Case Report

Anaesthetic management of pacemaker implantation in a child with dilated cardiomyopathy and acquired complete atrioventricular heart block

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ABSTRACT

We report a case of an 8-year-old girl who presented with syncopal attacks and a history of viral illness a month ago. On examination, she was conscious, oriented but had a heart rate of 42/min which was unresponsive to atropine. She was started on dobutamine and isoproterenol. Electrocardiography and echocardiography revealed complete heart block with moderate tricuspid regurgitation, dilated cardiomyopathy and low ejection fraction. Patient was planned for urgent permanent pacemaker insertion. General anaesthesia was administered with endotracheal tube and controlled ventilation using fentanyl, ketamine and pancuronium. For patient safety, invasive arterial monitoring was instituted and external pacing was kept standby. Transvenous pacemaker leads were implanted onto the right ventricular wall through the left subclavian vein.

Key words: Anaesthetic management, complete heart block, dilated cardiomyopathy, myocarditis, pacemaker

INTRODUCTION

Viral myocarditis is usually asymptomatic in children but may potentially be life threatening in some paediatric patients, due to fulminant progression to conduction abnormalities, heart failure and dilated cardiomyopathy. However, while most children recover from conduction anomalies, few may need a permanent pacemaker, as recovery can be delayed and may take weeks to months.

CASE REPORT

An eight-year-old girl (20 kg) was admitted to the hospital with the complaints of syncopal episodes. The patient was awake, oriented and afebrile with blood pressure of 110/60 mm Hg, heart rate of 42/min and respiration rate of 20/minute. She had history of upper respiratory tract infection one month ago. ECG showed a complete atrioventricular (AV) block with atrial rate 100 bpm and ventricular rate of 42 bpm. Bradycardia was unresponsive to injection atropine so infusion of isoproterenol was started at the rate of 0.05 μg/kg/min and dobutamine 5 μg/kg/min. Laboratory investigations revealed creatinine phosphokinase, troponin T and CRP to be elevated (750 U/L, 50.2 ng/ml and 44 mg/L respectively). Serum electrolytes and brain natriuretic peptide levels were within normal limits. Cardiomegaly was seen on the chest X-ray. Transthoracic echocardiography revealed

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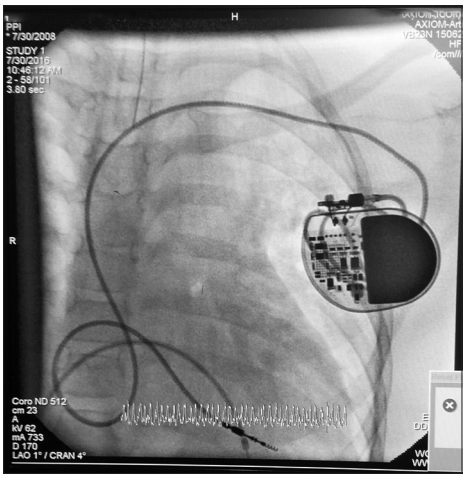

Figure 1: Chest X-ray AP view showing permanent VVI pacemaker (Medtronic E2DR21 EnPulse 2 DR) with transvenous leads

moderate tricuspid regurgitation with mild mitral regurgitation and dilated cardiomyopathy with left ventricular ejection fraction of 30%. In view of syncopal attacks and prolonged recovery from myocarditis, decision of permanent pacemaker implantation was taken.

After informed consent from parents, the patient was shifted to operation theatre. On arrival, her heart rate was 38 beats/min despite the preoperative infusions. In view of further deterioration during the anaesthetic induction, transcutaneous pacemaker pads were applied. Non-invasive monitoring in the form of electrocardiogram (ECG), peripheral oxygen saturation and temperature probe were started. The left radial artery was catheterised for beat to beat blood pressure monitoring after premedication with injection ketamine 0.5 mg/kg IV and oxygen supplementation by Hudson mask. Anaesthesia was then induced with fentanyl 2 μg/kg and 1 mg/kg of ketamine. After achieving adequate muscle relaxation with 0.06 mg/kg pancuronium, airway was secured with cuffed endotracheal tube (internal diameter 5.5 mm) and end tidal carbon dioxide was maintained between 35-40 mm Hg. Percutaneously, venous access was obtained through left subclavian vein and permanent pacemaker was inserted (Medtronic E2DR21 EnPulse 2 DR) in right ventricular wall [Figure 1]. Intraoperative haemodynamic parameters were stable. Heart was paced at the rate of 90 beats/min and on ventricular demand pacing mode (VVI). After completion of procedure, patient was extubated and shifted to high dependency unit (HDU). Post-operative pain was mild and was managed with 200mg paracetamol.

DISCUSSION

Myocarditis is an inflammatory process of myocardium which may have varied course.[1] It is an important cause of morbidity and mortality in children, due to its association with cardiac dysfunction and dilated cardiomyopathy.[2] Viral myocarditis has been recognised as an important cause of dilated cardiomyopathy in 18-35% of children.[3] Mostly patients have non-specific symptoms such as fever, fatigue, myalgia, shortness of breath but some may present with chest pain, syncopal attack and even sudden death.[4]

Sinus tachycardia is the most common ECG finding in myocarditis. Conduction anomalies, bundle branch block and complete heart block are less common. They usually resolve within few days, but may persist up to several weeks. Symptomatic bradycardia or complete heart block for more than 2 weeks is the indication of permanent pacemaker implantation reported in literature.[5] Dual-chamber pacing would ideally restore the appropriate mechanical atrioventricular synchrony and improve cardiac output. The greatest haemodynamic improvement has been shown with atrial synchronised simultaneous biventricular pacing.[6] Since our patient could not afford the cost of double chamber pacemaker, single chamber pacemaker was planned.

Different anaesthetic techniques are described for pacemaker implantation in the literature.[7] Pacemaker implantation can be performed transvenously under local anesthesia with sedation in adults, but in paediatric population, only a few case reports are available. Since our patient was uncooperative and continuously crying even after counselling, general anaesthesia was the only feasible and safest option. Also, in view of non-responsiveness to pharmacological therapy, we planned to keep transcutaneous pacing stand by during induction. According to literature no benefit has been achieved by practising routine preoperative temporary pacing in children with third degree heart block undergoing permanent pacemaker.[8]

These children have increased sensitivity to volume loading and have poor tolerance to changes in vascular resistance. Thus, in addition to the principles applying to all children requiring general anaesthesia, specific effects of the administered anaesthetics on the cardiovascular system should be considered

and pharmacologic as well as electrical measures to increase heart rate should be prepared before induction of general anaesthesia. Most volatile and intravenous anaesthetics influence myocardial contractility, heart rate, and systemic flow resistance and concentration should be carefully titrated to response. Opioids benzodiazepines and ketamine exert fewer effects on blood pressure. Hence we decided to induce with fentanyl and ketamine. Alternative intravenous induction agents are thiopental and propofol but they may depress contractility and decrease systemic vascular resistance. Sevoflurane exerts direct myocardial depressant effects but the magnitude is smaller than those of other volatile anaesthetics. Therefore, in this case, anaesthesia was maintained with sevoflurane (end-tidal concentration 2.5-2.8%). Pancuroninum was the muscle relaxant of choice due to its vagolytic activity.

CONCLUSION

Myocarditis is a potentially life-threatening disease. Its tendency to occur in young patients makes it one of the most frequent causes of DCM in this age group. Myocarditis should always be considered in child with DCM and CHB undergoing general anaesthesia for permanent pacemaker implantation. Induction with fentanyl, ketamine and maintenance with sevoflurane are a safe practice.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Durani Y, Giordano K, Goudie BW. Myocarditis and pericarditis in children. Pediatr Clin N Am 2010;57:1281-303.
2. Stiller B. Management of myocarditis in children: The current situation. Adv Exp Med Biol 2008;609:196-215.
3. Caforio AL, Pankuweit S, Arbustini E, Basso C, Gimeno-Blanes J, Felix SB, *et al*. Current state of knowledge on aetiology, diagnosis, management, and therapy of myocarditis: A position statement of the European society of cardiology working group on myocardial and pericardial diseases. Eur Heart J 2013;34:2636-48.
4. Canter CE, Simpson KE. Diagnosis and treatment of myocarditis in children in the current era. Circulation 2014;129:115-28.
5. Veve I, Melo LF. Anaesthesia for pacemaker insertion. Semin Cardiothorac Anesth 2000;4:138-43.
6. YaoFSF. Pacemaker. In: Yao FS, editor. Yao and Artusio's Anesthesiology. Problem-oriented Patient Panagement. Philadelphia: Lippincott-Raven Publishers; 1999.p. 258-75.
7. Atlee JL. Cardiac pacing and electroversion. In: Kaplan JA, editor. Cardiac Anesthesia. Philadelphia: WB Saunders Company; 1999. p. 959-90.
8. Bennie RE, Dierdorf SF, Hubbard JE. Perioperative management of children with third degree heart block undergoing pacemaker placement: A ten year review. Paediatr Anaesth 1997;7:301-4.