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Case Report

Anaesthesia Management of Case of Atrial Septal Defect (Cardiac Disease) for Proximal Humerus Fracture (Non-Cardiac Case)

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ABSTRACT

Atrial Septal Defect is most common congenital developmental acyanotic cardiac anomaly. There is left to right shunt of blood in normal compensated state. In decompensated state, the shunt is reversed and flow is from right to left side causing heart failure and thrombo-embolic event. Here, we report a case of Humerus fracture with large ASD, managed under General Anaesthesia with Interscalene block without any deleterious effects like Venous Air Embolism, Spontaneous Reversal of Shunt etc. As patient was in Beach chair position.

Introduction

Atrial Septal Defect (ASD) is the most common acyanotic congenital developmental cardiac anomaly of the septum between the two atriums in which, there is mixing of blood forming left to right shunt of blood in normal compensated state. It is predominant in females with ratio of 3:1 to males [1].

Types of ASD: 1. Ostium Primum; 2. Ostium Secundum; 3. Ostium in Septum Venosus; 4. Ostium in Septum Coronary Sinus. As in compensated state the shunt works through left to right flow. But due to pressure imbalance in the intra-atrial pressure, it can reverse the shunt i.e. from right to left hence it causes Right sided Heart failure in patients [2].

Hence, it was necessary to maintain adequate intra-atrial pressures during the surgery so as to make sure there is no reverse shunting of blood during the induction of anaesthesia due to cardiac depressive activity of majority of the anaesthesia agents. And also to monitor peri-operative haemodynamic changes to avoid reverse shunting.

In this report, we present a case of Large ASD posted for non-cardiac elective surgery.

Case Report

55 year old female (57kg) known case of ASD with hypertension with history of trauma to right proximal humerus fracture and was posted for open reduction and internal fixation. Patient was haemodynamically stable on admission, with no history of head injury or any associated complaints. The patient is known case of hypertension since 7 years and was on treatment Tab. Amlodipine 5mg OD, Tab. Ramipril 2.5mg OD, Tab. Ecosprin 75mg HS.

Old reports of her Transoesophageal Echocardiography were suggestive of ASD Ostium Secundum with size of 22.8 mm along the diameter.

Further evaluation of patient, all routine investigations were normal with moderate anaemia with HB 10.7 gm/dl, ECG suggestive of bifid P wave, broad QRS complexes

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with T wave inversion in Lead III, V2,V3 and flattening of T wave in rest precordial leads; 2D Echocardiography as suggestive of large ASD of diameter 27.4mm, Left ventricular ejection fraction of 45%, Dilated right atrium and right ventricle, moderate pulmonary artery hypertension with PASP of 54 mm of Hg, moderate Tricuspid regurgitation. Cardiac biomarkers were within normal limits. Chest radiograph was suggestive of significant cardiomegaly and prominent broncho-vascular markings.

Comprehensive anaesthesia plan was laid down to go ahead with surgery as by induction of general anaesthesia with endotracheal intubation and Interscalene block to provide adequate intra-operative anaesthesia and post-operative analgesia. Written informed high risk consent was taken after explaining the plan of anaesthesia and discussing the intra-operative or post-operative complications and its management, to the patient and her relatives.

On patient's arrival to the operation theatre. All emergency equipments and drugs for difficult intubation and resuscitation were kept ready. All standard monitors i.e. ECG, pulse oximeter, non-invasive blood pressure monitors were attached. Under all aseptic precautions, patient was premedicated through large bore 18G Intravenous (IV) catheter on left hand, Inj. Glycopyrrolate 0.2 mg, Inj. Midazolam 1mg, Inj. Ondansetron 4mg, Inj. Fentanyl 50mcg IV. For special monitoring, under USG guidance central venous catheter was placed into right internal jugular vein to assess central venous pressure during the peri-operative period in event of haemodynamic instability, arterial line was also placed in left radial artery for invasive blood pressure monitoring to assess beat to beat variations.

For general anaesthesia, patient was pre-oxygenated with 100% O2 on closed circuit followed by Inj. Fentanyl 50 mcg IV. Induction agent Inj. Etomidate 20mg IV and Inj. Vecuronium 5 mg IV was administered as muscle relaxant to facilitate endotracheal intubation. Inj. Esmolol 2 mg was given to blunt the intubation pressor response. Endotracheal tube no 7.5 ID was placed, confirmed with EtCO2 graph.

Patient was then taken on Volume control mode of ventilation with O2 50%, Air 50%, Sevoflurane on closed circuit with Intermittent Positive Pressure Ventilation and Inj. Vecuronium IV for maintenance of surgical plane of anaesthesia. Core temperature was monitored with a temperature probe placed into nasopharynx and state of normothermia for patient was maintained by providing external heat by hot air body warmer.

Under all aseptic precautions, right interscalene block was administered under USG guidance, which blocks brachial plexus at the level of roots with Inj. Ropivacaine 0.75% 10cc, Inj. Dexamethasone 4mg, Inj. Normal Saline 0.9% 5cc after confirming negative aspiration every 4cc.

Later, patient was given beach chair position and open reduction, internal fixation with plating was done. Vigilant intra-operative monitoring was done. Precordial stethoscope was placed and stand-by portable USG machine with 2D Echo was kept to assess the intra-operative events of tachycardia, venous air embolism due to the nature and position during the surgery. Blood pressure was maintained between 100-120/60-80 mm of Hg. Adequate fluid resuscitation was done to maintain Central Venous Pressure between 8-10 cm of water, replaced the blood loss (300ml) with 1-pint Packed cell volume of blood. There were no intra-operative untoward events noted. Hence, it was decided to extubate this patient.

After completion of surgery, Inj. Esmolol 2mg IV was administered to attenuate extubation reponse. Patient was reversed with Inj. Neostigmine 2.5mg and Inj. Glycopyrrolate 0.4mg IV. Patient was later shifted to SICU for post-op monitoring. She was comfortable and pain free in post-operative period for 28 hours, later discharged to wards the next day.

Discussion

ASD is most common acyanotic congenital heart defect. It has more propensity to occur in females with ratio of 2:1 than in males. Usually population upto 40 years of age are asymptomatic. In early stages patient presents with complaints of fatigue, dyspnoea on exertion, palpitations or arrthymias. In later years, ASD manifests as Pulmonary arterial hypertension (PAH), right sided heart failure, atrial fibrillation-flutter, stroke, Eisenmenger syndrome [1,3].

Most ASD are as small as 3mm in size, which often close spontaneously. Defects as large as 9mm never close by themselves. It needs clinical intervention to manage the defect. Here, we have mentioned the defect being approximately 28mm, much larger than 9mm as mentioned in classification for size of ASD. The immensity of left to right shunt depends on the size of ASD, for this patient the large size of 27.4mm of ASD has manifested into 2D echo changes suggestive of dilated right chambers of heart and significantly raised pulmonary arterial pressures to 54 mm of Hg [4].

Due to raised pulmonary arterial pressure and state of cardiac depression due to various anaesthetic agents used during induction of general anaesthesia, causes decrease in cardiac output, raised pulmonary vascular resistance (PVR) which in-turn causes reversal of shunt, state of hypoxemia and complete cardiac failure. So the goal of anaesthetic management in patients with PAH is to lower the PVR and maintain adequate systemic vascular resistance (SVR) also avoiding tachycardia which can lead to decreased cardiac output in this patient. Hence monitoring beat to beat variation of heart rate, blood pressure via arterial line and monitoring central venous pressure to maintain adequate hydration as there is higher risk of air embolism in dehydrated patients was of utmost importance to watch for.

There is likelihood of causing venous air embolism. Therefore vigilant monitoring the EtCO2 to avoid

hypercarbia, PA pressure and in case of sudden desaturation, a precordial stethoscope is placed for auscultation and standby portable USG machine was kept to perform intra-operative 2D echo to increase the sensitivity of diagnosis of Venous air embolism.

Hypothermia also causes increase in PVR [5] therefore, core temperature monitoring is necessary. Also to maintain the SVR in these patients, Inj. Esmolol was used to blunt the pressor response during intubation and extubation. Use of Air 50% as a carrier gas for inhalational agent is preferred, due to contraindicated effect of increasing SVR by the most commonly used agent i.e. Nitrous oxide [6].

As ASD is usually a left to right shunt, during surgery it can cause reversal of shunt i.e. right to left due to various factors which increases the risk of entering the air into systemic circulation leading to paradoxical air embolism. Also due to the particular beach chair positioning of the patient, she was at risk for venous air embolism. Hence, care was taken to not inject any air into the vascular circulation, by implementing aspiration into the syringe before injecting any drug into the circulation via central or peripheral lines.

Additional regional neuraxial block will facilitate the patient to tackle noxious painful stimulus after recovery from general anaesthesia, which in-turn will reduce the chances of increasing the heart rate and SVR, leading to detrimental reversal of ASD shunt. Therefore, additional neuraxial block should be given to patients, to provide adequate intra-operative anaesthesia and prolonged post-operative analgesia. That decreases the need of intra-operative anaesthetic agents, opioid analgesics in such patients. Here in this case, we had administered Interscalene block for same purpose.

Considering cardio-pulmonary pathophysiology of patients with large ASD. Selection of appropriate plan of anaesthesia with meticulous implementation of safer techniques to avoid deleterious complications.

Conclusion

Detailed pre-operative evaluation and proper plan of balanced anaesthesia with vigilant monitoring for the prompt recognition of untoward complications like reversal of shunt, venous air embolism etc and its management is necessary for safe outcome of patients with large ASD for non cardiac cases.

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