A Long-Term Complication Occurred After Transcatheter Closure of Large Atrial Septal Defect

Chenyu Zhao,1 MD, Jinyu Xu,1 MSc, Dan Cui,1 MSc and Kexiang Liu,1 MD

Summary
Transcatheter closure of ostium secondum atrial septal defect has become an alternative method to surgical closure. However, the incidence of complications and long-term results of using large size (> 40 mm) Amplatzer septal occluders are unknown. This case reported a 59 years old woman, whom received transcatheter closure of atrial septal defect (36 mm) with a 40 mm Amplatzer septal occluder 10 years ago and was diagnosed with heart failure. Transthoracic echocardiography showed severe mitral valve regurgitation. Intraoperatively, we confirmed and removed the large device, but we found that the mitral annulus was badly damaged. Mitral valve replacement was performed. We believe large size devices need to be implanted cautiously, especially for the large defect with insufficient rims, and also routinely follow-up is necessary.

(Int Heart J 2020; 61: 183-185)

Key words: Amplatzer septal occluder, Mitral valve regurgitation, Mitral annulus deformation, Heart failure

Case Report
A 59-year-old Chinese woman presented with paroxysmal palpitations and dyspnea for 6 months. She received the transcatheter closure treatment 10 years ago. Her original transthoracic echocardiography (TTE) revealed an ostium secondum ASD of a mixed central and inferior vena cava type measuring 30 × 36 mm. The posteroinferior rim of the ASD was 4 mm, while other rims were greater than 5 mm. Her surgery note showed that operators tried to close the ASD by using a 38 mm ASD device but failed, and then a 40 mm device was successfully implanted. One-year follow-up results were normal. On admission, physical examination found a class IV/6 systolic murmur on the apical area of heart, moderate edema of both lower limbs, and NYHA III. TTE showed a large device (50 × 42 mm) at the atrial septal, severe mitral valve regurgitation, an enlarged left atrium, and a low left ventricular ejection fraction (Figure 1). Blood tests showed high brain natriuretic peptide levels, 2,448 pg/mL (0-100 pg/mL), while erythrocyte sedimentation rate and anti-streptolysin O were normal.

The patient received the surgery after drug therapy. Cardiopulmonary bypass (CPB) was established through cannulation of the ascending aortic artery and superior/inferior vena cava. Left atrium was cut up. We confirmed the large ASO, which was endocardialized incompletely. The anterior/inferior border of ASO compress the posteromedial annulus of mitral valve tightly and lead to its geometric change. Also, we found that the leaflets and chordae were mild thick and stiffness, while the papillary muscle was normal. So, we removed the device (Figure 2) and repaired the ASD by autologous pericardial patch. Considering a mild rheumatic change of mitral valve, obvious geometric change of mitral annulus, and also the patient’s age, we performed mitral valve replacement to avoid further valve surgery rather than a single mitral annuloplasty. The weaning off of CPB was supported with a continuous infusion of dopamine (10 μg/kg/minute) and nitroglycerin (1.0 μg/kg/minute).

The postoperative process was uneventful. The patient was discharged on the 7th postoperative day. Her one-year follow-up showed an improved cardiac function and better life quality.

Discussion
In 1976, King firstly reported the technique to treat ostium secondum ASD by using a transvenous umbrella. Nowadays, this technique has become an alternative method to surgical closure. Many surgeons try to close
big defects by using large ASD devices, regardless of the size and location of the ASD. Although Lopez\(^4\) reported that 40 mm ASO is safe and effective in most patients in the short-term follow-up, we still know little about long-term result on these patients.

In this paper, we described a patient diagnosed with severe mitral valve regurgitation. It’s a long-term complication occur after implanting a large ASD device. The mechanism of this complication is unclear now. Hiraishi and his colleagues’ study\(^5\) revealed that the geometric change of right ventricular after closure of ASD may be one of the reasons. Jalal\(^6\) considered the geometric change of mitral valve annulus, and the alternation of atrial function could explain the observation. As in our case, the large ASO was implanted regardless of the big size and improper location of the defect 10 years ago. As the endocardialization progressed, the device gradually compressed the posteromedial annulus of mitral valve. It caused a dislocation of the mitral leaflet toward the left atrial side in the area of coaptation, which finally leads to a severe mitral valve regurgitation.

From the case, we consider that both ASO size and ASD features (size, location, rims) are important factors that cause the complication. In our ongoing follow-up study, we found patients whose big ASO was mixed, and central and inferior vena cava type were more likely to suffer from mitral valve regurgitation after implanting a large ASO. Thus, five rims and their rigidity of ASD should be carefully evaluated preoperatively. Operators are supposed to control the indications of transcatheter closure of ASD strictly. For those cases in which the defect is big (> 30 mm) but rims are small and soft, devices (> 40 mm) need to be implanted much more cautiously to avoid valvular regurgitation.\(^7\) Meanwhile, patients who already received a large device implantation should receive TTE examination routinely, so that valvular regurgitation could be found and treated earlier.

**Disclosure**

**Conflicts of interest:** None.

**References**