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ANAESTHETIC MANAGEMENT OF A PEDIATRIC PATIENT WITH ATRIAL SEPTAL DEFECT UNDERGOING NON-CARDIAC SURGERY: A CASE REPORT

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Abstract
This case report presents the anaesthetic management of a 2-year-old male child with bilateral congenital thumb anomalies and an incidentally diagnosed moderate ostium secundum atrial septal defect (ASD) undergoing elective pollicisation surgery. Despite the presence of congenital heart disease, the patient exhibited no pulmonary hypertension or cardiac symptoms. A multidisciplinary approach involving cardiology consultation and meticulous perioperative planning enabled safe administration of general anaesthesia. The case highlights the importance of tailored anaesthetic strategies in pediatric patients with congenital heart defects undergoing non-cardiac procedures.

Keywords: Atrial Septal Defect, Pediatric Anaesthesia, Congenital Heart Disease, Pollicisation, Non-Cardiac Surgery, Pulmonary Hypertension, Perioperative Management

INTRODUCTION

Congenital heart diseases (CHDs) are among the most common congenital anomalies encountered in pediatric patients, with atrial septal defect (ASD) representing approximately 25% of acyanotic CHDs. ASD is characterized by a defect in the interatrial septum allowing left-to-right shunting of blood, which can lead to right heart volume overload and pulmonary vascular changes over time. The osteum secundum type is the most prevalent form, typically located at the fossa ovalis.

Children with ASD may remain asymptomatic for years, and the defect is often discovered incidentally during evaluation for unrelated conditions. Anaesthetic management in such patients requires careful consideration of the cardiovascular implications, especially when undergoing non-cardiac surgeries. This case report discusses the perioperative anaesthetic considerations and successful management of a pediatric patient with moderate ASD undergoing pollicisation for congenital thumb hypoplasia.

CASE PRESENTATION

A 2 year 1 month -old male baby was diagnosed to have bilateral congenital thumb anamoly(**B/L Thumb Hypoplasia Right Grade IV, Left Grade IIIB)** since birth and was planned for elective sugical correction of the thumb deformity(pollicisation of the thumb).During pre operative evaluation he was incidentally diagnosed to have moderate ostium secundum ASD.

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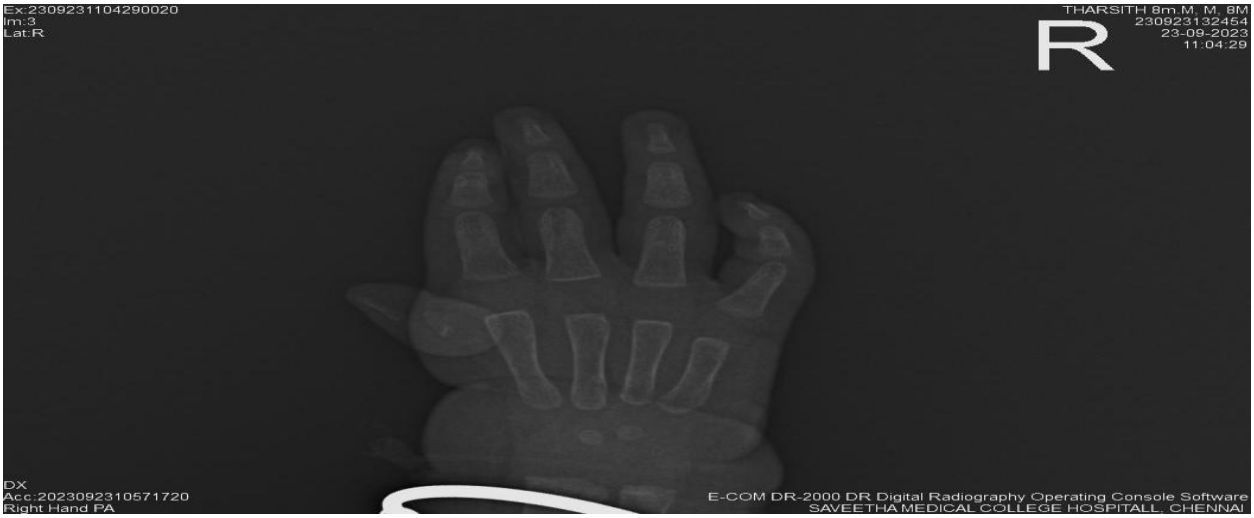
He was born with birth weight of 2.7 kgs normal vaginal delivery with milestones achieved till date and immunised up to age.



He has no cardiac complaints at present.

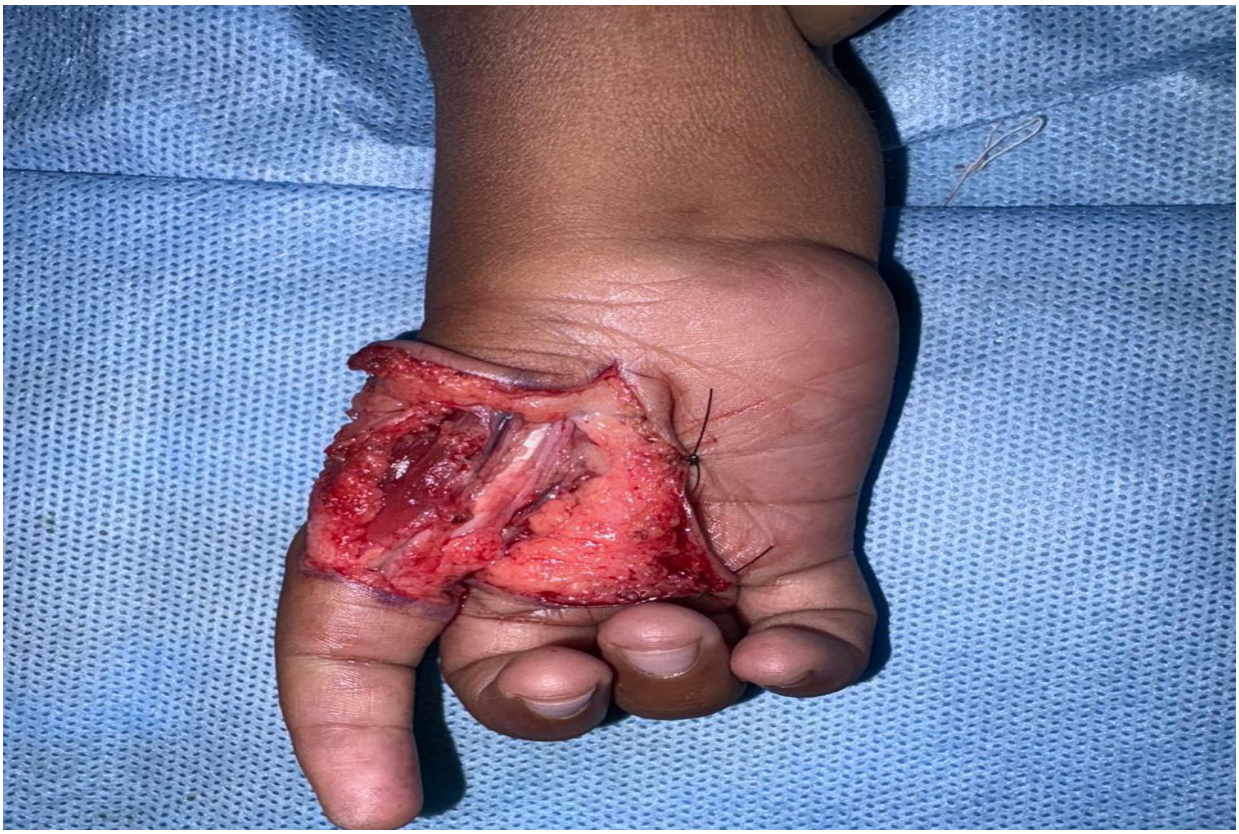
There was Mild failure to thrive.No history of recurrent repiratory tract infections.

On general examination, patient weighed 10.2 kg. For preanesthetic assessment his vitals were recorded, pulse rate was 120 beats per minute and blood pressure was 102/60 mm Hg.Spo2:98% at RA.CVS :s1 normal.S2 wide and fixed split.Grade 3 ejection systolic murmur + in the pulmonary area

.His airway assessment showed COPUR score of 6. Chest auscultation showed normal vesicular breath sound with bilaterally equal air entry.

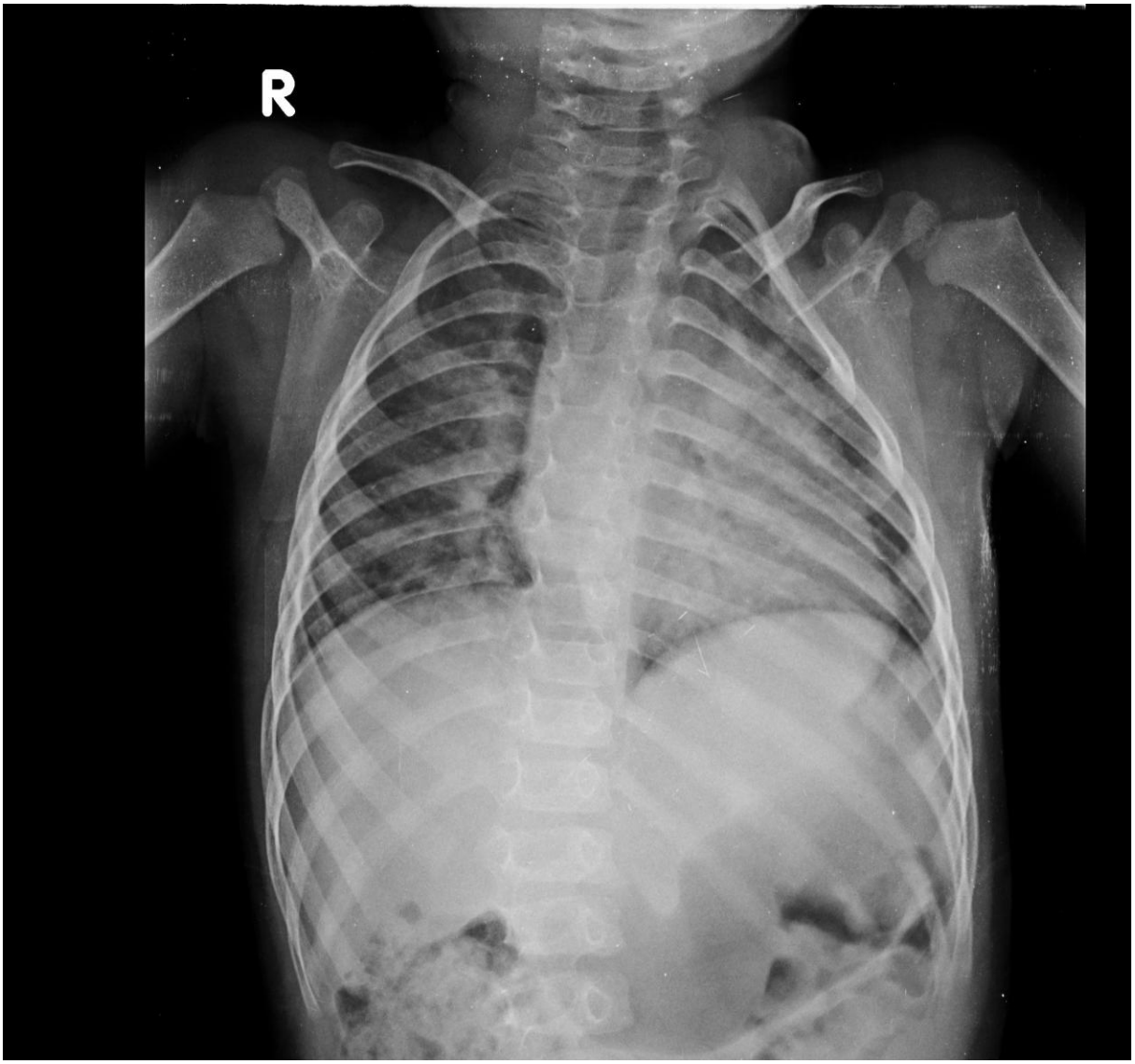
XRAY SHOWED DILATED RIGHT ATRIUM AND RIGHT VENTRICLE,DEVIATION OF TRACHEA TO LEFT

Electrocardiogram (ECG) showed sinus rhythm,QRS Axis +90,PR INTERVAL 120 Msec, RV DOMINANCE.



2D Echo reported Medium sized osteum secundum ASD of size 11mm with left to right shunt, PAPVC OF LUPV VIA LEFT VERTICAL VEIN TO INNOMINATE VEIN,DILATED RA,DILATED RV,NO PAH,GOOD BIVENTRICULAR SYSTOLIC FUNCTION..

Cardiologist opinion was taken and cardiologist advised to proceed with the surgery with no additional risk to anaesthesia His haemoglobin was 10 gm % and other blood reports were within normal limits. General anaesthesia was planned for the surgery and written informed high-risk consent was taken after proper counselling. Patient was kept fasting for six hours preoperatively. In the operation theatre, 22G venflon was secured, intravenous line was deaired and IVF DNS was started. Standard noninvasive monitors including End-Tidal Carbon Dioxide ($EtCO_2$) and temperature monitors were attached. Inj Glycopyrrolate 0.1 mg,INJ DEXAMETHASONE 1mg, Inj Ondansetron 1 mg and Inj Fentanyl 20 mcg were given intravenously (IV). Preoxygenation was done with 100% Oxygen for three minutes. Inj Thiopentone 50 mg was given slow IV as induction agent and airway was secured with portex cuffed endotracheal tube of size 4.5 after giving loading dose of muscle relaxant, Inj Atracurium 5 mg IV .Tube was fixed appropriately after checking bilateral equal air entry. Maintenance of anaesthesia was done with Oxygen and Isoflurane. Intermittent doses of Inj. Atracurium 0.1 mg/kg iv was given for muscle relaxation. Intraoperatively, his Mean Arterial Pressure (MAP) was maintained between 60-70 mmHg, heart rate remained in range of 115 -125 per minute, oxygen saturation was 98% and $EtCO_2$ was 32-34 mmHg. Intravenous fluid was given judiciously with regular monitoring of urine output and blood loss. At the end of surgery after adequate reversal of neuromuscular blockade patient was extubated smoothly. Postextubation vitals were normal and patient was monitored in the ward



for one day. Postoperatively, adequate analgesia was ensured with Inj Paracetamol and Diclofenac rectal suppository. Patient started his feeds orally after 3 hours and was discharged on fifth postoperative day. He had his first follow-up after seven days and had no new complaints and was referred to cardiology OPD for further management of ASD.

DISCUSSION

Atrial Septal Defect (ASD) is one of the more frequently documented acyanotic congenital cardiac anomalies (about 25% of all Congenital Heart Diseases).ASD is defined by a defect in the interatrial septum permitting pulmonary venous return in left atrium to pass directly to the right atrium. ASD can be categorised based on the defect location in relation to fossa ovalis, the size of the defect and volume of the shunt and can be associated with anomalies resulting into a wide range of clinical manifestations from asymptomatic cardiac sequelae to right heart failure, pulmonary arterial hypertension, and rarely atrial arrhythmias Osteum Secundum is the most prevalent type of ASD and it amounts to 70% of cases with ratio of 1:2 for males to females, respectively. It involves the fossa ovalis and is located in the mid-septal region .Large ASD, >20 mm leads to significant shunt and can have substantial haemodynamic effects in form of increased pulmonary perfusion and resulting increase in pulmonary vascular resistance, which if chronic, leads to development of PHT. Echocardiography is the choice of investigation to confirm the size and type of ASD, volume of shunt and also the presence and grade of PHT. PHT can be graded as mild (36-49 mmHg), moderate (50-59 mmHg) and Severe (>60 mmHg) [6-8]. Ventricular hypertrophy, myocardial ischaemia and arrhythmias and even heart blocks are reported adverse events for long standing PHT and therefore, these can be anticipated during general anaesthesia along with air embolism in cases of ASD .In Eisenmenger syndrome, Pulmonary Vascular Resistance (PVR) is very high and is characterised by irreversible pulmonary vascular disease with reversed or bidirectional shunt flow. Perioperative mortality is more in patients with Eisenmenger syndrome.In our case, a 2-year-old male had a moderate sized Osteum Secondum defect with left to right shunt with no PHT undergoing pollicisation of thumb.The preferred anaesthetic technique for pollicisation surgery in pediatric age group is General anaesthesia. Maintenance of ventilation and systemic vascular resistance is possible in general anaesthesia.Also, mechanical ventilation of lungs by their stretching effect stimulates release of nitric oxide and prostaglandins which are pulmonary vasodilator One of the important precautions that have to be taken is to avoid systemic air embolisation, so the IV lines were cautiously deaired. The patient was induced by administering Inj. Thiopentone in small incremental doses of 20 mg till the patient lost consciousness. According to Lovell AT the rate and dose of the IV-induction agent are more important than the actual drug itself.N2 O was not used for maintenance of anaesthesia so as to decrease the risk of paradoxical air embolism. The intention of anaesthetic management in such patients is to reduce the increase in pulmonary vascular resistance, to stabilise systemic vascular resistance, to safeguard tissue oxygen delivery. Inadvertent rise in PVR leads to acute right heart failure followed by oxygen desaturation and reduced cardiac output.Factors that cause increase in PVR are hypercapnia, hypoxemia, hypothermia, acidaemia, pain. Inadequate anaesthesia and stimulation of sympathetic nervous system can result in increase of systemic vascular resistance and increase in PVR which cumulatively will decrease cardiac output resulting in hypotension leading to decrease in pulmonary blood flow causing desaturation. Hence, it was aimed to maintain normotension, euthermia, adequate pain relief and depth of anaesthesia. Patient was optimally oxygenated and ventilated to avoid hypercapnia and desaturation. Intravenous fluid was given judiciously in view of PHT. Inj Xylocard was given intravenously before intubation and extubation to decrease the sympathetic response associated with these procedures. Postoperatively, patient was closely monitored in ward and was ensured adequate pain relief. Course in hospital remained uneventful.

CONCLUSION

Patients having large ASD with PHT can successfully undergo general anaesthesia for noncardiac surgeries .This can be achieved by optimal preoperative preparation with meticulous intraoperative management, which aims at avoiding increase in PHT, maintaining systemic vascular resistance, optimal oxygen delivery along with ensuring good postoperative analgesia.

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