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CASE REPORT

Three-dimensional echocardiographic demonstration of aortic wall erosion after percutaneous atrial septal defect closure

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Abstract

Although late complications of percutaneous closure of atrial septal defect (ASD), including cardiac erosion and thrombosis, are rare, they are the most lethal. Data are still lacking regarding the usefulness of new imagining modalities, such as three-dimensional echocardiography (3DE), for the detection of these complications. Here, we report the case of a 57-year-old woman in whom cardiac erosion was very well visualized by 3D transesophageal echocardiography (3D TEE) after percutaneous ASD closure.

KEYWORDS

AMPLATZER Septal Occluder, cardiac erosion, secundum atrial septal defect, three-dimensional echocardiography

1 | INTRODUCTION

Transcatheter closure has emerged as a first-line approach for treatment of *secundum* atrial septal defects (ASDs).[1] In contrast to surgical repair, percutaneous device closure is a safe and effective procedure with a high success rate and a lower morbidity risk than other procedures.[2] Percutaneous ASD closure avoids the need for cardiopulmonary bypass and blood products; it also improves patient comfort, does not leave a surgical scar, requires a short hospital stay, and is more affordable than other procedures.[1–3] Cardiac defects, such as ASDs, can be closed by using an AMPLATZER Septal Occluder (ASO) which is highly effective and has a lower risk of complications than other devices.[4] Moreover, excellent early results and fewer complications of transcatheter closure with ASO have been reported during the follow-up period, but, although late complications, including cardiac erosion and thrombosis, are rare, they are the most lethal.[1] Cardiac erosion mainly occurs due to the use of an oversized device in a defect with inadequate aortic rim. New imagining modalities, such as three-dimensional echocardiography (3DE), are rapidly growing and improving, but data are still scarce regarding their use for the detection of the lethal complications of percutaneous ASD closure. Here, we report the case of a 57-year-old woman in whom cardiac erosion was well visualized using 3DE after ASD closure.

2 | CASE REPORT

A 57-year-old woman, with a history of ASD closure with an AMPLATZER device in 2014, presented with progressive shortness of breath over the previous 6 months. Her physical examination revealed wide fixed splitting of S2 with an accentuated pulmonary component, as well as palpable epigastric and parasternal pulsations. The ECG showed normal sinus rhythm with right bundle branch block. The chest X-ray showed prominent pulmonary artery. The laboratory investigations were unremarkable. Two-dimensional transthoracic echocardiography with an Ie33 system (Philips, Bothell, WA) with an X5-1 transducer showed a dilated right ventricle (RV) with basal, mid, and longitudinal dimensions of 45, 44, and 70 mm, respectively, preserved RV systolic function, tricuspid annular plane systolic excursion (TAPSE) = 22 mm, and pulmonary hypertension: pulmonary arterial systolic pressure (EPASP) = 50 mmHg. However, no shunt was detected across the interatrial septum. The left ventricular internal dimensions were normal with preserved global contractility: ejection fraction (EF) = 68%. The left atrial diameter was 48 mm (dilated). The mitral valve examination found no evidence of significant stenosis or incompetence. Grade I diastolic dysfunction was seen based on the mitral Doppler inflow pattern. There was no evidence of pericardial effusion. We then performed 2D and 3D transoesophageal echocardiography (TEE) using the same ultrasound system with an X7-2t matrix

transducer, which showed a partial displacement and rocking of the AMPLATZER device with a clear defect between the device and the aortic rim (erosion) (Supporting Information Movie 1, Figure 1). Color Doppler confirmed a residual significant shunt (mainly left to right) across the secundum ASD (Supporting Information Movie 2). The calculated pulmonary to systemic blood flow ratio (QP/QS) was 3. The device position and the leak between the device and the aortic rim were seen easily with 3D TEE (Supporting Information Movie 3). However, after systematic cropping of the full volume data sets, the erosive area was clearly seen to have an irregular shape between the two atria, and it was possible to evaluate it comprehensively. Finally, the patient was referred for cardiac surgery for removal of the device and surgical closure of ASD.

3 | DISCUSSION

Cardiac erosion and thrombosis are potentially lethal complications of percutaneous ASD closure, although atrial arrhythmias are the most common complications.[1] Godart et al.[5] reported 760 patients who had a history of ASD closure with an ASO from December 1999 to October 2011. Late complications from using this device were not observed up to 15 years after implantation. Color-Doppler imaging during the follow-up showed full occlusion in more than 90% of the cases, and the rest of the cases had insignificant shunt. According DiBardino et al.[6] the most common adverse event was embolization of the AMPLATZER occluder (51.1%). Cardiac perforation, erosion, or rupture were the second most common adverse events (22.9%). In 2004, 28 cases of hemodynamic compromise after ASD closure with ASO were reported, and the incidence of cardiac erosion by the device was 0.1%.[7] All the reported erosions were observed at the roof of the atria near the aortic root, and 89% of the cases had a deficient aortic rim. The main risk factor of erosion is an oversized device, and patients with a deficient aortic rim belong to the high-risk group.[3] Using oversized devices to repair defects is not an appropriate way to prevent embolization. Residual shunt or device embolization can be caused by an undersized device. However, cardiac erosion, perforation and impingement on adjacent cardiac structures can result from using an oversized device.[8] One of the advantages of 3D over 2D TEE imaging is that it enables to make a more accurate diagnosis. To the best of our knowledge, this is the first case report of 3D TEE in a patient with aortic erosion without aortic fistula. In our case, although the diagnosis was clear with 2D TEE, 3D TEE allowed for better visualization of the erosive area, and demonstrated the anatomic relationships between the implanted device, the aortic root, and the mitral valve annulus.

In conclusion, long-term follow-up after percutaneous ASD closure is essential to detect possible life-threatening complications. Assessment of ASD using 3D TEE is highly recommended before percutaneous ASD closure and during the follow-up period. It allows to properly assess the size of the defects, identify their number, select the proper closure device, and assess the adequacy of the rim for patients who are candidates for percutaneous closure. It can also be used during follow-up to detect any possible late onset complications.

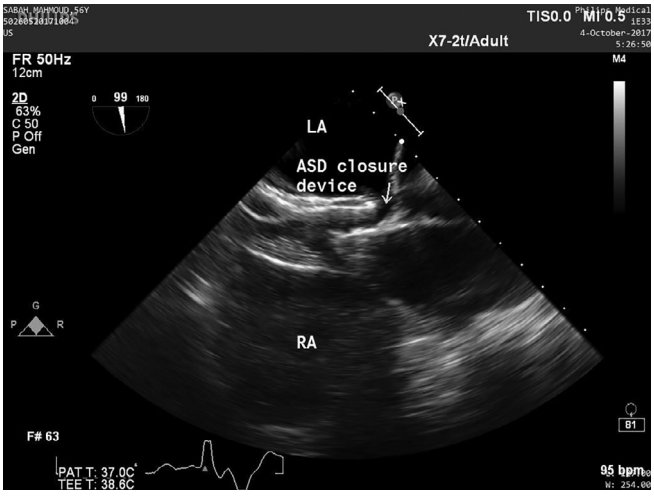

FIGURE 1 Two-dimensional trans-esophageal echocardiography study: mid-oesophageal bicaval view at 100° angle showing a clear defect between the Amplatzer device and the aorta

CONSENT

The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

I would you like to state that all authors have made a substantial contribution, all have read and approved the final manuscript, and the content has not been previously published or submitted for publication in another journal.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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