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Original Article

Initial experience of transcatheter closure of subarterial VSD with the Amplatzer duct occluder

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Abstract

Background: The traditional treatment of subarterial ventricular septal defect (VSD) is open heart surgery. This study aimed to evaluate the feasibility, safety and outcome of transcatheter closure with the Amplatzer duct occluder (ADO).
Methods: Between March 2012 and June 2015, a total of 16 patients (8 male and 8 female) with subarterial VSD who underwent transcatheter closure with the ADO were enrolled retrospectively. Their age ranged from 3.0 to 65.6 years, with the median of 35.6 years; their body weights ranged from 14 to 92 kg with the median of 60 kg. All patients had prolapse of the right coronary cusp without subaortic rim. Mild aortic regurgitation was noted in 11 (69%) patients.
Results: Left ventriculogram showed VSD size ranged from 1.3 to 9.3 mm with the median of 3.5 mm. The device was successfully implanted in 88% (14/16) of the patients. Although one patient had mild skin allergy to contrast medium, no other complication was noted. Complete closure rate was 64%, 86%, 86% and 86% at 1-day, 1-month, 6-month and 12-month follow-up, respectively. Two patients developed new or worsening aortic regurgitation during follow-up.
Conclusion: Transcatheter closure of subarterial VSD with ADO is technically feasible and safe in patients older than 7 years of age. However, development or worsening of aortic regurgitation requires long-term follow-up.

Keywords: Amplatzer duct occluder; Cardiac catheterization; Doubly committed; Subarterial; Transcatheter closure; Ventricular septal defect

1. Introduction

Ventricular septal defect (VSD) is the most common congenital heart disease. Although less prevalent in the Western world, subarterial type VSD is relatively commonplace in the Asian and Far East populations, accounting for about 30% of all VSDs.[1] The synonyms for VSD include but are not limited to type I, supracristal, outlet, conoseptal, conal, subpulmonary, doubly committed. This defect is closely related to the aortic valve which might induce prolapse and thereafter cause regurgitation.[2,3] Because spontaneous closure is uncommon, and subsequent aortic valve complication is relatively frequent and usually progressive, early intervention to avoid aortic valve deformity and replacement is warranted. Device closure of VSD is currently viable for muscular and perimembranous-type defects. However, device closure of subarterial VSD is considered difficult

Conflicts of interest: The authors declare that they have no conflicts of interest related to the subject matter or materials discussed in this article.

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to accomplish due to its proximity to the aortic valve with possible impingement and subsequent development/worsening aortic regurgitation; therefore, surgical closure is recommended in most cases.

There are some recent reports of transcatheter closure of subarterial VSD (intracristal subtype) using eccentric devices,[4,5] but those devices are expensive and not globally available. The Amplatzer duct occluder (ADO, St. Jude Medical) was successfully used to close perimembranous VSD with the advantage of low cost and technical ease. This study retrospectively reviewed our experience of transcatheter closure of subarterial VSD using the ADO.

2. Methods

2.1. Study design

This is a retrospective, cohort study conducted in accordance with the Declaration of Helsinki and the ethics regulations of our hospital.[6] Between March 2012 and June 2015, a total of 16 patients with subarterial VSD who refused surgical closure and underwent transcatheter closure with ADO after informed consent was obtained were enrolled retrospectively. The inclusion criteria of patients included: 1) subarterial VSD as shown by echocardiography, and 2) age ≥3 years old. Exclusion criteria included: 1) moderate to severe prolapse of aortic valve, 2) moderate to severe aortic regurgitation, 3) sepsis, and 4) inability to obtain informed consent. There were 8 males and 8 females, ranging in age from 3.0 to 65.6 years with the median of 35.6 years. Study subject body weight ranged from 14 to 92 kg with the median of 60 kg. Echocardiographic imaging showed all patients had a prolapse of the right coronary cusp without subaortic rim. Mild aortic regurgitation was noted in 11 (69%) patients. Symptoms included chest pain in 13 patients, exercise intolerance in 9, palpitation in 8 and syncope in one. The demographic data was summarized in Table 1.

2.2. VSD classification

All patients were evaluated pre-procedure by transthoracic echocardiography, and all defects were located in the infundibular septum roofed by fibrous continuity without a muscular component. VSDs were classified according to their location.[7] Subarterial VSDs were further subclassified as supracristal and intracristal, based on their position on an analog clockface in the short-axis parasternal view on transthoracic echocardiography. In this view, intracristal VSD was seen at 12 o'clock and supracristal VSD was seen between the 1−2 o'clock directions (Fig. 1). In our series, there were supracristal type VSDs in 9 patients and intracristal type in 7 (see Figs. 2 and 3).

2.3. Procedure

For all study subjects, informed consent was obtained from patients or their guardians. The device closure procedure was conducted as briefly described below. Antibiotics (cefazolin

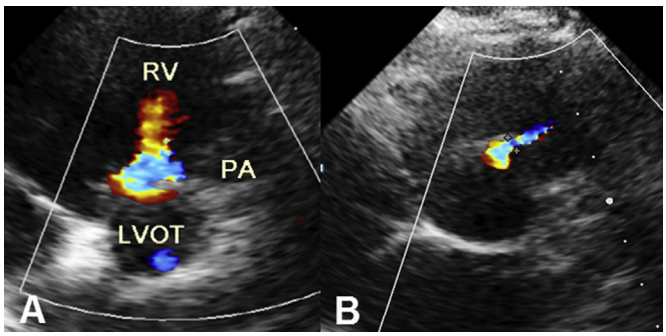

Fig. 1. Subtype of subarterial VSD. Parasternal short-axis view on transthoracic echocardiography shows the intracristal VSD located at 12 o'clock (A) and supracristal VSD at 1−2 o'clock position (B). LVOT: left ventricular outflow tract; PA: pulmonary artery; RV: right ventricle: VSD: ventricular septal defect.

Table 1
Patient demographics before procedure.

No.	Age (yr)	Gender	Body weight (kg)	VSD subtype	AR	Associated diagnosis	NYHAclass	Palpitation	Chest pain	Syncope
1	23.5	F	58	supracristal	−		II	+	+	−
2	63.1	M	65	intracristal	−	DCRV, HT, DM	II	−	+	−
3	30.4	F	60	intracristal	mild		II	+	+	+
4	46.7	M	85	intracristal	mild		I	−	+	−
5	29.9	F	57	intracristal	mild	bicuspid AV, epilepsy	III	+	+	−
6	15.3	M	55	intracristal	−		I	−	+	−
7	7.0	F	27	intracristal	−		I	−	−	−
8	26.8	F	78	supracristal	mild		II	−	−	−
9	35.6	F	60	supracristal	mild		III	+	+	−
10	35.7	M	76	supracristal	−		I	−	−	−
11	42.3	F	53	supracristal	mild		II	+	+	−
12	39.2	M	82	intracristal	mild		I	+	+	−
13	65.6	F	55	supracristal	mild		III	+	+	−
14	55.2	M	72	supracristal	mild		I	−	+	−
15	41.9	M	92	supracristal	mild		II	+	+	−
16	3.0	M	14	supracristal	mild		I	−	+	−

AR: aortic regurgitation; AV: aortic valve; DCRV: double chambered right ventricle; DM: diabetes mellitus; F: female; HT: hypertension; M: male; NYHA: New York Heart Association; VSD: ventricular septal defect.

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