Transcatheter ventricular septal defect closure: Should we feel comfortable after many years?

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Introduction

Ventricular septal defect (VSD) is the most common congenital heart defect. Indicated closure is performed either by surgery or by using a transcatheter route in eligible patients (1). Although closure rates are similar in the transcatheter and surgical VSD closure, both the transcatheter closure of a VSD and surgery are not a complication-free procedure (2, 3). The occurrence of a complete atrioventricular block (CAVB) is one of the major complications of transcatheter closure, particularly in perimembranous-type VSDs. CAVB may occur acutely during the procedure or after a few days or months of the transcatheter closure (3-8). Late development of CAVB is an alarming complication because of the risk of sudden death. According to our knowledge, the longest interval between the procedure and the occurrence of CAVB in the literature is 20 months (5). Herein, we report the case of an 8-year-old girl who developed CAVB at 51 months after an uneventful closure of muscular VSD located just below the membranous septum (known as high-muscular VSD).

Case Report

Transcatheter VSD closure was performed in the patient at the age of 3.5 years and weighed 15 kg. She had no significant medical problem other than VSD. Her ECG did not show any conduction abnormality. The size of the defect was measured to be 5.5 mm via transesophageal echocardiography (TEE). VSD was closed in a standard manner under the guidance of TEE and fluoroscopy. A 6-mm membranous VSD occluder (Amplatzer) was used. Hemodynamic measurements showed that the Qp/Qs ratio was 3 and the mean pulmonary artery pressure was 28 mm Hg. The intervention was uneventful, and there was only right bundle branch block (RBBB) without any atrioventricular conduction abnormality after the procedure. Transthoracic echocardiography (TTE) performed on the following day showed a complete closure of the defect with good device position (Fig. 1). Routine follow-ups were performed with ECG, TTE, and Holter monitoring at 1, 3, and 6 months as well at every 6 months after the procedure, thereafter. At her last follow-up visit, she was aged 7.5 years. Her ECG, TTE, and Holter monitoring did not show any abnormalities, except RBBB. She experienced a brief syncopal episode at 51 months after the transcatheter VSD closure. She was urgently referred to our clinic because of significant bradycardia. Upon arrival, her ECG showed CAVB with a ventricular rate of 35/min (Fig. 2). Clinical studies showed no obvious reason for CAVB. Transvenous transient endocardial pacemaker was urgently placed and permanent endocardial pacemaker was implanted without any complication.

Discussion

A major concern for percutaneous perimembranous VSD closure is the risk of CAVB. The frequency of this alarming complication in

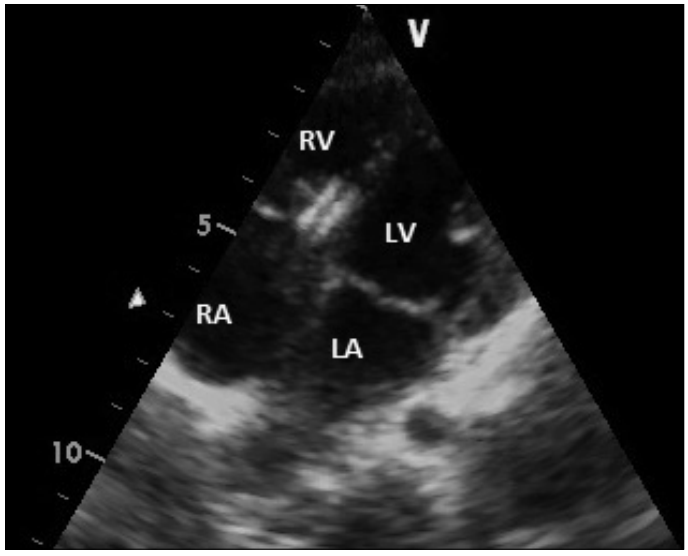

Figure 1. Transthoracic 2-dimensional echocardiography in 4-chamber view shows a good position of the membranous ventricular septal defect occluder after implantation.
LA - left atrium; LV - left ventricle; RA - right atrium; RV - right ventricle

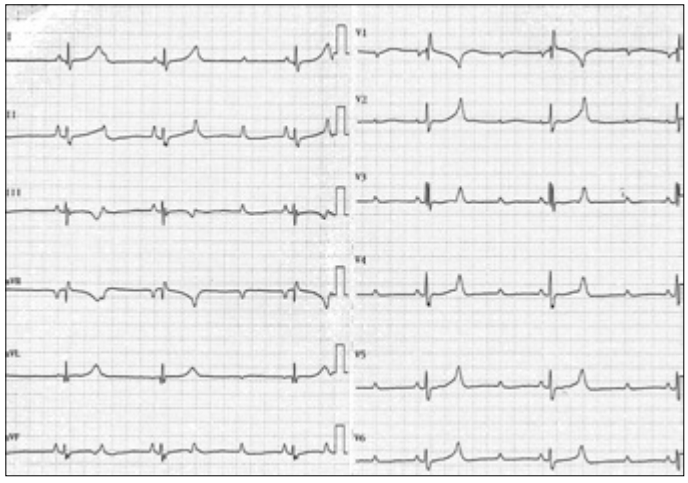

Figure 2. A 12-lead standard surface ECG shows complete atrioventricular block

patients was reported to be 1%–5% (3-8). There may be an early occurrence of CAVB during the procedure. However, in most patients, CAVB develops days or even months after the intervention. The latest occurrence of CAVB in the published literature was 20 months after the procedure (5, 8). The development of CAVB is mainly related to the adjacency of the conduction system to the borders of the perimembranous VSD. Direct compression of the conduction system in early CAVB and fibrosis secondary to the inflammation provoked by the device in late CAVB has been suggested as possible mechanisms (5, 8). Although the VSD of the presented case was not perimembranous, it only had a muscular rim with a size of 2 mm separating it from the membranous septum. Therefore, the same mechanisms responsible for CAVB development may be accountable for CAVB development in this patient as well.

CAVB can also occur after surgical perimembranous VSD closure; however, its incidence in recent series is less than 1% in most centers (1, 9, 10). A recent multicenter study that involved the surgical perimembranous VSD closure of 4432 patients reported an incidence rate of 1.1% of CAVB requiring permanent pacemaker placement (9). Thus, the risk of surgical atrioventricular block is equal to or lower than the risk of transcatheter closure. Another important point that should be considered is that CAVB generally occurs early after operation in surgical patients; however, in percutaneously treated patients, the timing of CAVB development is completely unpredictable, and it is usually a late event (5, 8, 9).

Conclusion

The occurrence of CAVB after more than 4 years of intervention in our patient suggests that clinicians should be aware of the lifelong risk of CAVB development in patients undergoing percutaneous VSD closure, particularly those who had VSDs located near the membranous septum. The decision makers should think twice before percutaneous VSD closure, and the potential lifelong risk of CAVB should be considered when counseling families regarding options for VSD closure.

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DOI:10.5152/AnatolJCardiol.2015.6410