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Transient Complete Heart Block after Percutaneous Transcatheter ASD Device Closure

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ABSTRACT

Transcatheter device closure of atrial septal defect (ASD) is associated with increased complications in small children in device size ≥ 19mm or indexed size ≥ 0.18 mm/cm and weight≤ 15 kg. Complete atrioventricular heart block (CHB) is reported as a rare complication of ASD device closure. We report the case of a 7year-old boy, 23kg weight, underwent device closure of ASD and subsequently developed CHB next day after the procedure which was completely resolved by day 3 with steroid treatment. Similar case reports were rarely reported in the literature.

Key words: atrial septal defect, complete heart block, device/height ratio

INTRODUCTION

Percutaneous transcatheter closure of ostium secundum ASD is being increasingly attempted in small children due to development in device technology and was reported to have increased frequency of major and minor complications in small children weighing less than 15kg with event rate accounting to 5.5% and 9.4% respectively.[1]ASD device closure is less commonly associated with atrioventricular conduction blocks (AVB) than Ventricular Septal Defect device closure. The reported incidence of AVB varies from < 1% to 6.1% following ASD device closure.[1-4]

CASE REPORT

A 7-year-old boy, presented with history of recurrent lower respiratory tract infections since the age of 3months. He was 112 cm tall and weighed 23 kg. Physical examination was suggestive of ASD. Baseline 12-lead electrocardiogram (EKG) showed normal sinus rhythm, RBBB with no conduction delays (Fig.1). On Transthoracic 2D echocardiography 22 mm ASD was found with adequate superior, posterior and inferior rims along with dilated right atrium and right ventricle. Pulmonary to systemic flow (Qp/Qs) was 3.5:1 with normal pulmonary arterial pressure. After confirming drainage of three pulmonary veins into left atrium, transcatheter device closure of ASD was carried out under general anesthesia with 26 mm Lifetech Cera Multi-fenestrated ASD occluder. EKG monitoring during the procedure was within normal limits. There is neither residual shunt nor impingement on atrioventricular valves was found on post procedure 2D echocardiography (Fig. 2). EKG monitoring on next day showed complete heart block (CHB) with a ventricular rate of 90 beats per minute (Fig.3). As the patient was asymptomatic and hemodynamically stable, oral prednisolone course at 1 mg/kg/day and aspirin at a dose of 10 mg/kg/day to decrease the inflammation and edema around the AV node were started assuming the above cause as reason for conduction problems. On day 3 of steroid treatment, patient reverted to normal sinus rhythm with no conduction delays or blocks (Fig. 4). A 5-day course of steroids was administered in the hospital, before patient was discharged

to home with a prescription of aspirin for 3months and a 5-day steroid taper. He remained asymptomatic with normal sinus rhythm with no recurrence of heart block at 6 months of follow up.

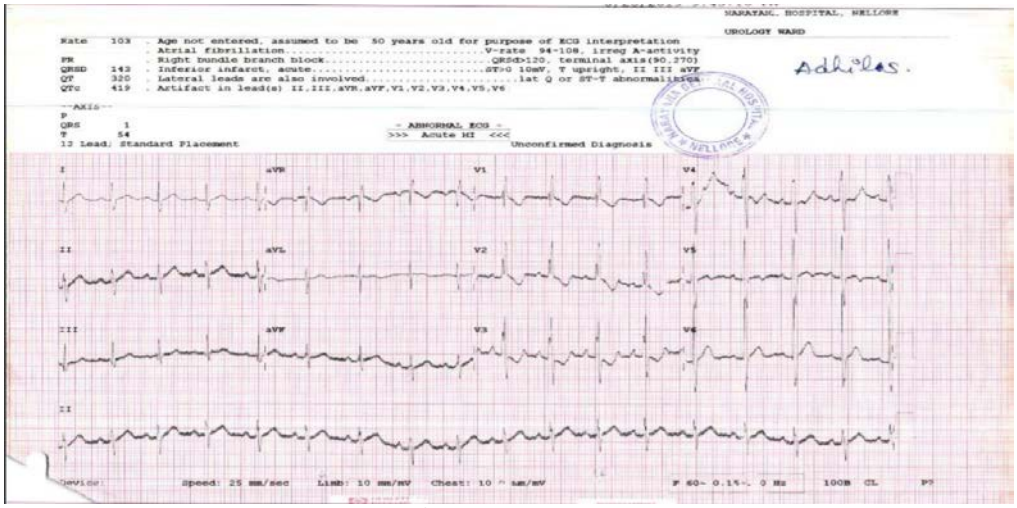

Fig. 1 EKG at the time of presentation with sinus rhythm and RBBB

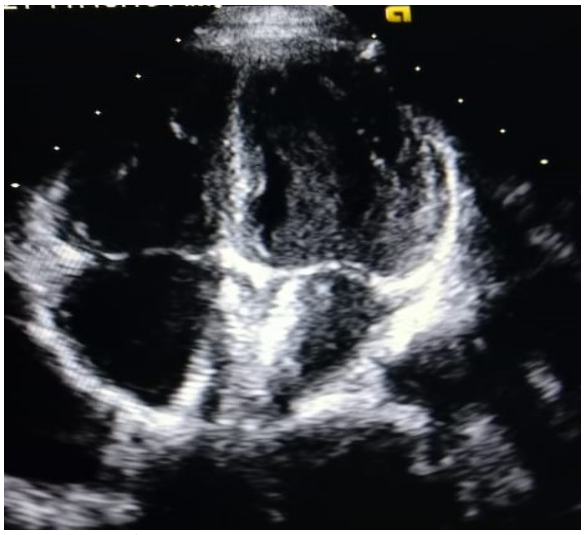

Fig. 2 Apical four chamber view 2D echocardiogram showing ASD device in Situ with no impingement on the atrioventricular valves

DISCUSSION

In ASD baseline conduction defects may occur due to proximity of defect to the AV node in the triangle of Koch and hemodynamic changes and chamber dilation that occur secondary to the defect. This anatomic location may predispose conduction disturbances on any septal repair procedure. This risk of arrhythmias ranges from 10 to 30% with open surgical repair and about 1-6% after percutaneous device closure.[5] The onset may be as early during device deployment to as late as few days to weeks. Late progression of first degree AVB to complete heart block four years after ASD device closure was described in one of the case reports.[6] Most of the studies reported complications in children less than 15 kg, but in our case the child is 23kg and this is the first case of CHB we have encountered, which spontaneously reverted with steroid therapy.

One of the important risk factors for development of CHB is deficient postero-inferior rim. But in spite of adequate postero-inferior rim, our patient developed CHB. The inflammation and edema caused around the AV node by the atrial discs is partly considered as etiology of the conduction blocks after ASD device closure which is the basis for empirical steroid therapy in such cases, along with evidence from studies of ventricular septal defects on conduction blocks after device closure.[7,8]However there have been cases where steroids were not useful and hence the recommendations on this issue are not standardised.[9] In our case the cause of CHB is assumed to be due to inflammatory edema and transient ischemia of the AV node secondary to mechanical irritation by ASD device, which responded with anti-inflammatory therapy. Risk factors for development of AVB include hemodynamically significant defect with

QP/QS ratio >2.8, larger defects[10]with greater device/height ratio ≥ 0.18mm/cm, larger devices, short distance between right atrial disk to tricuspid valve, deficient postero-inferior rim where in our case QP/QS ratio was around 3.5 and device by height ratio 0.23 mm/cm with adequate distance between right atrial disc to tricuspid valve with adequate postero-inferior rim.

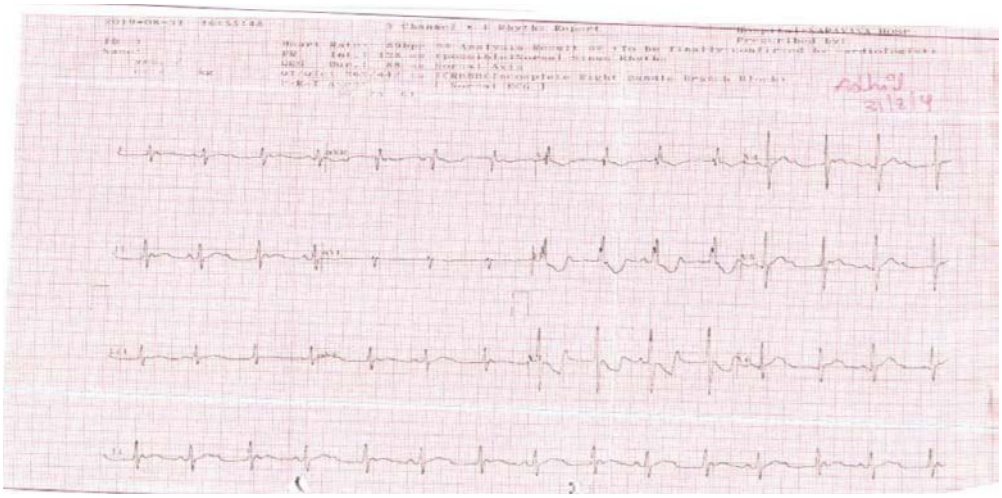

Fig. 3 EKG done next day of ASD device deployment showed atrioventricular dissociation and complete heart block.

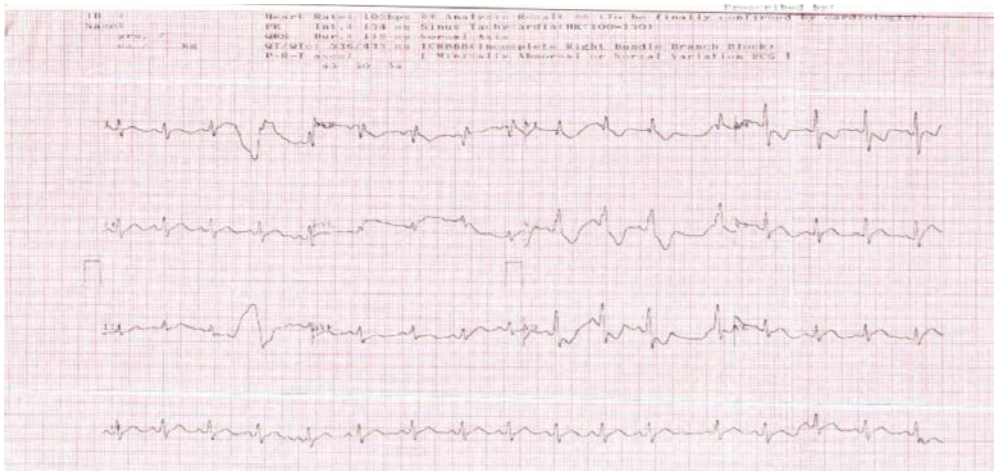

Fig. 4 EKG at third day showed normal sinus rhythm with resolution of complete heart block.

CONCLUSION

Most of the studies had reported complications in children less than 15kg, but in this case we encountered such complication with child weighing 23kg, with device height ratio of 0.23 mm/cm, device size of 26 mm and adequate postero-inferior margin signifying the cause of conduction defects mainly depends on device size and device height ratio, less dependent on weight of patient and steroid therapy playing a major role in CHB after device closure.

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Conflict of Interest: None

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