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Transcatheter Aortic Valve Implantation and Simultaneous Closure of Ostium Secundum Atrial Septal Defect

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ABSTRACT

We were faced with a difficult question: how to treat a high-risk patient with severe aortic valve stenosis and a secundum atrial septal defect (ASD II). An 85-year-old woman with progressive dyspnea and pedal edema and in New York Heart Association class IV was treated with concomitant transapical aortic valve implantation and transcatheter closure of the ASD II. The combined procedure and postoperative course were completely uneventful. At 2 years after the clinical follow-up, the patient is doing well. This case report demonstrates, for the first time, the feasibility, safety, and effectiveness of simultaneous application of 2 transcatheter methods—aortic valve implantation and closure of an ASD II. As surgeons, we should consider percutaneous treatment of combined structural heart disease in patients at high risk for conventional surgery.

CASE REPORT

We were recently faced with a difficult question: how to treat a high-risk patient with severe aortic valve stenosis and an ASD II. We found the optimal treatment to be a combination of minimally invasive transcatheter treatments for the 2 pathologies. We decided to implant a balloon-expandable transcatheter aortic stent/prosthetic xenograft via the transapical route and to close the ASD II via transvenous access during the same procedure.

An 85-year-old woman with progressive dyspnea and pedal edema and in New York Heart Association class IV was admitted to our hospital. Preoperative examinations showed severe aortic valve stenosis, a large ASD II (Figure 1), an enlarged right ventricle with reduced contractility, tricuspid valve regurgitation of grade II to III, a good left ventricular function, partial calcification of the ascending aorta, and no coronary artery disease. The logistic EuroSCORE was 34.3%, and the Society of Thoracic Surgeons mortality score was 19.5% because of the several comorbidities.

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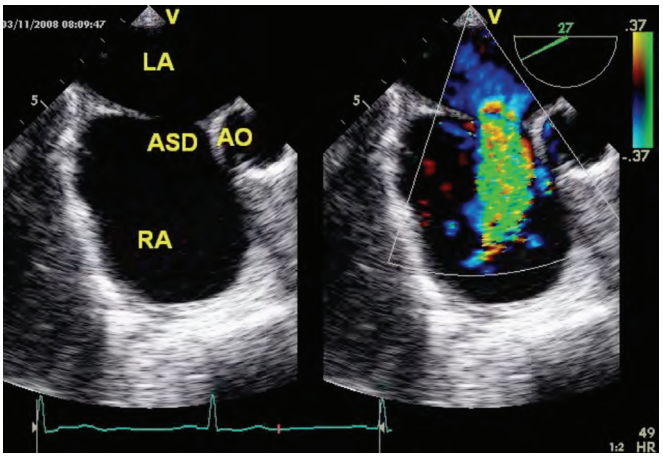

Figure 1. Transesophageal echocardiography (midesophageal view) showing the ascending aorta (AO), the left atrium (LA), the right atrium (RA), and the 13-mm ostium secundum defect (ASD), with the left-to-right atrial shunt seen in color Doppler.

Technically, the procedure was performed in our hybrid operating room as a combination of 2 standard interventions. First, we carried out a standard transapical aortic valve implantation [Pasic 2010a, 2010b]. The chest was entered through a small anterior thoracotomy in the sixth intercostal space. After performing a balloon aortic valvuloplasty, we implanted a 23-mm Edwards Sapien valve (Edwards SAPIEN THV; Edwards Lifesciences, Irvine, CA, USA) (Figures 2 and 3). Both steps were performed under rapid ventricular pacing at a rate of 180 beats/minute. A 23-mm valve was used because the aortic valve annulus measured 20.7 mm in preoperative computed tomography and intraoperative transesophageal echocardiography (TEE) evaluations. The heart recovered immediately with normal hemodynamics, and there was no need for additional inotropic support. Second, we performed a standard transcatheter closure of the ASD II [Berger 1999] after percutaneous puncture of the femoral vein with a 14-mm septal Amplatzer occluder device (AGA Medical Corporation, Plymouth, MN, USA) (Figures 4-6). The hemodynamic situation remained stable throughout the procedure. The combined procedure was monitored by continuous TEE,

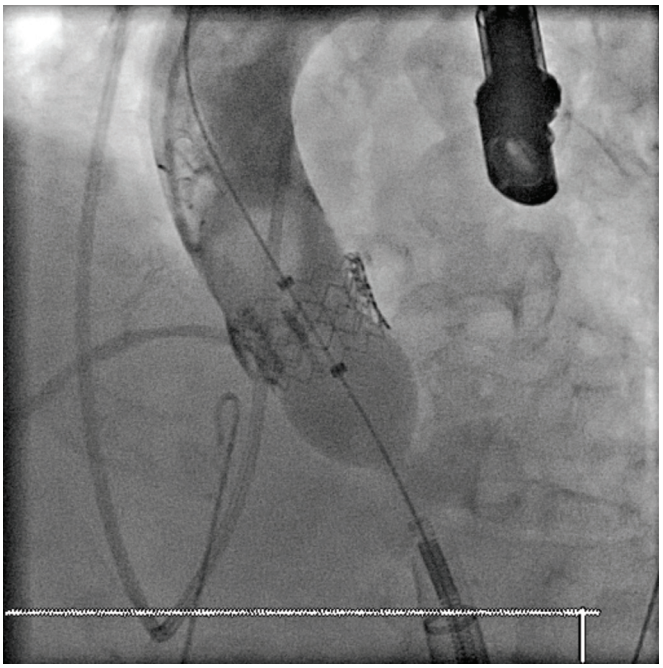

Figure 2. Valve deployment using intraoperative angiography for precise valve positioning.

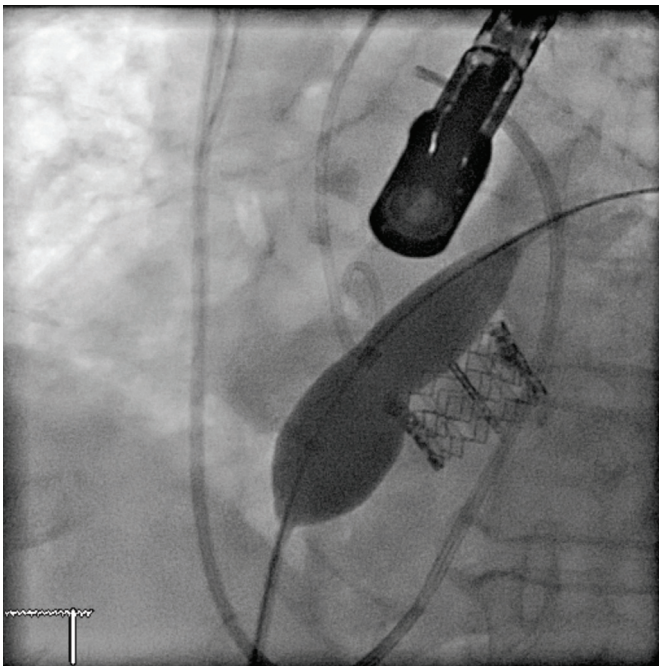

Figure 4. Fluoroscopic measurement of the balloon-stretched diameter of the atrial septal defect. Note that the Edwards Sapien valve has already been placed in the position of the native valve.

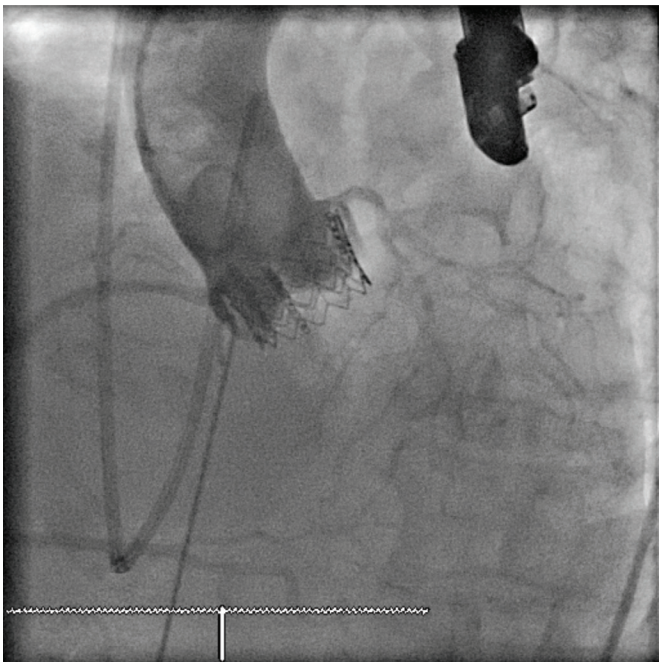

Figure 3. Control angiography evaluation demonstrating an excellent position of the aortic Edwards Sapien valve with no valvular or paravalvular regurgitation.

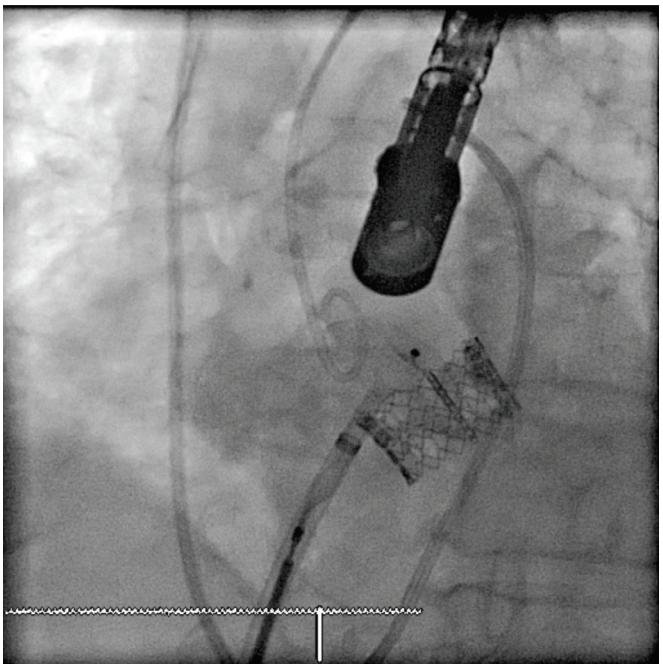

Figure 5. Fluoroscopy image demonstrating deployment of the left atrial disc of the Amplatzer Septal Occluder.

fluoroscopy, and angiography. Invasive measurements were performed only during balloon occlusion of the septal defect to monitor the hemodynamic changes. The postoperative final TEE showed both good prosthetic valve function with no regurgitation and correct positioning of the occluding device with no residual left-to-right interatrial shunting

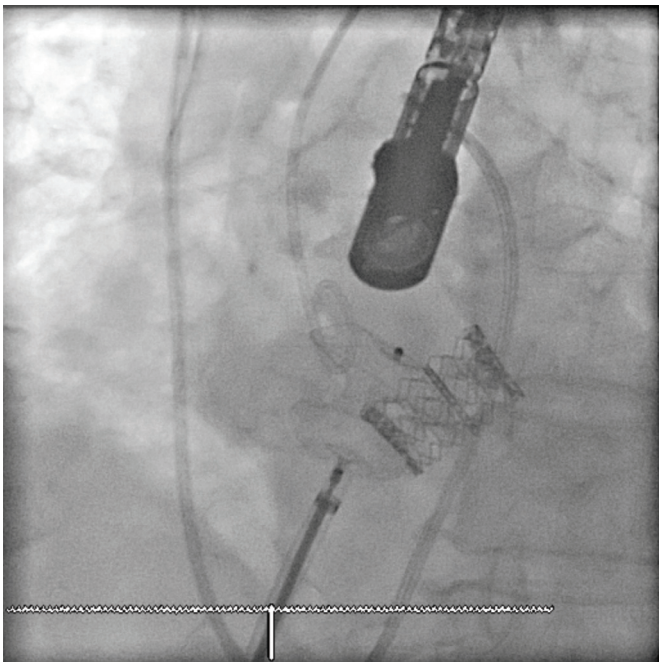

Figure 6. Fluoroscopy image demonstrating deployment of the right atrial disc of the Amplatzer Septal Occluder. The left atrial disc is already fully deployed.

(Figure 7). The procedure time was 65 minutes, and the fluoroscopy time was 13.1 minutes.

The patient was extubated 15 hours after the procedure and transferred to the normal ward on the first postoperative day. Postoperative medication consisted of aspirin and clopidogrel in addition to the patient's individual therapy for comorbidities. The subsequent postoperative course was completely uneventful except for a short episode of atrial fibrillation, and the patient was transferred for postoperative rehabilitation on the sixth postoperative day. Two years after the procedure, the patient is doing well. A transthoracic echocardiography evaluation showed a completely regular function of the new valve with a mean transvalvular gradient of 6 mm Hg without any valvular or paravalvular regurgitation, no residual left-to-right interatrial shunting, a reduction in the right ventricular diameter with improved contractility, and no tricuspid regurgitation.

This case demonstrates, for the first time, the feasibility, safety, and effectiveness of simultaneous application of 2 transcatheter methods—aortic valve implantation and closure of an ASD II. Since the first transcatheter closure of an ASD II in 1976 by King et al [1976], this procedure has become a generally accepted alternative to cardiac surgery [Berger 1999]. Transcatheter aortic valve implantation, on the other hand, is a new approach for high-risk

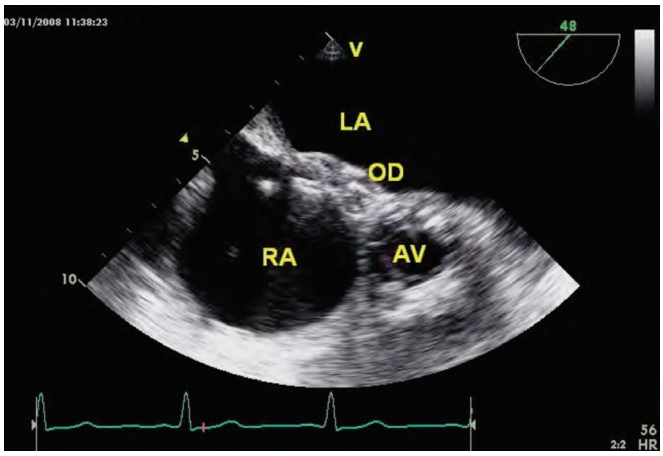

Figure 7. Transesophageal echocardiography image (midesophageal view) showing a secundum atrial septal defect closed with an Amplatzer occluder device (OD) and an opened implanted Edwards SAPIEN aortic valve (AV) in midsystole. LA indicates left atrium; RA, right atrium.

patients with severe aortic stenosis [Pasic 2010a, 2010b]. By combining these interventions, we eliminated the patient's severe aortic valve stenosis and at the same time reduced the volume overload status of the right ventricle by closing the septal defect. The combined procedure was technically very simple to execute. It required close interdisciplinary collaboration between the surgeons, the pediatric and adult cardiologists, and the anesthesiologists. As surgeons, we should consider percutaneous treatment of combined structural heart disease in patients at high risk for conventional surgery.

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