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Anaesthetic Management of Patient with Large Atrial Septal Defect with Mild Pulmonary Hypertension Posted for Left Patella Fracture Repair

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Abstract: ***A 21year old female patient posted for left patella fracture repair was diagnosed to have large Atrial Septal Defect with mild pulmonary arterial hypertension. We report the successful management of this case using general anaesthesia along with Adductor canal Block. Careful monitoring and vigilant care during the perioperative period led to an uneventful recovery.***

Keywords: Atrial Septal Defect; left patella fracture; Mild PAH; General Anaesthesia; Adductor Canal Block

1. Introduction

Atrial Septal defect is most common congenital acyanotic heart disease. It has 3 type of defects namely ostium primum, ostium secundum and sinus venosus. The ostium secundum is the most common and accounts for 70% of cases with male to female ratio 1:2[1]. ASD results in Left to Right intracardiac shuntresulting in right ventricular volume overloadand hypertrophy withpulmonary hypertension. Complications of Uncorrected ASD include severe PAH, right sided heart failure,atrial fibrillation and Eisenmanger`s syndrome [2].

The Adductor canal block is another block of femoral nerve further down so that much of motor innervation of quadriceps group has already departed the nerve. This preserves much of quadriceps strength making early ambulation and rehabilitation safer. The most significant advantage of ACB is predominantly sensory block[3]

We hereby present a detailed management of a patient with Large ASD, mild PAH who underwent left patella fracture repairunder general Anaesthesia combined with Adductor Canal Block

2. Case Report

A 21 yr female, came to outpatient department with history of fall from height sustaining injury to spine and left Patella. The patient was posted for ORIF with TBW for left patella fracture.

Patient gave history of recurrent respiratory tract infection and dyspnoea on exertion NYHA grade 2 since 4 years.

Patient was previously operated for spinal instrumentation of L1-L2 1 month back under GA and kept in ICU for 3 days under observation and was uneventful.

3. Pre Anaesthetic Evaluation

On examination, heart rate - 114/min regular, blood pressure 110/70 mmHg, oxygen saturation 98% on Room air and jugular venous pressure was raised. On auscultation of chest, air entry was bilaterally equal.Airway examination revealed normal parameters Mallampati score grade I.

CVS – Mitral Area – Opening snap S1, S2 present

Pansystolic murmur Grade IV/VI in pulmonary and mitral area

Biochemical and haematological investigation were within normal limits. Chest Xray revealed prominent central pulmonary vessels, cardiomegaly. ECG revealed incomplete right bundle branch block. 2D Echo showed grossly dilated right atrium and right ventricle, Large ASD (21 mm) with left to right shunt, mild PAH 40 mmHg and left ventricular ejection fraction of 60%

4. Anaesthetic Management

A thorough pre anaesthetic check-up was done and high risk written informed consent was taken. Patient was kept nil orally for 8 hrs prior to surgery. General Anaesthesia combined with adductor canal block was planned for postoperative analgesia.

After shifting patient to Operation Theatre, monitors were attached ECG, pulse oximeter , NIBP (non-invasive blood pressure) and transducer with invasive blood pressure was attached after securing 20 G arterial line on left forearm. IV access was secured with 18 G large bore cannulae in Right forearm. 7fr Rt IJV central line was inserted for monitoring of intravascular volume status and ventricular function. Patient was preoxygenated and premedicated with Inj Midazolam (0.05 mg/kg) and Inj Fentanyl (2ug /kg) in titrated doses. Patient was then induced with inj Etomidate (0.3 mg/kg) and Inj Atracurium (0.5-1) mg/kg in titrated

doses. Oral Endotracheal intubation was done using ET tube no. 7 & cuff inflated and anaesthesia was maintained with air, oxygen (50:50), sevoflurane and controlled ventilation.

Throughout the surgery, continuous monitoring of ECG, Heart rate, Spo2, NIBP, IABP,CVP and ETCO2 was done. All the parameters including the urine output, fluid intake and blood loss were closely monitored.

After the surgery was over, the operative leg was slightly flexed at knee and externally rotated into stable position. After draping the leg with sterile sheet, an ultrasound transducer was placed transversely on medial part of thigh, halfway between superior anterior iliac spine and patella. After identifying Femoral Artery, femoral nerves were visible on either side of artery as bright echo densities. A 23 G spinal needle was inserted in plane from lateral side of transducer. The local anaesthetic solution of 15 ml of 0.5 % Inj bupivacaine and 5 ml of 0.2% lignocaine was injected on each side of artery at points of bright densities.

After end of procedure,residual neuromuscular blockade was reversed with Inj glycopyrrolate(0.008 mg/kg) + Inj Neostigmine (0.05 mg/kg). Patient was extubated once he regained full consciousness and obeyed verbal commands. Patient was assessed for pain 12 hrs after surgery VAS score -0.

5. Discussion

Atrial Septal Defect (ASD) is progressive in nature, asymptomatic in childhood but symptomslike exertional dyspnea, fatigue, palpitations, and arrhythmias appear during later ages due to reversal of shunt. [4]

Pulmonary hypertension is classified as mild (36 - 49 mmHg), moderate (50 - 59 mmHg) and severe (> 60 mmHg) based on the estimated right ventricular systolic pressure calculated by echocardiography [5].

The common complications arisingunder GA for this patient include paradoxical air embolism during the vascular access, heart block, dysrhythmias,shunting and infective endocarditis. All intravenous lines must be meticulously de-aired to prevent the risk of systemic air embolization in patients with intracardiac shunts. Inadequate depth of anaesthesia andsympathetic nervous system stimulation might increase Systemic Vascular Resistance, exacerbate left to right shunting, and reduce cardiac output in a patient with large ASD. An abrupt rise in Pulmonary Vascular Resistance can precipitate acute right ventricular failure causing decreased cardiac output, progressing to severe bradycardia and cardiac arrest[6] Pulmonary hypertensive crises can be avoided by hyperventilation, avoid sympathetic stimulation and minimize intrathoracic pressure. Inhaled nitric oxide should be available in the operating room for use in high risk patients requiring treatment for drastic rise in Pulmonary Vascular Resistance [7].

General Anaesthesia provides better hemodynamic stability and Adductor canal block provides adequate analgesia during postoperative period. Hypercarbia can be avoided by adequate modulation of tidal volume and respiratory rate. Inflation of lungs with intermittent positive pressure ventilation leads to release of endogenous nitric oxide and prostaglandins, which causes pulmonary vasodilatation [8]. Our primary aim during GA was to minimize increases in PVR, maintain SVR,detect atrial arrhythmias, avoid paradoxical air embolism as these changes may lead to hypoxemia, cyanosis and myocardial ischemia.

Intravenous induction agents for anaesthesia may depress myocardial contractility and decrease SVR which can adversely affect tissue oxygen delivery; hence induction was done with titrated doses using Injection Etomidate for better hemodynamic stability. Intraoperatively, tachycardia was managed with adequate analgesia. Nitrous oxide may increase PVR and increase the size of air bubble hence nitrous oxide was avoided.

Atrial and ventricular dysrhythmias are common in adults with CHD especially intraatrial reentrant tachycardia.Invasive arterial blood pressure monitoring is essential in patients with intracardiac or systemic to pulmonary shunts, susceptible to sudden changes in SVR/PVR.

Postoperative pain can affect early ambulation, range of motion and duration of stay in hospital.Adequate analgesia with motor preservation has become prime goal after orthopaedic surgeries to enable shorter hospital stay, early physiotherapy and faster recovery.[9]

In knee surgeries, epidural analgesia faces arelatively high failure rate [10] including adverse effects such as urinary retention and motor block [11], thereby hindering early mobilization.Adductor canal block(ACB) is associated with good analgesia and preservation ofmotor function. Compared with FNB, ACB results in less reduction in the quadriceps muscle strength [12] as only the motor nerve to the vastus medialis of the quadriceps muscle traverses the adductor canal [13].VAS is used for evaluating variation in pain intensity in which patients are instructed to indicate intensity of pain by marking 100mm line anchored with terms `no pain' at one end and `worst pain' on other. The VAS numeric value is distance in millimetres from `no pain' to the point marked by the patient.[14]

6. Conclusion

Patients with large ASD and PAH can undergo non-cardiac surgery after a detailed preoperative assessment, balanced intraoperative anaesthetic management including intraoperative and postoperative analgesia to avoid changes in SVR/PVR, tachycardia, hypotension, hypercarbia, hypoxemia and hypothermia.

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