Rupture of the membranous septum and aortic root perforation after transcatheter aortic valve implantation successfully treated by surgery

Damian Hudziak[1], Radosław Gocoł[1], Grzegorz Smołka[2], Radosław Parma[2], Michał Lelek[3], Wojciech Wańha[2], Andrzej Ochała[2], Joanna Ciosek[2], Magdalena Mizia-Szubryt[3], Aleksandra Żak[1], Łukasz Morkisz[1], Tomasz Darocha[4], Leszek Machej[4], Marek A Deja[1], Wojciech Wojakowski[2]

[1]Department of Cardiac Surgery, Medical University of Silesia, Katowice, Poland
[2]Division of Cardiology and Structural Heart Diseases, Medical University of Silesia, Katowice, Poland
[3]1st Division of Cardiology, Medical University of Silesia, Katowice, Poland
[4]Department of Anesthesiology and Intensive Care, Medical University of Silesia, Katowice, Poland

Correspondence to:
Damian Hudziak, MD, PhD, Department of Cardiac Surgery, Medical University of Silesia, Ziołowa 47, 40–635 Katowice, Poland,
phone: +48 507 037 783,
e-mail: damhud@gmail.com

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Transcatheter aortic valve implantation (TAVI) has become a treatment of choice for aortic stenosis (AS) in patients at high and intermediate surgical risk [1, 2]. Emergency cardiac surgery after TAVI is rare (1%) and has a high mortality rate (67%). The most common causes are prosthesis dislocation/embolization, coronary occlusion, severe regurgitation, right ventricle (RV) or aortic annulus rupture, and aortic dissection [3]. A 70-year-old male was admitted with symptomatic severe AS (the New York Heart Association [NYHA] class III). Transthoracic echocardiography (TTE) showed a bicuspid aortic valve (BAV), maximal and mean gradients of 78 and 46 mm Hg, respectively, and of 50% left ventricular ejection fraction (EF). The patient was disqualified from surgical valve replacement due to high risk (EuroSCORE, 4.7%) and comorbidities (chronic obstructive pulmonary disease, diabetes, liver cirrhosis, chronic renal insufficiency). Based on multi-slice computed tomography (MSCT), the Heart Team recommended TAVI via the right femoral artery despite calcified stenosis of the right external iliac artery. The lithotripsy was attempted with a 6.5 × 60 mm Shockwave balloon but was unsuccessful, so transcarotid access was chosen as the next step. Under general anesthesia, Edwards-SAPIEN 3 Ultra 29 mm valve was implanted through the left carotid artery (Figure 1A) with satisfactory effect: mean gradient 14 mm Hg, EF 50%, no paravalvular leak. Three days after TAVI the patient developed hypotension (90/30 mm Hg) and oliguria. Hemodynamically significant fistula between the aortic root and the RV was visualized on transesophageal echocardiography (TEE) (Figure 1B). MSCT confirmed rupture of the membranous part of the interventricular septum (Figure 1C). Transcatheter closure of the fistula was unsuccessful because of the instability and dislocation of the 4 Amplatzer Valvular Plug III occluders in the pulmonary artery. Occluders were removed with a snare (Figure 1D). Due to progressive cardiogenic shock (blood pressure 80/10 mm Hg, metabolic acidosis, anuria), the patient was subjected to salvage surgery (EuroSCORE, 83.8%). During surgery, the fistula between the aorta and RV was closed with a pericardial patch (40 × 20 mm), and Hancock 25 (Medtronic, Minneapolis, MN, US) bioprosthesis was implanted (Figure 1E). The ruptured ascending aorta was replaced with the aortic prosthesis (JOTEC, Hechingen, Germany). The procedural time was 4 hours, and after 15 hours the patient was weaned from the ventilator. Three days after surgery a pacemaker was implanted due to advanced AV block. TTE showed preserved EF, proper function of the prosthetic valve, and no PVL. Post-sternotomy wound infection was successfully treated by vacuum-assisted closure therapy and antibiotics. Hospitalization time was 32 days. After

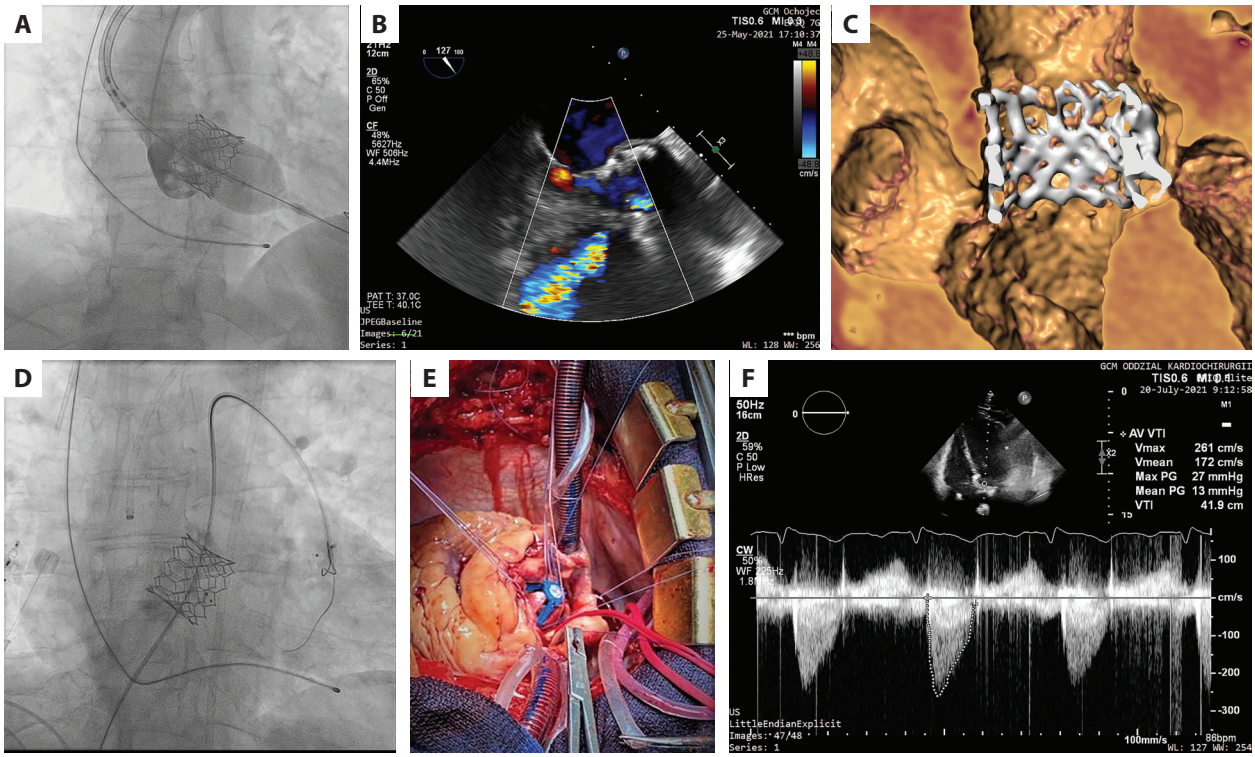

Figure 1. A. Fluoroscopy imaging of transcarotid transcatheter aortic valve implantation (TAVI) SAPIEN 3 Ultra 29 implantation. **B.** Echocardiography imaging of jet from the aortic root into the right ventricle. **C.** 3D imaging of the reconstruction rupture of ventricular septum after TAVI. **D.** Fluoroscopy imaging of attempts to close the ventricular septum rupture. **E.** Implantation of the Medtronic Hancock 25 valve. **F.** Echocardiography follow-up imaging

a 30-day follow-up, the patient remains stable (NYHA class I), and TEE results are reassuring (Figure 1F). The key to the success of the TAVI procedure is proper valve size selection and an optimal depth of implantation, especially in BAV. Recent consensus summarized the sizing and positioning of SAPIEN valves in BAV [4]. Bioprosthesis sizing based on the annulus diameter, rather than the circle method, may have contributed to the complication. Circle measurement at the inter-commissural aortic valve region suggests a downsized bioprosthesis could have provided safe anchoring and proper sealing. In case of such serious complications, only good cooperation of the Heart Team gives the patient a chance to survive.

Article information

Conflict of interest: None declared.

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