

Anaesthetic Management of Pulmonary Stenosis in a Pediatric Patient with Chronic Renal Disease Posted for Laparoscopic Continuous Ambulatory Peritoneal Dialysis Repositioning: A Case Report

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ABSTRACT:

The presence of a progressive congenital valvular heart disease in a pediatric patient, can pose a challenge to anaesthetists in planning for incidental surgeries. Most of the available case reports from various journals describe the anaesthetic management in adults, whereas, pulmonary stenosis can present anytime during childhood and adolescence. The present case-report highlights anaesthetic management in a 9-year-old child, who was diagnosed with moderate pulmonary stenosis, with no availability of current severity grading of peak pressure gradients, along with underlying renal failure posted for an emergency laparoscopic procedure.

Keywords: Pulmonary stenosis, Laparoscopic Continuous Ambulatory peritoneal dialysis, tachycardia.

INTRODUCTION

The latent asymptomatic period in right sided valvular heart diseases has been seen to have resulted in lesser reception of attention from clinicians[1].The pulmonary stenosis is a condition associated with right ventricular outflow tract obstruction. It can be valvular, subvalvular, supra-valvular or in pulmonary arterial tree. The more severe the obstruction, earlier the valvular abnormality is detected. Long-term asymptomatic survival is common, in most patients with mild to moderate pulmonary stenosis, except for the critical stenosis in neonates [2].Isolated pulmonary stenosis accounts for about 10% of congenital heart diseases [3].

CASE REPORT A nine-year-old patient weighing 20 kgs, known case of Polycystic kidney disease induced chronic renal failure,was posted for Emergency Continuous Ambulatory Peritoneal Dialysis repositioning. Her records revealed that she was advised pulmonary balloon valvuloplasty 6 months back, on her only cardiology reference visit and she was started with oral Tab propranolol 2.5 mg and Tab

Digoxin 0.25 mg 1/2, both, twice a day, since then; with her echocardiogram findings of moderate pulmonary stenosis with pulmonary pressure gradient of 52 mm Hg, with dilated RA/RV and Ejection fraction of 45%. Her diagnosis of pulmonary stenosis was incidental and was through the cardiology reference made by pediatric nephrology department. Her father stated that, they were not aware regarding any cardiac ailment as she was always asymptomatic, until she developed easy fatigability while playing only 1.5 years back, when she was diagnosed with the renal condition, followed by the ongoing dialysis till date. She was on tab losartan 12.5 mg and tab clonidine 0.1 mg 1/2, both, once a day for chronic kidney disease related hypertension.

Our pre-anaesthetic evaluation revealed a New York Heart Association (NYHA) class 2 patient with pulse rate of 100 bpm, blood pressure of 140/90 mm Hg and respiratory rate of 20 pm. Auscultation revealed delayed pulmonic component of second heart sound and long systolic murmur in the neo aortic area, radiating to all other areas including back. Her electrocardiogram revealed right axis deviation and right ventricular hypertrophy. Jugular venous pressure was not raised, fresh echocardiogram was not available and blood gas analysis revealed [pH: 7.29, BE :-5.2, HCO₃⁻ :18 mmol/L, Na⁺: 138 mmol/L, K⁺ :5.0 mmol/L]. Hb: 8.6 g/dL, serum creatinine: 2.1 mg/dL and serum potassium: 4.8 mEq/L. Platelets and coagulation profile were within normal limits.

Parents were explained regarding the patient's condition and written informed consent was taken, with American Society of Anesthesiologists, grade IV. On the day of surgery, morning dose of all the ongoing medications were continued. In the operating room, routine monitors like electrocardiogram, non invasive blood pressure and pulse-oximeter were connected. There was a double lumen catheter present in the right sided internal jugular vein, with only one port functioning. Chest x-ray was ordered and its insitu location in superior vena cava, just above the carina was confirmed. Inj. Ondansetron 2mg, Glycopyrrolate 0.1mg, inj. Midazolam 1mg and inj. Fentanyl 50mcg were given intravenously. Pre-oxygenated with 100% oxygen for 3 min, inj. Lignocaine 30mg iv given, followed by induction with inj. Propofol 40mg i.v., given in slow titrated doses. I-gel of size No. 2 was inserted, after inj. Atracurium 10 mg i.v. was injected and maintained with air and oxygen in ratio of 50:50 and sevoflurane. Paracetamol suppository 500mg was placed. Inj. sodium bicarbonate 10 ml was given iv. As there was tachycardia with heart rate 120 bpm and blood pressure 148/90 mm Hg, after pneumoperitoneum with carbon dioxide insufflation at 12-14 mm Hg, Inj. Fentanyl 25 mcg iv and Inj. Lignocaine 10 mg iv bolus were repeated. There was a further rise in blood pressure to 154/92 mm Hg and heart rate to 140 bpm, Inj. esmolol 10 mg was given iv in titrated bolus doses, followed by transient drop in blood pressure to 130/84 mm Hg and heart rate to 120 bpm. FiO₂ was increased to 1.0. Depth of anaesthesia was ensured by titrating sevoflurane and repeating 10mg propofol iv bolus. Clearing on omentum loop and adhesions, made the procedure last upto 45 minutes. There was another peak in heart rate to 150 bpm and blood pressure 134/92 mm Hg, following which Inj. Metoprolol 1 mg iv was given, that finally stabilized the vitals. Emergency backup of Digoxin, furosemide and dobutamine injections along with defibrillator was kept ready. Total fluid transfused intraoperatively was 80ml of normal saline. She was reversed with inj. Neostigmine 1 mg and Glycopyrrolate 0.2 mg i.v. and extubated after patient gained adequate respiratory efforts. The patient was conscious & comfortable with vital signs stable, blood pressure 110/70 mm Hg and heart rate 94 bpm. The patient was shifted to post-operative ward with nasal cannula at 2L/min oxygen and was kept under observation for vital signs. Her post-operative stay was uneventful. She was referred to cardiology centre after resumed-dialysis post-repositioning and provided with strict instructions to have regular follow-up with cardiologist.

DISCUSSION

Severity grading of the hemodynamic consequences in pulmonary stenosis, based on peak systolic pressure gradient, Trivial < 25 mm of hg, Mild 25-49 mm of hg, Moderate 50-79 mm of hg, Severe >80 mm of hg [4]. Echo and Doppler flow studies help to determine the site of obstruction and severity of stenosis. Relief of stenosis is recommended in all patients with peak gradient \geq 50 mm Hg. Balloon valvuloplasty is the treatment of choice for symptomatic moderate or severe pulmonary stenosis [1]. Long-term outcome of these patients is considered to be excellent and there is well-recognized decline in the pressure gradient during first year of valvuloplasty [5-7]. The present case-patient had moderate pulmonary stenosis (peak gradient 52 mm Hg), as per her reports, 6 months back. Laparoscopic procedure and underlying chronic kidney disease were added challenges to the absence of evidence of current severity grading of the disease. Pulmonary stenosis, being a progressive condition, fresh echocardiogram and cardiology opinion were must to proceed, as we had no clear picture of the current deterioration grading, but owing to emergency surgery, the risks associated with the laparoscopic procedure with the concurrent kidney and cardiac involvement, were explained to the parents. Balloon valvuloplasty should have been done, as per the cardiologist advice 6 months back, as situation might have worsened up with the presence of recent history of catheter malfunction related irregular dialysis, in an already CKD patient. Carbon dioxide insufflation in laparoscopy can further increase the tachycardia and hypertension, as seen in our case, despite of the morning dose of rate controlling medications. The objectives of hemodynamic parameter management are maintenance of right ventricular contractility alongwith right and left ventricular afterload. A low normal heart rate is recommended. Pulmonary stenosis aggravates workload of right ventricle and intraventricular pressure [5]. Optimization of myocardial contractility necessitates maintenance of preload; however right heart failure can be precipitated with excessive preload. Cardiac arrest in these patients, may result into an extremely difficult resuscitation, as the stenotic pulmonary valve obstructs the force of blood flow across, resulting into ineffective cardiac compressions[5]. Lidocaine and Esmolol should be given rapidly, in case of cardiac arhythmias and external defibrillator should be available standby. [5,7] General anaesthesia with I-gel, helped us in avoiding pressor response with better airway control, managing hemodynamic stability during induction & fluid management. In present case, patient could have developed tachyarrhythmias in no time and would have needed resuscitation, if tachycardia could not have been controlled with long acting beta blocker administration.

CONCLUSION

Pulmonary stenosis, being a progressive condition, can turn symptomatic at any time till adulthood, such patients present with a potential challenge to the attending anaesthetist, especially in emergency cases and absence of cardiac workup on the day of surgery. They require meticulous preoperative assessment even when planned for shortest duration or minimally invasive surgery. Well preparedness with emergency backup of anticipated risks and associated complications always saves the day.

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