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Case Report

A case report on the use of combined spinal epidural technique in the anaesthetic care of a patient with a large ASD and severe pulmonary hypertension

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ABSTRACT

A defect in the septum between the left and right atrium is known as atrial septal defect which is a congenital heart disease. The defect causes shunting of blood from left to right side of the heart, increasing the blood flow through the lungs. Small atrial septal defects may be found incidentally and never cause a major concern. Larger defects may damage the heart and also the lungs. The use of combined spinal and epidural technique in a patient with ASD can maintain hemodynamic stability, provide perioperative analgesia and also avoid the hemodynamic perturbations associated with general anaesthesia in a patient with severe pulmonary hypertension.

1. Introduction

The most prevalent acyanotic congenital heart condition identified in adulthood is atrial septal defect (ASD).[1] There are four types: coronary sinus defect (rare), ostium secondum (85%), ostium primum (10%), and sinus venosus (5%).[2] Younger patients are typically asymptomatic, but by their third or fourth decade, people with untreated ASD may experience exertional dyspnea. A large ASD results in blood shunting from the left to the right, which overloads the right ventricle and leads to its hypertrophy and pulmonary artery hypertension (PAH), further causing atrial fibrillation, congestive heart failure, and Eisenmenger syndrome in long-standing cases.[3] The two main variables influencing the shunting fraction in ASD are systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR). Excessive sympathetic activation, anxiety, or changes in SVR or PVR may lead to exacerbation of the shunting across the defect (left to right). Here we describe the use of combined spinal and epidural (CSE) anaesthesia in the management of a patient posted for emergency hernioplasty. The patient had a large ASD (52 mm) and significant pulmonary hypertension.

2. Case Presentation

A 42-year-old man who weighed 50 kg and had a history of ostium secundum atrial septal defect (OS-ASD) and severe PAH went to the emergency room complaining of stomach pain, right inguinal pain, and vomiting for the previous two days. According to his prior medical records, he had a known case of OS-ASD and was not taking any medication. He had a history of palpitations and dyspnea on exertion. His pre-anaesthesia evaluation revealed an irregular heartbeat of 92 beats per minute (bpm), blood pressure (BP) of 116/83 mmHg, SpO2 of 92% on room air (RA), and normal jugular venous pressure (JVP). The patient had a breathing rate of 30 breaths per minute.

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A grade 4/6 pan-systolic murmur (PSM) was heard in the pulmonary and mitral areas, along with a loud P2 during a cardiovascular examination. On auscultation, there were audible bilateral basal crepitations. Biochemical and haematological investigations have shown normal results. Chest x-ray suggested cardiomegaly (Figure 1). ECG showed atrial fibrillation with right axis deviation (Figure 2).

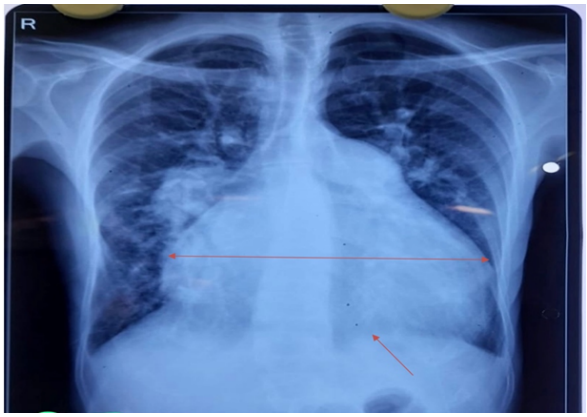

Figure 1: Chest X-ray showing cardiomegaly and dilated pulmonary vessels

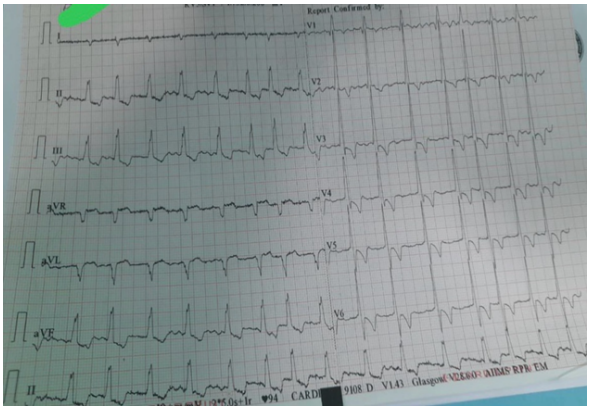

Figure 2: ECG showing atrial fibrillation and right axis deviation

Echocardiography: Large OS-ASD (52 mm) with left to right shunt, severe TR, severe PAH with estimated RVSP 86.17 mmHg, LVEF 73%, and extensively dilated RA/RV was detected (Figure 3).

A complete pre-anaesthesia examination was followed by signed, informed and high-risk consent. The nil per oral (NPO) status of the patient was confirmed to be in accordance with the guidelines. Upon arrival in the preoperative holding room, an 18-gauge venous access was established. Ringer lactate (RL) was administered as the maintenance fluid. EMLA cream was applied to the skin overlying the left radial artery to provide local anaesthesia, after which the cannulation procedure was performed. Standard ASA monitors were attached, and continuous

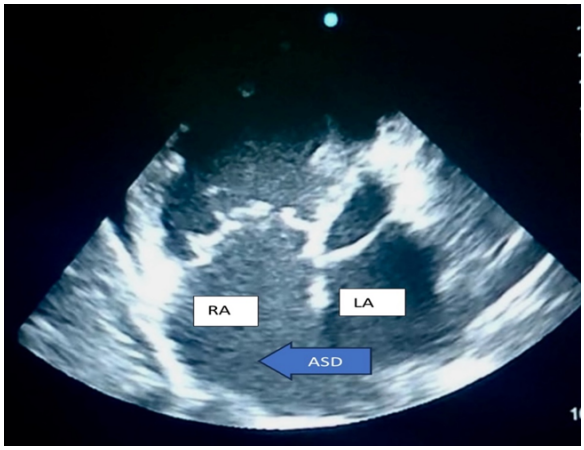

Figure 3: 2D Echocardiography image showing right atrium (RA), left atrium (LA) and the atrial septal defect (ASD).

monitoring of blood pressure was done via the arterial line. ABG at baseline indicated pH/pCO2/pO2/HCO3 2-/BE/Lac/Sodium/Potassium = 7.47/28.8/64.1/21.6/ 0.5/0.8/138.9/3.31. After confirming the loss of resistance (LOR) to the saline method, an epidural catheter was placed at the L2L3 level under aseptic measures for intraoperative anaesthesia and postoperative analgesia. To achieve the T8 dermatomal level, low-dose spinal anaesthesia (7.5 mg bupivacaine) was administered with 25 mcg of fentanyl as an adjuvant in the L3-L4 area. Using a Hudson face mask, oxygen augmentation was administered. The intraoperative heart rate ranged from 60 to 80 bpm (Reference range: 60-100 bpm), the mean arterial pressure (MAP) was 65 to 85 mm Hg (Reference range: 65-105 mmHg), and the oxygen saturation level was between 94 and 96% (Reference range: 92%-100%), 400 cc of ringer lactate was administered intraoperatively. Around 100 ml of blood was lost, while approximately 100 ml of urine was produced. After one hour of the subarachnoid block, 4ml of 0.5% bupivacaine (20 mg) was injected into the epidural space to sustain the motor block up to T8-T10. After 50 minutes, another 4ml of 0.5% bupivacaine was administered via the epidural. ABG was repeated at 2 hours intraoperatively and showed: pH/pCO2/pO2/HCO3 2/BE/Lac/Sodium/Potassium = 7.421/27.4/192.9/18/ 4.7/1.5/140.7/3.93/. Surgery lasted for 2 hours without any hemodynamic disturbances.

Targeting a VAS pain score below 4, postoperative analgesia was maintained with an epidural infusion of 0.125% bupivacaine. On the third day after the surgery, the epidural catheter, which was used for pain management, was carefully removed. Following that, the patient was closely monitored for any signs of discomfort or complications. After ensuring that the patient was stable and comfortable, they were discharged from the hospital on the fourth day after the surgery.

3. Discussion

ASD is an acyanotic heart disease, forms 6-10% of all the congenital heart defects.[4] It is characterised by a hole or a defect between the right and the left atrium of the heart. Cardinal symptoms such as palpitations, dyspnea with exertion, weariness, and atrial arrhythmias are frequently present in patients with mild ASD well into middle age.[5] 70% of instances involving the fossa ovalis involve OS-ASD, which is mid-septal.[6] Large ASDs (>9 mm) can cause alterations in the heart that increase pulmonary blood flow as well as clinically substantial left-to-right shunting. The main applications of echocardiography are the noninvasive assessment of pulmonary artery hypertension and assistance in risk-stratifying the patients presenting for various surgical procedures under anaesthesia. Transthoracic echocardiography was carried out in the preoperative area just before surgery to validate earlier findings. In accordance with the right ventricular systolic pressure (RVSP) determined by TTE, pulmonary artery hypertension is categorised as mild (36-49 mmHg), moderate (50-59 mmHg), or severe (60 mmHg).[7]

The presence and severity of pulmonary artery hypertension, the location and size of the ASD, and hemodynamic impact of the shunt, are assessed by transthoracic echocardiography.[8] For patients with ASD, perioperative changes in SVR may be significant.[9] The relative impedance of the pulmonary and systemic circulation and the ventricular diastolic features along with the size of the ASD affect the left to right shunting.[10]

We used the combined spinal epidural anaesthesia (CSE) approach, which combines epidural and low-dose spinal anaesthetic. Use of low dose spinal drug helped in achieving an adequate level of motor blockade which was subsequently extended with the help of an epidural. With the use of CSE technique, we avoided the undue sympathetic stimulation that occurs during GA intubation and extubation, which can negatively affect SVR and PVR.

All potential causes of shunt reversal or increased shunt fraction were kept to a minimum intraoperatively. Epidural injections were used to provide adequate analgesia because the pain might dramatically raise a patient's SVR after surgery. Combining low-dose spinal and epidural anaesthetics enhances analgesia and perioperative hemodynamic stability.

4. Conclusion

Non cardiac surgeries in a cardiac patient may pose unique challenges to the anaesthesiologist. It involves the interplay between certain determinants of cardiac output like heart rate, pre-load, after-load, contractility, systemic vascular resistance and pulmonary vascular resistance.

In a patient with ASD, SVR and PVR are the two significant parameters that determine the shunting across the defect.

The use of neuraxial techniques like CSE as a choice of anaesthesia could avoid the unnecessary stimulation that is associated with general anaesthesia, provide better perioperative analgesia as compared to any other pain management technique and also maintain a stable hemodynamic profile throughout the perioperative period.

Therefore, it may be concluded that with neuraxial techniques like CSE non-cardiac procedures can be performed with little difficulty.

5. Source of Funding

None.

6. Conflict of Interest

None.

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