ANAESTHETIC MANAGEMENT OF A CHILD WITH UNCORRECTED TETRALOGY OF FALLOT UNDERGOING MYRINGOPLASTY

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ABSTRACT

Perioperative management of the patients with uncorrected Tetralogy of Fallot (TOF) for noncardiac surgery is a challenge for the anesthesiologists. TOF is the commonest cyanotic congenital heart disease (CHD). We report a case of a child with unrepaired TOF, presented for ear surgery highlighting the anaesthetic concerns and the methods to minimize the complications in the perioperative period.

Keywords: Myringoplasty, non-cardiac surgery, tetralogy of Fallot

INTRODUCTION

Tetralogy of Fallot (TOF) is the commonest cyanotic congenital heart disease (CHD), representing 10% of all CHDs. (1) It comprises ventricular septal defect (VSD), an over-riding aorta, right ventricular outflow tract obstruction (RVOTO) with resultant right ventricular hypertrophy (RVH). Hypercyanotic spell is the most feared complication of an unrepaired TOF, caused by excessive right to left shunting which occurs due to reduced systemic vascular resistance or infundibular spasm. An anaesthesiologist faces major challenges to maintain cardiovascular stability in such patients but their complications can be minimized by adequate planning and preparation.

CASE REPORT

A 12-year-old male weighing 30 kg, admitted in our hospital with complaints of foul-smelling ear discharge (Right>Left) with decreased hearing since a year. The patient had history of easy fatigability, multiple hospital admissions in the past for respiratory infections and even PICU admission a month back for septic shock. On general examination, the patient was tachycardic, SPO_2 of 74-82% in room air with no cyanosis or signs of respiratory distress, and pan systolic murmur. His haemoglobin was 13 g/dL with haematocrit 33% and normal coagulation profile. Echocardiography was suggestive of TOF with large subaortic VSD of 1.4cm with subpulmonic extension, bidirectional shunt with net left to right shunt, overriding of aorta 50%, severe infundibular and valvular pulmonary stenosis (PS), Atrial septal defect (ASD) 3.1mm with left to right shunt, dilated right atrium, right ventricle, aortic root, RVH, left sided aortic arch and ejection fraction 60%. ECG showed right axis deviation with RVH.

He was diagnosed as bilateral mucosal chronic suppurative otitis media (CSOM) and was planned for right myringoplasty. The patient was accepted as ASA physical status Class IV, and informed consent was obtained.

In the operating room, 22 G intravenous (i.v.) cannula was re-checked for patency and antibiotics was given for infective endocarditis prophylaxis and judicious preloading was done. Standard monitors were attached which showed preoperative pulse rate of 117/min and blood pressure of 110/71 mm Hg. After preoxygenation his SpO_2 raised to 95%, and the patient was premedicated with 50 mcg fentanyl. Left radial artery was cannulated with 22G catheter. Ketamine 40 mg and propofol 20mg was given intravenously for induction and tracheal intubation was carried out after xylocard 50mg and 3 mg of vecuronium. Postintubation pulse rate was 116/min and blood pressure 103/68 mmHg. Oxygen, vecuronium and isoflurane (1%–1.5%) were used to maintain anaesthesia and SpO_2 was 94-

95%with ETCO2 of 38-40mmHg. Surgery lasted for 55 mins and 30 mL of blood was lost. After the completion of surgery 0.3 mg glycopyrrolate and 1.5 mg neostigmine was given and trachea was extubated. Paracetamol infusion and dexamethasone was given intraoperatively. The patient had 3 episodes of hypotension which was treated with phenylephrine 30mcg i.v. bolus. The patient was shifted to PICU and was observed for the next 24 hrs and was then transferred to HDU and subsequently shifted to ward with SpO_2 76% at room air after 2 days.

DISCUSSION

The dreaded complication in an unrepaired TOF presenting for surgery is a hyper cyanotic spell due to increasing right to left shunt leading to desaturation and cardiovascular collapse. Anaesthetic aims are to maintain preload and systemic vascular resistance (SVR), minimise increase in pulmonary vascular resistance (PVR) and thus promote left to right shunting. SVR can be maintained by iv fluid bolus, use of vasopressors such as phenylephrine and keeping the patient in knee chest position. Increase in PVR can be minimized by avoidance of acidosis, hypercarbia and hypoxia. Sympathetic stimulation also causes infundibular spasm and promotes right to left shunting; hence sedation, proper pain management and avoidance of light plane of anesthesia are equally important.

These patients may have associated chromosomal abnormalities (Edward's, Down's syndrome) and if dysmorphic features are present, the airway management can be challenging. Also, tracheal anomalies are not uncommon and may require smaller endotracheal tubes. (2) The pre-operative evaluation should categorize high risk patients who have more risk of hyper cyanotic spells. Patients with more frequent spells and those taking beta blockers fall in this category. (3) Patients with long-standing disease may have polycythaemia and adequate fluid management and sometimes venesection before surgery may be required in such cases. Antibiotics prophylaxis for infective endocarditis is advised in uncorrected TOF which was given 30 minutes before the start of surgery in our case.

During induction of anaesthesia, rapid fall in SVR is undesirable. (4-6) We inserted an arterial line before induction and dose of Ketamine (40mg) with propofol (20mg) was given in a titrating manner. Ketamine preserves SVR and hence was used for induction and A-line helped us measure the beat to beat blood pressure and intervene immediately in case of fall in blood pressure. There was no drop in blood pressure during induction.

Sympathetic stimulation also promotes right to left shunting by causing infundibular spasm and increasing PVR. Hence adequate sedation with anxiolytics in preoperative period, proper pain management and avoidance of light plane of anaesthesia in perioperative period are equally important. We used multimodal analgesia (fentanyl, paracetamol, dexamethasone, local infiltration) and intubated the patient in deep plane and after giving xylocaine to blunt the sympathetic response to laryngoscopy.

We made sure that i.v. lines were free of air bubble throughout the surgery because even small amount of air can lead to paradoxical embolism which may be life-threatening. Nitrous oxide increases PVR and has cardio depressant effect, hence needs to be avoided in such cases. The anaesthetic concerns and implications are tabulated in Table 1.

Table 1. Anaesthetic concerns and implications in unrepaired TOF

Anaesthetic concerns	Causes	Implications
Difficult airway	Associated chromosomal anomalies	Difficult airway cart, smaller tubes.
Paradoxical air embolism	Intracardiac defects with right to left shunt	Avoidance of bubbles in iv line
Infective Endocarditis	Congenital heart diseases	IE prophylaxis
Desaturation	Increased right to left shunting	Prevent decrease in SVR: vasopressors, iv fluids, knee chest position
Hypercyanotic spells	Decreased SVR, Increased PVR, right to left Shunt	Maintain SVR: vasopressors, iv fluids, knee chest position Prevent increase in PVR: Avoid acidosis, hypercarbia, hypoxia, hypothermia, pain
Sympathetic stimulation	Pain, anxiety, laryngoscopy, light plane of anaesthesia during surgery	Proper pain management, sedation, blunt reflexes during laryngoscopy and intubation, maintain deep plane of anaesthesia

CONCLUSIONS

Goal of anesthesia should be aimed at maintaining normovolemia, normothermia, preventing hypoxemia, and avoiding decreases in systemic vascular resistance (SVR) and increases in PVR, avoiding air bubbles in IV lines and preventing excessive sympathetic stimulation. Carefully administered anesthesia with meticulous planning, judicious use of drugs, combined with strict monitoring, and vigilance can make a safe outcome even in difficult cases.

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