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The Traveling Amplatzer
Rare Complication of Percutaneous Atrial Septal Occluder Device Embolism

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A 43-year-old woman with a history of recurrent embolic strokes and migraines was referred to our institution for primary percutaneous closure of a secundum atrial septal defect (ASD). Seven hours after successful placement of an Amplatzer atrial septal occluder (ASO) device, the patient began to complain of acute chest pain. Subsequent workup of this chest discomfort revealed dislodgement and migration of the Amplatzer device to the left ventricular outflow tract.

Cardiac magnetic resonance imaging was performed during her preprocedure examination and demonstrated the

Figure 1. Cardiac magnetic resonance imaging with balanced steady-state free precession sequence of 4-chamber (A) and modified short-axis (B) views confirmed the presence of the secundum ASD with left-to-right shunt (B, arrowhead depicts blood flow acceleration from left atrium into right atrium) and hypermobility of the posterior rim (A, arrow). Bicaval view of preprocedural TEE (C) revealed a hypermobile secundum ASD. Corresponding color Doppler flow image (D) showed blue signals across the ASD; this indicates blood flow away from the transducer and is consistent with a left-to-right interatrial shunt with a total defect measuring 12 mm. AV indicates aortic valve; RA, right atrium; and LA, left atrium.
presence of an ASD with a total defect size of 13×14 mm and hypermobility of the posterior rim (Figure 1A, Movie I). The anterior aortic rim measured 4 mm, but the other rims were adequate (>5 mm) (Figure 1B, Movie II). Using phase-contrast cardiac magnetic resonance, we calculated a shunt flow of 7 mL per beat. No other congenital anomalies or structural abnormalities were noted. In addition, a preprocedure transesophageal echocardiogram (TEE) confirmed the hypermobile secundum ASD with presence of a left-to-right interatrial shunt (Figure 1C and 1D, Movies III and IV).

The ASO device was implanted under fluoroscopic and TEE guidance. Cardiac catheterization revealed normal epicardial coronaries and normal pulmonary pressures. Balloon-stretch diameter was measured as 20 mm via TEE using the stop-flow technique and as 22 mm using fluoroscopy (Figure 2A and 2B). A 20-mm ASO (AGA Medical Corporation, Golden Valley, Minn) was successfully placed with good final results, demonstrating a well-seated device with no TEE evidence of residual shunting (Figure 2C and 2D).

Seven hours after the procedure, the patient complained of chest pain and stated that she felt the device had moved. Her 12-lead ECG indicated normal sinus rhythm at 69 beats per minute with occasional premature ventricular contractions but no ischemic changes (Figure 3A). On telemetry, the rhythm strip showed a 9-beat run of nonsustained ventricular tachycardia (Figure 3B). Both premature ventricular contractions and nonsustained ventricular tachycardia were of similar right bundle-branch block morphology, suggesting foci arising from the left ventricle. Chest radiography revealed malposition of the ASO device with a shift in its axis and orientation (Figure 3C and 3D). Bedside transthoracic echocardiography was subsequently performed, which confirmed the dislodgement and migration of the ASO device to the left ventricular outflow tract (Figure 3E). The patient was taken urgently to the catheterization laboratory, where fluoroscopy and TEE showed the device migration (Figure 4A through 4E, Movies V through VIII). Percutaneous retrieval of the device was attempted but was unsuccessful, and thus the patient underwent emergency surgical extraction of the device and patch repair of the ASD.

Transcatheter ASO devices have been validated as an effective therapeutic option for patients with a centrally located secundum ASD and are now the standard of care. Indications for percutaneous closure of ASD include symptoms of right heart failure and prevention of paradoxical embolism. Severe complications can occur in a very small percentage of patients.1 Device dislodgment is a rare event, and only anecdotal cases have been reported. Despite being a
very unusual complication, this can be a life-threatening situation that requires emergency open-heart surgery.

Clinically, a thin or deficient aortic rim is considered to be a potential cause of device migration. Some disagreement exists regarding the minimum requisite rim size that is required for successful ASO device placement; this is particularly true for aortic rims that measure <5 mm. Additionally, atrial septum hypermobility may be implicated as a cause of unsuccessful transcatheter device closure of ASD.2,3 However, a systematic evaluation of 69 device placements at our institution revealed no significant correlation between exaggerated septal mobility and successful device closure of interatrial communications.2 We should, however, highlight that in this series, the Sideris device was used in all patients. Perhaps this type of “patch” device is more suitable for the scenario of hypermobile posterior septum combined with a small anterior rim.3 The larger area of disk contact with the septum suggests that a lighter prosthesis can theoretically result in greater stability as compared with stenting devices, which have a central cylinder, as was used in this situation.

Figure 3. Twelve-lead surface ECG (A) showed normal sinus rhythm and occasional premature ventricular contractions with a right bundle-branch block morphology, suggesting that the origin of the premature beats is from the left ventricle. Three-lead telemetry rhythm strip (B) showed a 9-beat run of nonsustained ventricular tachycardia with the same right bundle-branch block morphology. Posteroanterior (C) and lateral (D) chest radiography showed displacement and malposition of the Amplatzer ASO device with a shift of its axis and orientation. On the posteroanterior view (C), the device should be in an obliquely angled position but is instead facing front. In the lateral view (D), the device should be more superiorly placed and in a deployed position but is instead located inferiorly and in an undeployed position. Apical 4-chamber view from the transthoracic echocardiography (E) revealed device migration to the left ventricular outflow tract.
When using the Amplatzer device on a patient with a deficient aortic rim, the device should be oversized to optimize anchoring.\textsuperscript{4}

As percutaneous occlusion of ASD becomes increasingly preferred to surgical repair, the complication reported here as well as other acute and long-term complications are rare; however, we should remain aware of the possibilities. Precise anatomic evaluation of the septum is as important for patient selection as it is for device selection. Information from other imaging modalities such as cardiac magnetic resonance and intracardiac echocardiogram may be helpful.

**Disclosures**

None.

**References**


