Valsalva Sinus Perforation Into the Right Atrium Due to Infective Endocarditis of Transcatheter Heart Valve

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Figure 1. (A) Transthoracic echocardiogram showing the Valsalva sinus perforation at the non-coronary cusp level into the right atrium (RA; arrow) in the presence of a paravalvular abscess (arrowheads). (B) Transesophageal echocardiogram showing the Valsalva sinus perforation at the non-coronary cusp level into the RA (arrow) in the presence of a paravalvular abscess (arrowheads). (C,D) 3-D reconstruction of the cavity between the Valsalva sinus and the RA (red arrow, abnormal blood flow from Valsalva into RA). LCC, left coronary cusp; NCC, non-coronary cusp; RCC, right coronary cusp.
Transcatheter aortic valve implantation (TAVI) is a recognized alternative to conventional surgical valve replacement in patients with severe aortic stenosis (AS) who are either inoperable or at high surgical risk.\textsuperscript{1,2} TAVI, recently introduced in Japan, is becoming increasingly more common. A potential complication of TAVI, often leading to valve failure, is infective endocarditis (IE),\textsuperscript{3} with a reported incidence of 0.5–3.4%.\textsuperscript{4–8} This can be life-threatening because patients who receive TAVI are generally frail with a number of comorbidities. Here, we report a case of transcatheter heart valve (THV) IE diagnosed 8 weeks after implantation via the transfemoral route, leading to Valsalva sinus perforation into the right atrium (RA) with a large aortic annulus abscess.

An 89-year-old man with permanent atrial fibrillation, chronic obstructive pulmonary disease and left internal carotid artery stenosis was diagnosed with symptomatic severe AS (New York Heart Association class IV). He had a past medical history of tuberculosis, colectomy for colon carcinoma as well as stroke. Transthoracic echocardiography (TTE) showed severe degenerative AS with an area of 0.89 cm\textsuperscript{2} and a mean aortic valve pressure gradient (AVPG) of 30 mmHg, which increased up to 50 mmHg on dobutamine stress test (maximum AVPG, from 50 to 90 mmHg). Left ventricular ejection fraction was relatively preserved (50\%) with a stroke volume index of 34.1.

Moderate mitral regurgitation was also detected. Multi-slice computed tomography showed an aortic annulus diameter of 21.5/23.8 mm with an annulus area of 470 mm\textsuperscript{2}. Operative mortality risks based on the logistic EuroSCORE and Society of Thoracic Surgeons score were 32.5\% and 6.9\%, respectively.

In view of the high surgical risk and the patient’s refusal for open heart surgery, a decision for TAVI was made after discussion at the Heart Team multi-disciplinary meeting. The procedure was performed via the left transfemoral approach under general anesthesia. A 26-mm Sapien XT valve (Edwards LifeSciences, Irvine, CA, USA) was deployed following predilatation with a 23-mm balloon under rapid pacing. Transesophageal echocardiography (TEE) and aortography showed a well-seated prosthesis with an acceptable AVPG (11 mmHg) and only mild paravalvular leak. Combination of sulbactam and ampicillin was administered before and after the procedure for 3 days. The patient was discharged home 8 days after the procedure. With regards to the anti-coagulation regimen, we opted for the combination of warfarin and clopidogrel 75 mg/day in view of the presence of atrial fibrillation. The patient was re-admitted to the emergency department 2 weeks after TAVI because of gastrointestinal bleeding with hemoglobin 8.7 g/dl despite international normalized ratio of prothrombin time within the therapeutic range (2.05). THV function remained good on TTE (mean AVPG, 8.5 mmHg with mild paravalvular leak). There was no evidence of infection during the second hospitalization. The patient was thus discharged home after a 16-day hospitalization with discontinuation of clopidogrel.

The patient was again re-admitted 5 weeks after TAVI (11 days after second discharge) due to hypoxia (pO\textsubscript{2}: 57.5 mmHg) with elevated body temperature (39.2°C). On biochemistry and hematology, white blood cell count was 13,510/μl and C-reactive

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**Figure 2.** (A) Presence of vegetation on the aortic side the 26-mm Sapien XT valve leaflets. (B) Explanted Sapien valve with no evident deformation. (C) Vegetation on the valve leaflets and commissures on the aortic side with no evidence of leaflet perforation. (D) Vegetation on the valve leaflet on left ventricular side. LCC, left coronary cusp; NCC, non-coronary cusp; RAA, right atrium appendage; RCC, right coronary cusp.
protein, 5.1 mg/dl. Chest computed tomography showed evidence of pneumonia. At this time, TTE did not show any obvious vegetation on the THV and native valves. Mean AVPG was slightly increased (18 mmHg) with the paravalvular leak remaining mild. Meropenem was changed to a vancomycin and amikacin regimen, because methicillin-resistant *Staphylococcus aureus* was detected on blood culture. At 21 days, a new cardiac murmur was diagnosed as well as complete atrial ventricular block. TTE and TEE demonstrated Valsalva sinus perforation at the non-coronary cusp level into the RA in the presence of an annular abscess (Figure 1). After discussion with the Heart Team, emergency open surgery was performed, which confirmed the aforementioned echocardiographic findings (Figure 2). A large paravalvular abscess was detected not only at the non-coronary cusp but also at the left coronary cusp, extending towards the mitral valve. Vegetation was seen also on all 3 THV leaflets. As a result both aortic and mitral valve replacement (19-mm Trifecta and 27-mm Epic, St. Jude Medical, St Paul, MN, USA, respectively) was performed along with patchplasty for the perforated Valsalva sinus and left ventricular outflow tract with bovine pericardium. Antibiotic regimen after surgery was as follows: vancomycin for 4 months, gentamycin for 3 months, and rifampicin for 5 months. After confirmation of several negative postoperative blood cultures, a permanent pacemaker was successfully implanted 2 months after surgery. The patient was eventually discharged home 5 months after the open heart surgery.

IE is a rare complication of TAVI that has not previously been reported in Japanese patients. This case also highlights the difficulty in treating IE leading to Valsalva sinus perforation as well as damage of the conducting pathways. Common causes of THV IE include central venous catheters and urinary catheters, which, however, the present patient did not have during the second hospitalization. The most plausible cause of THV IE in the present case is pneumonia. The patient’s teeth were another potential source because tooth infection was diagnosed following surgery.

**Disclosures**

Conflict of Interest: None.

**References**