, a near normal heart rate, SVR and PVR. Adequate monitoring was done to detect atrial arrhythmias and to avoid hypercarbia and hypoxia.

The Bilateral TAP block with NSAIDs provided superior postoperative analgesia without causing any haemodynamic instability [11]. The use of epidural catheter for postoperative analgesia might have caused unstable haemodynamics which could have been detrimental to our patient [12,13]. Postoperatively our aim was to avoid hypoxia and adequate pain control which was achieved by giving postoperative oxygen by mask for 4 hours and bilateral TAP block. This combined technique of General anaesthesia with bilateral TAP block can be used in these type of patients as its provides better intraoperative stability and good postoperative analgesia without causing haemodynamic instability.

Conclusion

Patients with ASD can undergo non cardiac surgery with the use of adequate balanced anaesthesia plan which can avoid increase in pulmonary vascular resistance, decrease in systemic vascular resistance, tachycardia, hypotension, hypercarbia, hypoxia and hypothermia. We achieved this balanced anesthesia by using general anaesthesia and bilateral TAP block. To conclude, with good preoperative assessment, proper preparation and providing good intraoperative and postoperative analgesia non-cardiac surgeries can be easily performed in these type of patients.

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Citation: Roy R, Prasad A (2015) Anaesthesia Management of a Patient with Large Atrial Septal Defect with Moderate Pulmonary Hypertension for Total Abdominal Hysterectomy. J Anesth Crit Care Open Access 2(6): 00075. DOI: 10.15406/jaccoa.2015.02.00075