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Migration of Atrial Septal Defect Closure Device due to Coughing

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Abstract

Percutaneous device closure of atrial septal defect (ASD) has emerged as an alternative to traditional surgical closure. Percutaneous device closure has advantages including less surgical morbidity, avoidance of a scar and reduced hospitalization duration compared with surgical closure and high success rate. However, some complications after procedure require immediate surgery. We report a rare complication of migration of ASD occluder into the left ventricle due to coughing.

Key Words : Cough, Heart septal defect, Septal occlude device

Introduction

Atrial septal defect (ASD) is one of the most common congenital heart disease in adults [1]. Percutaneous device closure of ASD has emerged as an alternative to traditional surgical closure [2]. The first percutaneous device closure of ASD was reported in 1974 [3]. Because percutaneous device closure has advantages including less surgical morbidity, avoidance of a scar and reduced hospitalization duration compared with surgical closure [4], and amplatzer duct occluder (ADO) is very efficient in clinical studies reporting success rates of 94% [5], it is regarded as current standard treatment for secondum type of ASD throughout the world. However, several serious complications after procedure may be concluded in a fatal outcome, or it requires surgical intervention for the management of complication. We report a rare complication of migration of the ADO into the left

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ventricle, one day after implantation.

Case Report

78 year-old women presented with dyspnea on exertion for 2 months. 4 years ago, she was diagnosed as secondum type of ASD. Although the defect was 2.25 cm by transthoracic echocardiography (TTE), patient underwent with medical therapy in accordance with the decision of her family. Current clinical examination revealed a systolic murmur at the left upper sternal border. Electrocardiography revealed atrial fibrillation and right ventricular hypertrophy. Laboratory findings including white blood cell count, hemoglobin, platelet count, electrolyte, blood urea nitrogen and serum creatinine were unremarkable. TTE revealed a 2.29 cm secondum type of ASD with left to right shunt flow (Fig. 1A) and left atrial enlargement (7.24 cm) and moderate tricuspid regurgitation. Percutaneous device closure of ASD was recommended to treat slowly progressive dyspnea. TTE and Cardiac computed tomography demonstrated sufficient rim length for device closure (Fig. 2A). Cardiac catheterization was performed and pulmonary-systemic flow ratio (Qp/Qs) was 3.23. Percutaneous device closure of ASD was performed under general anesthesia. Before implantation of the occluder, balloon sizing of the interatrial communication performed in 2 planes by both fluoroscopy and TEE. A 22 mm sized amplatz septal occlude was successfully deployed. No flow across the inter-atrial septum was observed on TEE (Fig. 1B). Chest X-ray, which was performed immediately after procedure, revealed the adequate location of ADO. She had no coughing before procedure. But she had recurrent severe coughing with foreign body sensation in the larynx at that night. Chest X-ray, performed at following day, showed migration of ADO. TTE confirmed the migration of the ADO into the left ventricle (Fig. 1C). Because the location of migrated ADO was not indicated for percutaneous removal, the patient was consulted to cardiac surgeon immediately for open heart operation. The device was removed out of left ventricle through aortotomy and secondum type of ASD direct closure was performed through right atriotomy without complication.

Discussion

Percutaneous device closure of ASD has been developed as alternative treatment to surgical

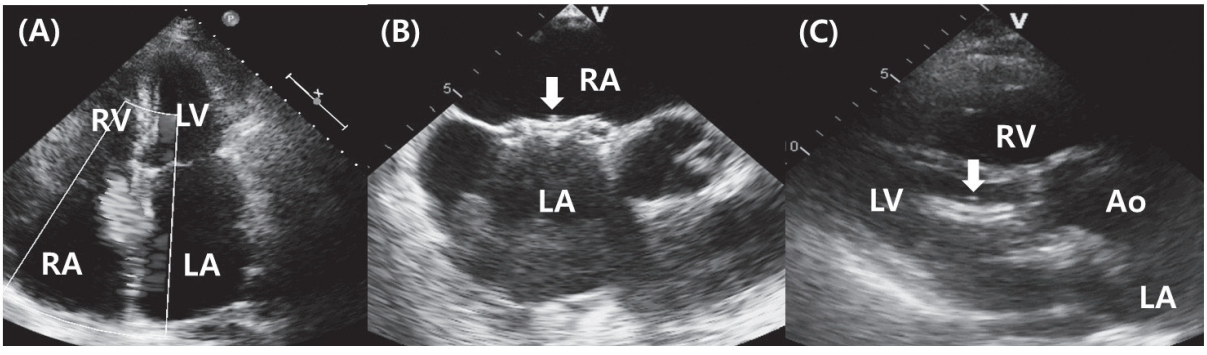

Fig. 1. (A) Secondum type ASD with left to right shunt flow. (B) successful deployment of ADO (arrow). (C) the dislodgement of the ADO (arrow) into the left ventricle.

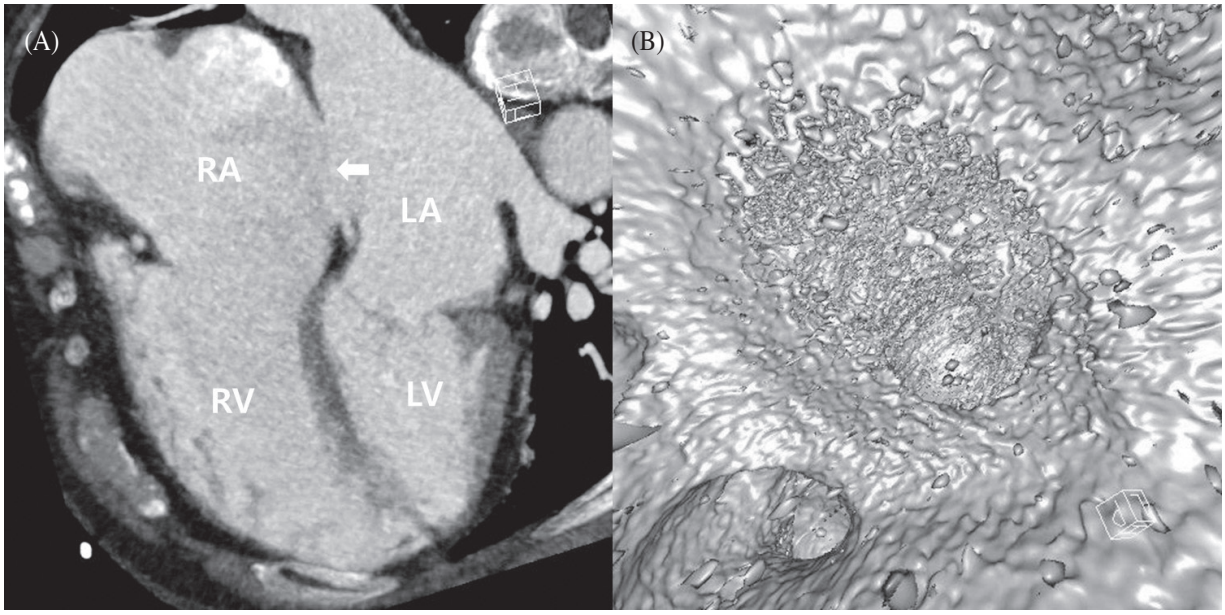

Fig. 2. (A) Contrast-enhanced coronary CT scan. four-chamber CT image showed a large ostium secundum defect (arrow) in the region of the fossa ovalis. (B) three dimensional virtual endoscopic image demonstrated large atrial septal defect.

closure because it has high success rate, lesser morbidity, shorter hospital stay, lack of a scar, and comparable rate of complications [2,4]. However, serious complications after procedure may have a fatal outcome and require surgical treatment. Reported complications include migration or embolization of the device, pericardial effusion, arrhythmias, thrombus formation on the device, vascular injury, and mitral regurgitation [3].

The most common complication of percutaneous closure of ASD is device migration or embolization with incidence ranging from 4% to 21% [6,7]. The majority of device migration or embolization occurs during the procedure or within a day (Table 1). Therefore, particular attention should be paid during ADO procedure.

There are several reasons of acute device migration, such as a too large defect or a poor device selection (low ratio of device to defect), the inadequate experience of the operator with inaccurate deployment, thin rim of atrial tissue, mobility of device post-implantation, and acute change in intracardiac pressure by physical stress [2,7,8].

Several cases with device migration were reported as the result from acute change in intracardiac pressure due to physical stress. In a usual physical stress, a sudden increase in afterload to the left heart in conjunction with diminished right heart filling (valsalva) may favored the migration of the device to the right and pulmonary artery. Therefore, avoidance from strenous exercise or heavy lifting was recommended for 6 months after procedure [9].

In our case, after waking up from general anesthesia, repeated severe cough was developed several hours later in the intensive care unit room. TEE during procedure was likely to irritate her larynx. Unfortunately, ADO was detected in left ventricle, one day after the procedure confirmed

Table 1. ADO migrations and embolizations in previous and our reports

Year	Author	Age (year)	Sex	ASD size (mm)	Location	Time (days)	Treatment
2006	Constantinos *et al* [11]	11	M	25	LV	0	surgery
2007	Manoranjan *et al* [8]	18	M	24.5	PA	1	surgery
2008	Thomas bartel *et al* [12]	56	F	15	RA	180	surgery
2009	Stephan Schoof *et al* [13]	3.5	F	9.5	aorta	1	surgery
2009	Harvinder SD *et al* [14]	34	M	20	PA	1	surgery
2010	Kam TC *et al* [15]	23	F	35	RV	1	percutaneous
2010	Selcuk Para *et al* [16]	35	F	4	aorta	0	percutaneous
2011	Muneer MA *et al* [17]	16	F	32	RV	1	surgery
2011	Muneer MA *et al* [17]	53	F	15	aorta	0	surgery
2012	Durmus YS *et al* [18]	16	M	20	PA	90	surgery
2012	Jeng Wei *et al* [19]	43	M	5	RIA	0	surgery
2013	Current case	78	F	22	LV	1	surgery

ASD: atrial septal defect, LV: left ventricle, PA:pulmonary artery, RA: right atrium, RV: right ventricle, RIA: right iliac artery.

by TTE. Most of dislocated devices migrated into the pulmonary artery [10], or right side heart as described in table 1. However, a few cases of systemic arterial embolization of ADO have been reported [2]. Suggested mechanism was that repeatedly coughing might raise intra-abdominal pressure and overloaded pressure in the right atrium might induce result in migration of the ADO into the left ventricle.

When ADO is embolized, percutaneous or surgical removal of the device is indicated [2]. In our case, percutaneous removal was not considered because of the orientation of the device in the left ventricle, just below the aortic valve, which can not be snared due to the risk of mitral valve injury and of systemic circulatory system embolization.

In conclusion, recurrent severe coughing can raise right atrial pressure, which may cause migration and embolization of ADO early after procedure. Physicians and patients should be informed that recurrent coughing can induce this serious complication. After ASD closure with ADO, careful monitoring with follow up TTE should be checked routinely for detecting early dislocation of ADO or other complications.

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