

# High-risk closure of atrial septal defect type II in a patient with pulmonary hypertension

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A 71-year-old woman with arterial hypertension, type 2 diabetes mellitus, and a history of exertional dyspnea lasting several months (New York Heart Association functional class III) was admitted to our department for further work-up. Blood tests revealed increased N-terminal fragment of the prohormone brain natriuretic peptide (NT-proBNP) levels of 550 pg/ml. In a 6-minute walk test (6MWT), she reached a distance of 380 m. Transthoracic echocardiography showed a markedly dilated right ventricle (42 mm) with moderate tricuspid regurgitation (peak tricuspid regurgitation velocity [TRV], 3.2 m/s), normal contractility of the left ventricle, and enlargement of both atria (right atrial area [RAA], 28 cm<sup>2</sup>; left atrial area, 26 cm<sup>2</sup>) with the presence of atrial septal defect type II (ASD II). Transesophageal echocardiography (TEE) confirmed ASD II (17 × 15 mm) with sufficient rims and left-to-right shunt on color-flow Doppler analysis (FIGURE 1A). Right heart catheterization indicated precapillary pulmonary hypertension (PH), with a mean pulmonary artery pressure (mPAP) of 32 mm Hg, pulmonary artery wedge pressure (PAWP) of 10 mm Hg, baseline pulmonary vascular resistance (PVR) of 4.8 Wood units (WU), baseline systemic vascular resistance (SVR) index of 8.9 WU, and pulmonary-to-systemic flow ratio of 2.

A decision was made to perform temporary balloon occlusion to determine operability. A Swan-Ganz catheter was inserted into the pulmonary artery, and mPAP and PAWP were continuously monitored. The ASD was occluded for 15 minutes using an Amplatzer sizing balloon (AGA, Medical Corporation, Golden Valley, Minnesota, United States). The balloon was inflated until the shunt completely disappeared, as shown by TEE (FIGURE 1B). Hemodynamic parameters were

measured at baseline and after 15-minute period of occlusion. During the occlusion test, the mPAP decreased to 20 mm Hg with a stable PAWP of 10 mm Hg. The diameter of the defect on stop-flow balloon sizing was 21 mm. A decision was made to perform simultaneous ASD II closure. Under fluoroscopic and TEE guidance, a 24-mm Occlutech Figulla Flex II septal occluder (Occlutech GmbH, Jena, Germany) was successfully implanted without residual shunt (FIGURE 1C and 1D). During a 1-year follow-up, exercise tolerance significantly improved, and the patient reached a distance of 560 m in the 6MWT. The plasma NT-proBNP concentration normalized to 115 pg/ml. Echocardiography confirmed the improvement of the right heart overload (TRV, 2.6 m/s; RAA, 18 cm<sup>2</sup>) and no residual shunt.

A therapeutic strategy in patients with ASD II and significant PH remains controversial due to lack of evidence-based trials.<sup>1</sup> There is no precise cutoff parameter that would preclude ASD II closure in the presence of PH. Currently, the closure is recommended if the defect is significant and PVR is less than 5 WU.<sup>2</sup> However, guidelines indicate that PH may be corrected by defect closure when PVR is 5 WU or higher, but the shunt is left to right, mPAP is less than two-thirds of systemic levels, and the ratio of PVR to SVR index is below 2/3, without a specific PVR cutoff value.<sup>2,3</sup> Some strategies suggest fenestrated ASD closure allowing right atrial decompression. On the other hand, Galie et al<sup>4</sup> considered closure to be contraindicated at a PVR of 4.6 WU or higher, but the recommendation was based on an expert opinion rather than a randomized trial. In our case, PVR was 4.8 WU and we decided to perform a balloon occlusion test to assess left ventricular function and, subsequently,

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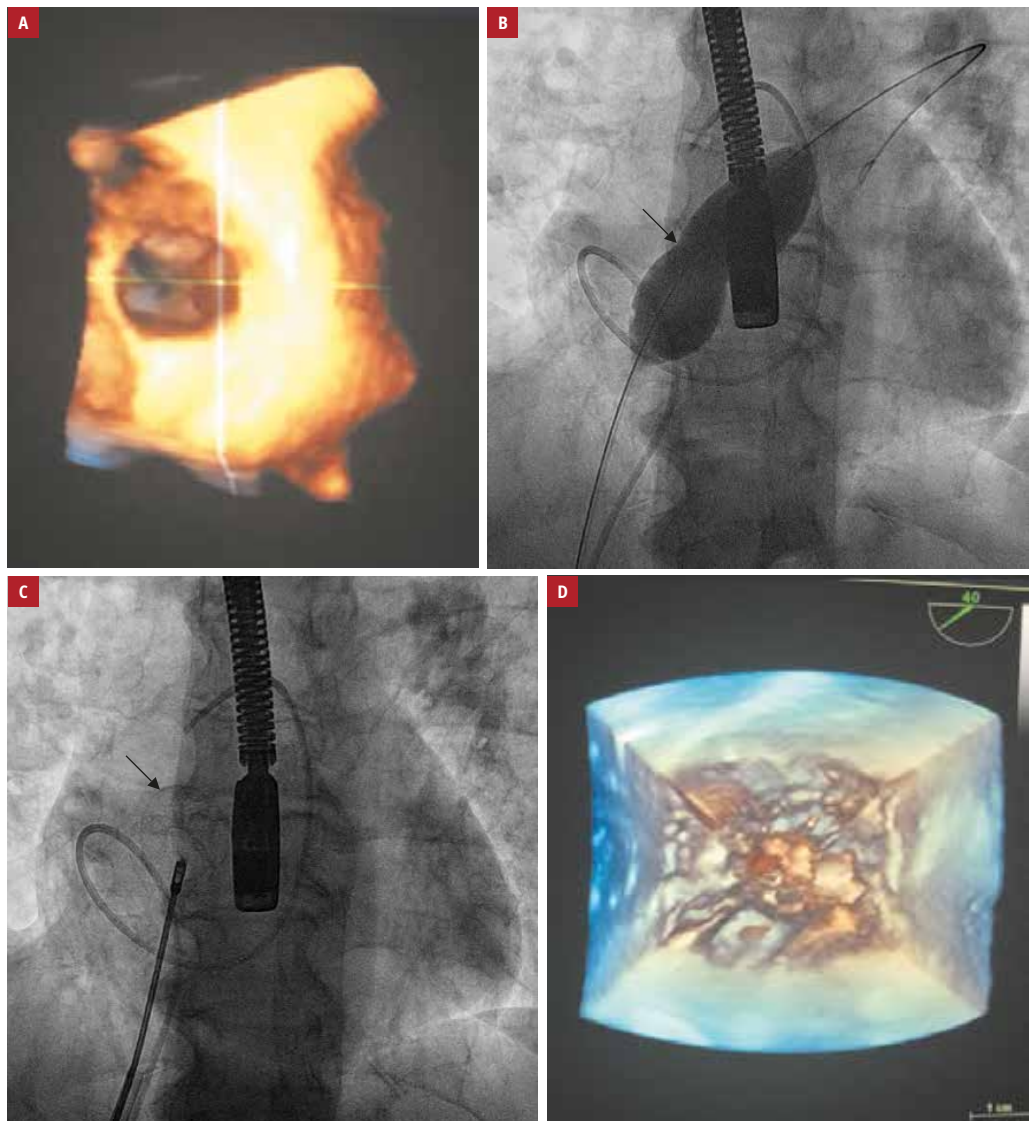
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**FIGURE 1** **A** – atrial septal defect (ASD) visualization by 3-dimensional echocardiography (3D TEE); **B** – ASD occlusion with a sizing balloon (arrow) and monitoring of pulmonary pressures with a Swan-Ganz catheter; **C, D** – successful ASD closure with the occluder without residual shunt shown on angiography (**C**; arrow) and 3D TEE (**D**)

closure of ASD. Our case indicates that percutaneous closure in carefully selected adults with ASD and PH might be safe and provide significant clinical improvement.

#### ARTICLE INFORMATION

**CONFLICT OF INTEREST** None declared.

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