INDIAN HEART JOURNAL 66 (2014) 366–369

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journal homepage: www.elsevier.com/locate/ihj

Case Report

Reversible complete atrioventricular block after percutaneous ASD device closure in a child < 15 kg

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ARTICLE INFO

Article history:
Received 18 July 2013
Accepted 23 March 2014
Available online 22 April 2014

Keywords:
ASD device closure
Complications
Complete heart block

ABSTRACT

Transcatheter device closure of atrial septal defect (ASD) in small children less than 15 kg may be associated with increased complications. Complete atrioventricular heart block (CHB) is a rare complication of ASD device closure in such a setting. We report the case of a 2-year-old girl, less than 15 kg, who underwent device closure of ASD with Amplatzer Septal Occluder and subsequently developed CHB 12 h after the procedure which resolved completely with steroid treatment on fifth day. Case report of a similar kind is rarely reported in the literature. Despite adequate postero-inferior margin CHB may still occur in small children as in our case.

1. Introduction

Due to development in device technology, transcatheter ASD device closure is being increasingly attempted in small children these days. A recent study in device closure of ASD in small children weighing less than 15 kg has reported a higher incidence of major and minor complications (5.5% and 9.4% respectively).[1] The atrioventricular conduction blocks (AVB) after device closure of ASDs is less commonly reported than after Ventricular Septal Defect closure. The reported incidence of AVB following ASD device closure varies widely from none up to 6.1%.[1–4]

2. Case report

A 2-year-old girl, presented with history of failure to thrive and recurrent lower respiratory tract infections since the age of 2months. She was 88 cm tall and weighed 10.6 kg. Physical examination was suggestive of ASD. Baseline 12-lead electrocardiogram (EKG) showed normal sinus rhythm with no conduction delays. Transthoracic 2D echocardiography showed a 15 mm ostium secundum ASD with adequate superior, posterior and inferior rims and dilated right atrium and right ventricle. Pulmonary arterial pressure was normal and ratio of pulmonary to systemic flow (Qp/Qs) was 2.9:1. Three

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http://dx.doi.org/10.1016/j.ihj.2014.03.013

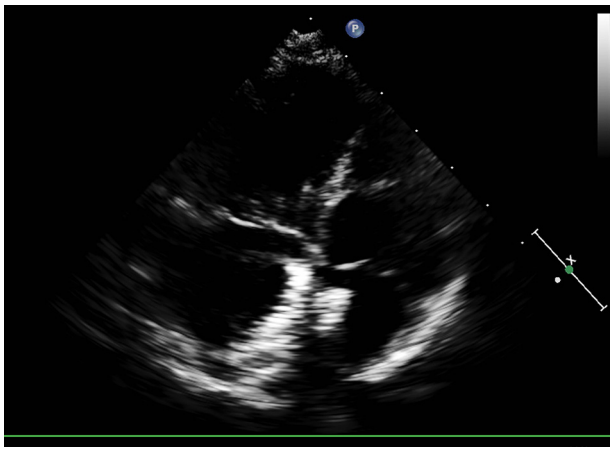

Fig. 1 – Post procedural 2D echocardiogram (Apical 4 chamber view) demonstrated ASD device in position. There was no impingement on the atrioventricular valves.

pulmonary veins were draining into left atrium. Transcatheter device closure of ASD was carried out under general anesthesia with 18 mm Amplatzer Septal Occluder device (ASO). EKG monitoring during the procedure was within normal limits. Post procedure 2D echocardiography showed no residual shunt and there was no impingement on atrioventricular valves (Fig. 1). EKG monitoring at 12 h showed complete heart block (CHB) with a ventricular rate of 75 beats per minute (Fig. 2). The patient was asymptomatic and hemodynamically stable. She was started on a course of oral prednisolone at 2 mg/kg/day and aspirin at a dose of 10 mg/kg/day to decrease the inflammation and edema around the AV node thought to cause the conduction problems. On day 5 of steroid treatment, patient reverted to normal sinus rhythm with no conduction delays or blocks (Fig. 3). A 7-day course of steroids was administered in the hospital, and patient was discharged to home with a prescription of aspirin for 3months and a 5-day steroid taper. At 9 months of follow up she continues to remain asymptomatic and in normal sinus rhythm with no recurrence of heart block.

3. Discussion

CHB after ASD device closure is rarely reported in the literature (Table 1). Conduction defects may be present in patients with ASDs at baseline, possibly due to hemodynamic changes and the proximity of the AV node in the triangle of Koch to the location of the defects. Further, this anatomic location predisposes any procedure for repair of the septal defect to cause a disturbance in the conduction. This risk of arrhythmias in the course of open surgical repair ranges from 10 to 30% whereas after percutaneous device closure it is about 1–6%.[2,3,5] The onset may be as early as during device deployment even before the device is released to as late as few days to weeks. One of the case reports illustrates late progression of first degree AVB to complete heart block four years after ASD device closure.[6] In our experience of 153 patients of ASD device implantation, this is the first case of CHB we have encountered, which spontaneously reverted with steroid

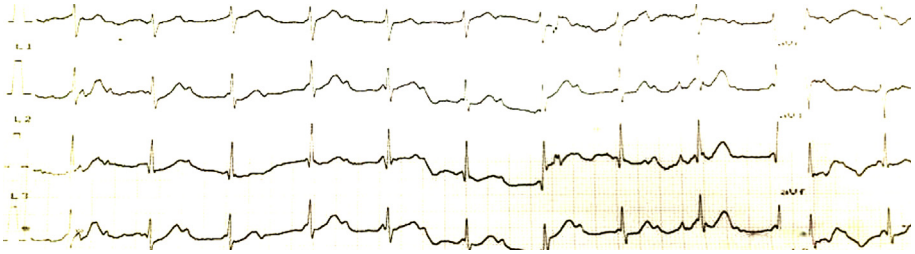

Fig. 2 – EKG at 12 h of ASD device deployment showed atrioventricular dissociation and complete heart block.

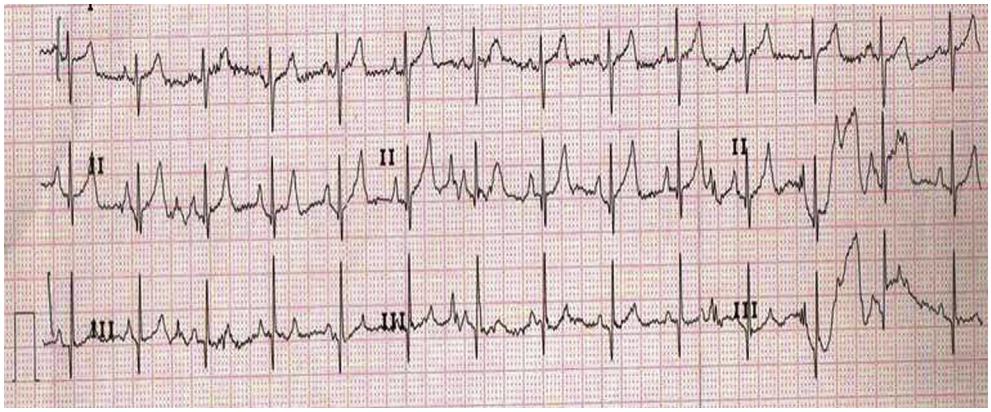

Fig. 3 – EKG at fifth day showed normal sinus rhythm with resolution of complete heart block.

Table 1 – Important studies on ASD device closure and AVB.

Studies	Number of patients who underwent ASD device closure	Number of patients who developed high grade AVB	Fate of AVB
Hausdorf (7)	41	4	All reverted
Chan (8)	100	1	Transient CHB, reverted
Du (2)	423 – ASD device closure with ASO 154 – Open heart surgery	1	Permanent CHB presenting after 6 months, requiring permanent pacemaker implantation (PPI)
Nehgme (6)	173	1	CHB developed four years later, requiring PPI
Sudha (4)	162	10 (4 – first degree AVB, 4 – second degree AVB, 2 – CHB) One had aggravation of pre-existing AVB	In 3 patients AVB developed during procedure. In other 7 patients AVB developed one day to one week later. All AVB resolved or improved spontaneously without any recurrence
Bartakian (1)	128 (weight <15 kg)	3	In one patient (41 month old) ASD device was removed due to cardiac arrest due to CHB and surgical referral was done. In the second patient, procedure was abandoned due to development of CHB. Temporary pacing was done. CHB reverted to 1st-degree HB. After 4 months she underwent successful device closure. In the third patient (37 month old) 24-mm Amplatzer septal device was removed due to CHB and repeat percutaneous ASD device closure was done successfully after one year of follow-up
Chessa (9)	417	1	CHB recovered 3 h after percutaneous device retrieval
Wang (10)	197	1	Transient CHB, reverted to first degree AVB after 3 days
Al-Anani (11)	3000 (ASD and PFO device closure)	2	Both patients developed AVB within 48 h and did not respond to steroid. Both underwent surgical device removal and ASD closure by1week.
Manoj K. Rohit	153	1	CHB developed after 12 h of device closure and resolved after 5 days of steroid and NSAID therapy

therapy. Deficient posteroinferior rim is one of the important risk factor for development of CHB. But in our patient, CHB developed despite adequate postero-inferior rim.

The etiology of the conduction blocks after ASD device closure has been attributed atleast partly to the inflammation and edema caused around the AV node by the atrial discs. This is one of the bases for the administration of steroids empirically in such cases, along with evidence from studies on conduction blocks after device closure of ventricular septal defects.[7] However there have been cases in which steroids have not helped and hence the recommendations on this issue are not quite clear.[6,8] In our case we could only hypothesize that the cause of CHB is the 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, greater device/height ratio, larger devices, short distance between right atrial disk to tricuspid valve, deficient postero-inferior rim <5 mm, and weight <15 kg.[1,4,8,9]

4. Conclusion

Transcatheter ASD device closure in small children may be associated with increased complications and completely reversible CHB in such patients is rarely reported. Despite adequate postero-inferior margin CHB may still occur in small children as in our case. CHB is a rare but worrying complication of ASD device closure, especially occurring in high-risk patients. Though in most of the cases it is a transient phenomenon resolving either spontaneously or with anti-inflammatory therapy, in some of the case it requires surgical removal of the device and closure of ASD. Timing of surgery is crucial as it has to be done before irreversible damage of AV node, after which the only salvage is by permanent pacemaker implantation.

Conflicts of interest

All authors have none to declare.

REFERENCES

1. Bartakian S, Fagan TE, Schaffer MS, Darst JR. Device closure of secundum atrial septal defects in Children< 15 kg complication rates and indications for referral. *JACC: Cardiovasc Interv*. 2012;5:1178–1184.
2. Du Z-D, Hijazi ZM, Kleinman CS, Silverman NH, Larntz K. Comparison between transcatheter and surgical closure of secundum atrial septal defect in children and adults results of a multicenter nonrandomized trial. *J Am Coll Cardiol*. 2002;39:1836–1844.
3. Bialkowski J, Karwot B, Szkutnik M, Banaszak P, Kusa J, Skalski J. Closure of atrial septal defects in children: surgery versus AmplatzerÂ® device implantation. *Tex Heart Inst J*. 2004;31:220.

4. Suda K, Raboisson M-Je, Piette E, Dahdah NS, Mir J. Reversible atrioventricular block associated with closure of atrial septal defects using the Amplatzer device. *J Am Coll Cardiol*. 2004;43:1677–1682.
5. Hill SL, Berul CI, Patel HT, et al. Early ECG abnormalities associated with transcatheter closure of atrial septal defects using the Amplatzer® septal occluder. *J Interv Card Electrophysiol*. 2000;4:469–474.
6. Nehgme RA, Huddleston AR, Cheatham JP. Progression to late complete atrioventricular block following Amplatzer device closure of atrial septal defect in a child. *Pediatr Cardiol*. 2009;30:367–370.
7. Yip WC, Zimmerman F, Hijazi ZM. Heart block and empirical therapy after transcatheter closure of perimembranous ventricular septal defect. *Catheter Cardiovasc Interv*. 2005;66:436–441.
8. Al-Anani SJ, Weber H, Hijazi ZM. Atrioventricular block after transcatheter ASD closure using the Amplatzer septal occluder: risk factors and recommendations. *Catheter Cardiovasc Interv*. 2010;75:767–772.
9. Cottens D, Van De Bruaene A, Troost E, Willems R, Moons P, Budts W. Influence of percutaneous transcatheter closure of an atrial septal defect on the atrioventricular conduction. *Acta Cardiol*. 2011;66:309.

Obituary

The Cardiological Society of India expresses its deep shock and grief at the sudden demise of Dr. Terezine Maria Kattakayam, Kerala. Dr. Kattakayam was a valuable and esteemed member of our society.