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BRIEF COMMUNICATION

An Unusual Complication of the Ventricular Septal Defect Closure by Device: Late Right Aortic Cusp Perforation

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Aortic regurgitation (AR) is a rare complication of transcatheter closure of perimembranous ventricular septal defects (pmVSD). It results from iatrogenic pinching of the aortic valve by the VSD occluder or perforation by the catheter. It is usually detected during control echocardiography (ECHO). The current study reports the first case of a late AR, which resulted from late right coronary cusp perforation by the VSD occluder.

The current manuscript discusses the possible causes of late cusp erosion due to occluder, advantages of early operation in such cases, and an alternative treatment method where the occluder removal is not possible at the operation.

Keywords Ventricular septal defect • Transcatheter closure • Aortic regurgitation • Occluder • Aortic valve

Introduction

PmVSDs are among the most common congenital heart defects [1]. Standard treatment is open cardiac surgery, which requires cardiopulmonary bypass (CPB) [2]. To avoid complications of open cardiac surgery, transcatheter VSD closure was reported in 1988 [3]. Hijazi et al. used Amplatzer VSD occluder for pmVSD closure for the first time, and reported that the method could be an alternative to surgery [4]. Despite technologic advances in recent years, a high rate of complications (2.9-5.7%) is still reported after transcatheter occluder closure, including heart block (5.6%), valve regurgitation (5.7%), and occluder migration. Due to the high rate of these complications open cardiac surgery is still the treatment of choice for pmVSD treatment in countries such as the United States. However, with the redesign of occluders, and the revision of the transcatheter closure criteria, successful results have been reported [8,9].

Aortic regurgitation, which originates from an occluder, usually results from the occluder pinching the cusp, and this event is detected in the early stages [7]. There are no reports of late-stage cusp perforation from the occluder causing progressive AR.

The current case presentation discusses the possible causes of aortic cusp perforation due to occluder, which caused AR in the late-stage, and its surgical treatment.

Case presentation

A 10 year-old male was admitted to our clinic with severe AR. According to his medical history, the patient underwent transcatheter pmVSD closure three years prior in another centre. The patient was discharged without any complications, as control aortography after occluder placement did not show AR (Figure 1). However, moderate AR was observed in the control echocardiography (ECHO) six months later, and the degree of AR increased in the subsequent follow-ups. On admission, his blood pressure was 120/50 mmHg, heart rate 108/min. Cardiac auscultation

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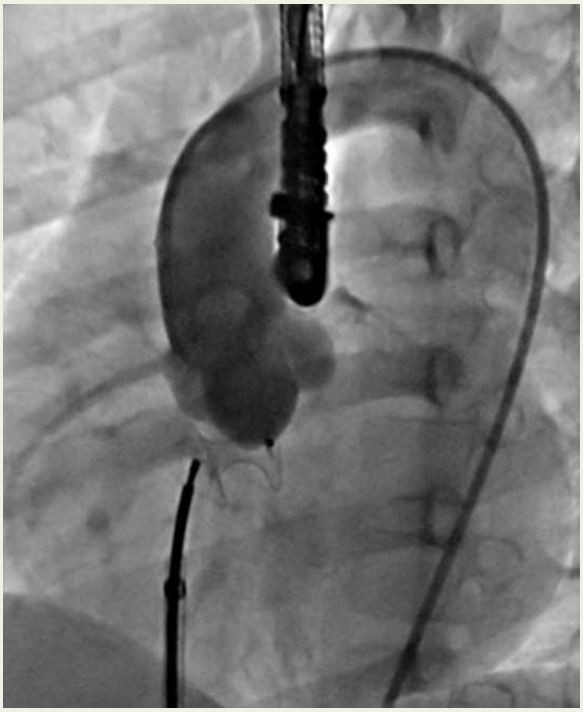

Figure 1 Angiography showing no signs of AR after transcatheter VSD closure.

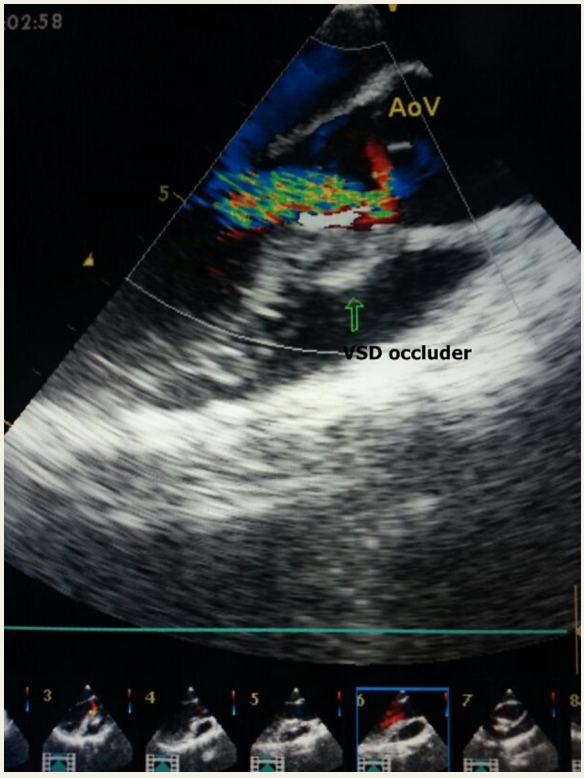

Figure 2 ECHO image of eccentric AR after transcatheter closure. AoV: aortic valve.

revealed a grade 3 early diastolic murmur in the right second intercostal space. Electrocardiograms demonstrated normal sinus rhythm. Chest radiography revealed an enlarged heart. ECHO showed severe AR and revealed left ventricle dilatation (Figure 2).

The patient was operated on CPB with mild hypothermia. After aortotomy we identified a 5x4 mm oval perforation at the base of the right aortic cusp (Figure 3). We observed that the anterosuperior region of the left side disc of occluder was not epithelialised and was not displaced from the septum and protruded into the left ventricular outflow tract. We thought that the right aortic cusp perforation was caused by this occluder which was very near to the right aortic cusp (Figure 4).

A right atriotomy was performed to control and remove the occluder through the tricuspid valve. Theocclude was epithelialised and adherent to the surrounding tissues. Known techniques were employed to remove the occluder, but it could not be removed due to the amount of adhesion. In order to not damage neighbouring tissues, excessive force was not applied. We decided to remove partially the left disc of occluder which caused aortic leaflet perforation. Therefore, the anterior-superior region of the occluder was partially cut without disrupting the occluder integrity. To prevent the formation of a thrombogenic occluder surface on the resected side and avoid occluder migration, the VSD was closed with autologous pericardium. The sutures were placed on the edge of occluder on the left ventricular side of the septum, in order to also secure the occluder The perforation in the coronary cusp was also closed with a patch of autologous pericardium. Aortic valve configuration and cusp coaptation were tested by filling the aortic root with saline. Configuration and coaptation of aortic valve was normal.

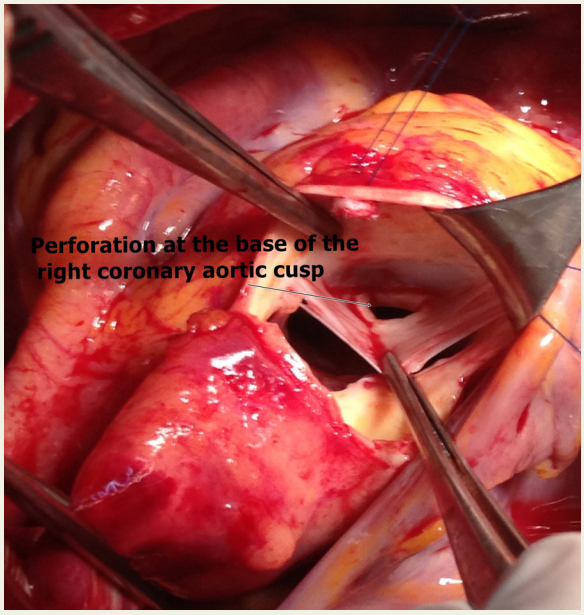

Figure 3 Perforation at the base of the right coronary aortic cusp.