

SUBACUTE, SILENT EMBOLIZATION OF AMPLATZER ATRIAL SEPTAL DEFECT CLOSURE DEVICE TO THE PULMONARY ARTERY

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Embolization of the closure device is a rare but potentially fatal complication of percutaneous atrial septal defect (ASD) closure. We report a case of 45-year-old woman who underwent ASD device closure with 32 mm Amplatzer device, which was embolized to the pulmonary artery without symptom one day after successful device implantation.

KEY WORDS: Atrial septal defect · Septal occluder device · Embolization.

INTRODUCTION

Atrial septal defect (ASD) is one of the most common congenital heart defect found in adults. Percutaneous device closure using Amplatzer ASD occluder (AGA Medical Corp., Golden Valley, MN, USA) is widely used for treatment of ASD and proven to be effective and safe as traditional surgical repair.¹⁾ However, procedure or device related complications can occur, which can be potentially fatal.²⁾ We report a rare case of subacute and silent embolization of Amplatzer device to the pulmonary artery, on the next day of successful percutaneous ASD closure.

CASE

A 45-year-old female was admitted due to symptom of dyspnea developed several months before admission. Transthoracic echocardiography (TTE) showed a secundum ASD measuring 28 mm anterior-posteriorly at apical 4 chamber view (Fig. 1A). Cardiac catheterization revealed pulmonary hypertension with pulmonary artery systolic pressure 46 mmHg and a large left to right shunt with a Qp/Qs 3.1. Transesophageal echocardiography (TEE) was performed and revealed a large secundum ASD measuring 27 mm, with sufficient superior vena cava (11 mm), inferior vena cava (14 mm) rim (Fig. 1B) and relative small atrioventricular rim (5 mm) (Fig. 1C). Posterior rim was sufficient in length (13 mm) but relatively thin in na-

ture, and aortic rim was nearly absent (Fig. 1D). Despite relative large size of ASD with insufficient aortic rim, percutaneous device closure with Amplatzer was planned because she refused surgical treatment.

During procedure, intracardiac echocardiography (ICE) was used for guiding intervention instead of TEE as our routine practice. ASD size measured by sizing balloon under fluoroscopy was 26 mm. An oversized 32 mm Amplatzer ASD device was selected because of insufficient aortic rim and deployed successfully after several failure of capturing atrioventricular rim. Prior to final release of the device, a secure and stable position of the device within the defect was checked by a push-pull maneuver and cessation of flow across the inter-atrial septum was confirmed by ICE and TTE (Fig. 2).

On the day following device closure, she was asymptomatic and routine follow up chest X-ray and TTE was performed. On chest X-ray, Amplatzer device shadow was found at the main pulmonary trunk area (Fig. 3A) and TTE revealed reappearance of the large ASD with embolized Amplatzer device in the ostium of right pulmonary artery (Fig. 3B). The right ventricular systolic pressure was increased to 63 mmHg, but she still remained asymptomatic and hemodynamically stable. We started intravenous infusion of heparin and asked for emergency surgery to remove the Amplatzer device and repair of the ASD.

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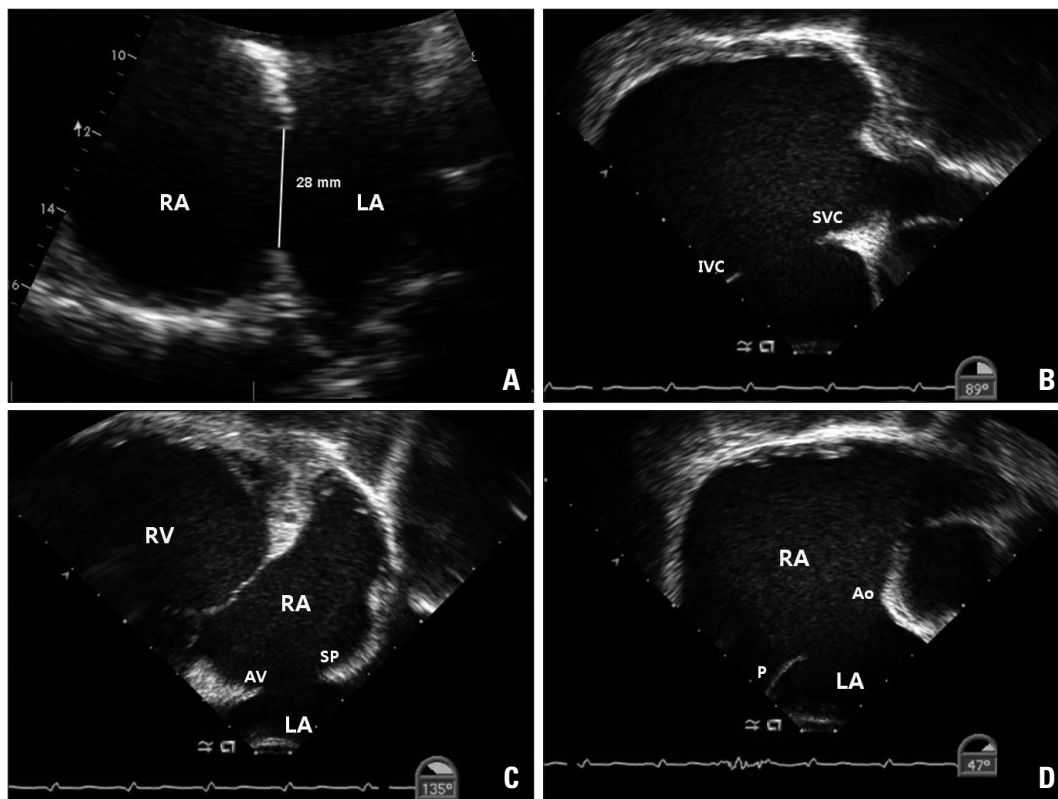


Fig. 1. Large secundum atrial septal defect measuring 28 mm on transthoracic echocardiography (A). Transesophageal echocardiographic findings of sufficient superior and inferior vena caval rim (B) and preserved atrioventricular rim (C). Posterior rim was sufficient in length but relatively thin in nature, and aortic rim was nearly absent (D). RA: right atrium, LA: left atrium, IVC: inferior vena caval rim, SVC: superior vena caval rim, RV: right ventricle, AV: atrioventricular rim, SP: superoposterior rim, P: posterior rim, Ao: aortic rim.

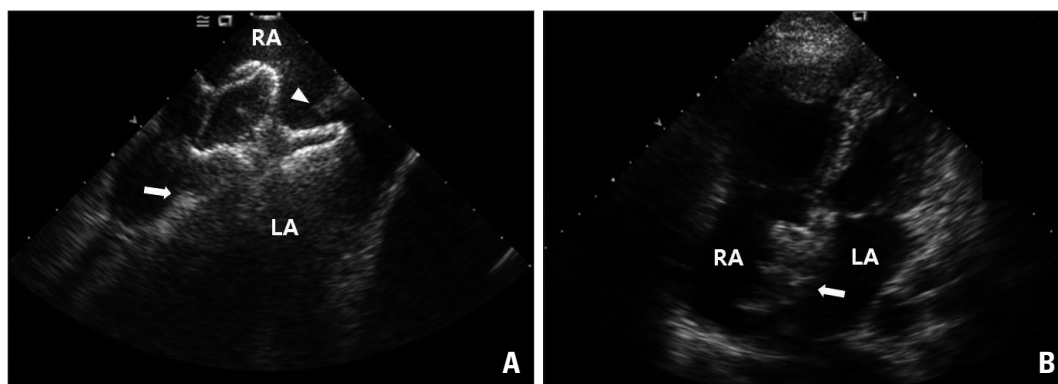


Fig. 2. Intracardiac echocardiographic still image during procedure (A). The Amplatzer device was successfully deployed and its secure and stable position was confirmed by push-pull maneuver. Inferior vena caval rim (white arrow) and superior vena caval rim (white arrowhead) were captured and well positioned between left and right discs. Still frame of apical 4 chamber view by transthoracic echocardiography after procedure (B). Amplatzer occluder (white arrow) is well positioned in interatrial septum without residual shunt. RA: right atrium, LA: left atrium.

The operation was carried out with median sternotomy. After cardiopulmonary bypass, pulmonary artery was opened and the Amplatzer occlude was identified in the bifurcation site of pulmonary artery trunk. Some of the marginal tissue in inferoposterior portion of the atrial septum was composed with friable membranous tissue. After removing the thin and friable tissue, the size of ASD was measured up to 30 × 40 mm. The ASD was closed using pericardial patch and she dis-

charged from the hospital on the 5th postoperative day without other complications.

DISCUSSION

Since the introduction in 1974, device closure of secundum type ASD is increasing and became an alternative to surgical treatment.³⁾ Although immediate procedural success rate of Amplatzer septal occluder is 95-98%, adverse events includ-

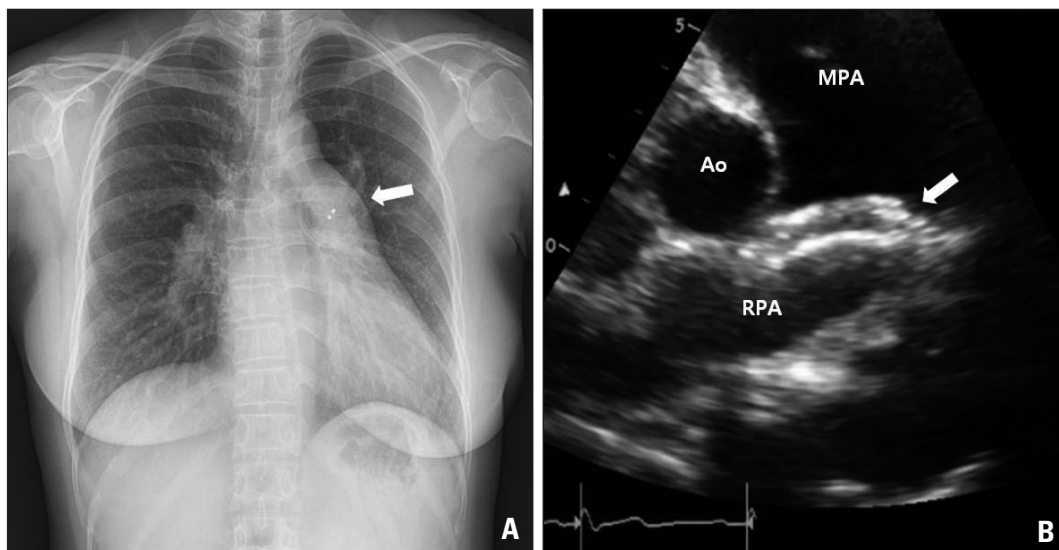


Fig. 3. One day after the procedure, the embolized Amplatzer device was seen in pulmonary artery (white arrow) on chest X-ray (A), which was lodged on right pulmonary artery ostium (white arrow) on transthoracic echocardiography (B). MPA: main pulmonary artery, RPA: right pulmonary artery, Ao: aorta.

ing arrhythmia, cerebral embolism, cardiac tamponade and device embolization requiring immediate surgical removal can occur.⁴⁾ Among them, device embolization is a potential life threatening complication requiring immediate removal via percutaneous or surgical intervention. Although the reported incidence is 0.01-0.55%, it would be higher in less experienced operators.⁴⁻⁶⁾ The common reasons for the device embolization are undersized ASD device, small left atrium to accommodate the device, inadequate or floppy rim and operator-related technical issues.⁶⁾ Most of the device embolization occurs during or several days after the procedures.⁴⁾ Immediate embolization occurs in the procedural field and thought to be caused by malposition or incorrect device size. Undersizing of the device is the most common reason for the embolization in such case.⁶⁾ However, subacute embolization within several days of the procedure is thought to be associated in large part with aortic rim erosion or floppy septum.⁷⁾

In present case, nearly absent aortic rim and large defect size (28 mm) could be one reason for device migration. However, large ASD size and the small or deficient aortic rim itself is not a contraindication and often considered as suitable for device closure with Amplatzer occluder.^{8,9)} Another important reason for the device migration is thin and floppy membranous nature of posterior portion of the atrial septum which was confirmed in operation field. Combination of small aortic rim and floppy membranous nature of counterpart rim (inferoposterior rim) increased the instability of oversized Amplatzer device and may lead to migration and embolization of device in our patient.

In case of complicated ASD, as our present case, it is often difficult to reconstruct the spatial structure with the use of two dimensional (2D) images. In this occasion, 2D TEE or balloon sizing may not be sufficient and additional imaging

modalities such as cardiac multidetector computed tomography or three dimensional TEE can be useful complementary option to 2D TEE for morphologic evaluation of ASD and guidance of transcatheter closure.^{10,11)}

About 50% of cases with Amplatzer occluder embolization, percutaneous retrieval is possible by using the devices including large sheaths, gooseneck snares, or endomyocardial biopsy forcep.¹²⁾ However, surgical removal and repair of the ASD is more preferable in the situation of inappropriate ASD rims for the second procedure as present case.

In conclusion, application of the strict criteria for selecting the device closure by comprehensive evaluation of ASD, and careful monitoring for the possible delayed embolization of device are mandatory in the case of complicated ASD.

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