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Valve: Case Report

Concurrent Explant of Infected Transcatheter Aortic Valve and Implant of Ventricular Assist Device

Zaid Abood, MD,[1]
M. Fuad Jan, MBBS (Hons), MD,[1,2]
Omar Nahhas, MD,[1]
Suhail Q. Allaqaband, MD,[1,2]
Tanvir Bajwa, MD,[1,2] and
Eric S. Weiss, MD, MPH[1]

A 60-year-old man with diabetes mellitus and aortic stenosis who had undergone transcatheter aortic valve replacement (TAVR) presented with persistent TAVR-associated infective endocarditis (TAVR IE) despite a prolonged antibiotic course. TAVR IE is a rare yet fatal complication, with surgical treatment carrying a high mortality rate, particularly in patients with systolic heart dysfunction. We present a case of successful TAVR explantation with left ventricular assist device insertion in a patient with persistent TAVR IE and refractory congestive heart failure with a left ventricular ejection fraction of 20%.

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Over the past decade, increased clinical expertise and technologic advancements have resulted in significantly improved transcatheter aortic valve replacement (TAVR) outcomes. Nonetheless, TAVR-associated infective endocarditis (IE) remains a catastrophic complication, with incident rates similar to those associated with surgical aortic valve replacement (SAVR). TAVR IE is a distinct category of prosthetic valve endocarditis (PVE) and may manifest with different clinical and microbiologic profiles and pose significant diagnostic challenges. It can occur any time after the TAVR procedure, with the highest reported incidence of 62% occurring within the first year. TAVR IE is associated with dire clinical outcomes and prognoses, leading to conservative treatment in most cases because of the substantial mortality rates regardless of the intervention strategy. Here we describe the simultaneous use of a left ventricular assist device in TAVR explantation and redo surgery to manage TAVR IE.

A 60-year-old man with aortic stenosis who had undergone TAVR (34-mm Evolut PRO, Medtronic) 18 months earlier and who had experienced 2 previous episodes of successfully treated vancomycin-resistant *Enterococcus faecalis* (VRE) IE was referred for surgical evaluation, given his third admission for IE and acute decompensated congestive heart failure (CHF). His other medical conditions included diabetes mellitus, chronic kidney disease stage 3, and a left ventricular ejection fraction of 20% with an implantable cardioverter-defibrillator in situ. Four months earlier, his admission at an outside hospital for IE included an extensive workup, with a positive VRE blood culture result, negative findings on a transesophageal echocardiogram (TEE), and negative findings on colonoscopy.

Fluorine-18 fluorodeoxyglucose positron emission tomography (18F-FDG-PET) showed increased uptake around the implantable cardioverter-defibrillator in the right atrium, a finding suggesting cardiac device-related endocarditis. Despite an initially favorable response and a negative repeat blood culture result before his outpatient-scheduled implantable cardioverter-defibrillator removal, the patient presented again, this time with decompensated CHF. The result of a repeat blood culture was positive for VRE. The TEE showed a well-seated TAVR prosthesis, a transvalvular mean gradient of 13 mm Hg, and a new thickening on the TAVR leaflet that was concerning for TAVR IE (Videos 1, 2). The surgical team advised ongoing medical management in view of the patient's elevated surgical risk, his history of negative posttreatment blood culture results, and

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[1]Aurora Cardiovascular and Thoracic Services, Aurora Sinai/Aurora St Luke's Medical Centers, Advocate Aurora Health, Milwaukee, Wisconsin; and [2]Division of Cardiovascular Medicine-Milwaukee Clinical Campus, University of Wisconsin School of Medicine and Public Health, Milwaukee, Wisconsin

Address correspondence to Dr Weiss, Aurora Cardiovascular and Thoracic Services, Aurora St Luke's Medical Center, 2801 W Kinnickinnic River Pkwy, Ste 130, Milwaukee, Wisconsin 53215; email: wi.publishing517@aah.org.

the presence of a competent TAVR device. Consequently, the patient underwent inpatient implantable cardioverter-defibrillator lead and generator extraction with pocket revision and debridement. After stabilization, he was discharged home with a wearable defibrillator and antibiotics.

Five days later, he was readmitted for worsening decompensated CHF despite diuretic therapy. The repeat TEE was unchanged, and his blood culture result was still positive for VRE. Given the patient's refractory decompensated CHF and persistent TAVR IE, the decision was made this time to proceed with surgical treatment.

The operation was performed through median sternotomy. After the cardiopulmonary bypass was begun, a HeartMate 3 device (Abbott Cardiovascular) was placed and secured with a locking pin, and the drive line was brought out into the right abdomen (Video 3). Then the aortic root was opened, the TAVR prosthesis was removed, and the valve leaflets were resected (Figure). Subsequently, a 27-mm Inspiris Resilia bioprosthetic aortic valve (Edwards Lifesciences) was tied in place using the Cor-Knot system (LSI Solutions) and was well seated below the coronary ostia with direct TEE visualization (Video 4). The patient was successfully weaned from bypass with a HeartMate device speed of 4800 rpm and a flow of 3.5 L/min.

The patient was transferred to the intensive care unit in stable condition. The subsequent repeat blood culture result was negative. The patient was successfully extubated the next day, recovered relatively well with a stable transthoracic echocardiogram (Video 5), and was discharged to physical rehabilitation.

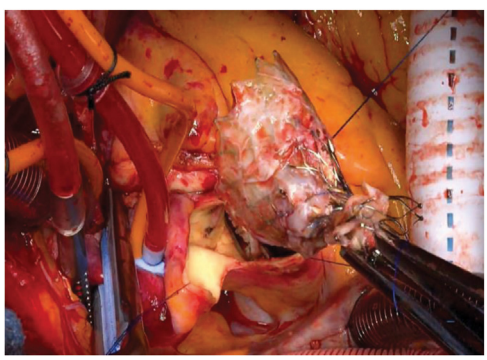

FIGURE Operative photograph showing successful transcatheter aortic valve replacement explantation.

COMMENT

The incident rates of TAVR IE vary from 0.3 to 2.0 per 100 person-years, similar to those of SAVR. TAVR IE may occur at any point, with the highest incidence reported within 100 days after the procedure.[1] Our patient had several risk factors associated with TAVR IE, including male sex, young age, diabetes mellitus, chronic kidney disease, and systolic heart failure.[2]

Although TAVR IE is considered a subtype of PVE and the modified Duke criteria are recommended for the diagnosis, these criteria remain challenging to implement. Atypical symptoms occur more frequently in TAVR IE than in PVE. Nonetheless, fever and sepsis remain the most common, followed by decompensated CHF, irrespective of previous left ventricular ejection fraction, as observed in our patient.[2,3] The microbiologic profile is significantly different in TAVR IE, with a higher frequency of enterococci, as found in our patient, compared with approximately 10% in SAVR IE.[2,4] Similar to SAVR IE, TAVR IE may manifest in patients with negative blood culture results. Moreover, the low diagnostic yield of echocardiography (transthoracic and/or transesophageal) in TAVR IE complicates the diagnosis because of potential false negative or inconclusive findings.

Even though the metallic and polymeric components of both mechanical and biologic prosthetic valves do not transmit ultrasound waves, thus leading to acoustic shadowing, previous studies have found that the sensitivity of echocardiography was lower in TAVR IE than in PVE. Therefore, additional imaging modalities, including 18F-FDG-PET, have been suggested for improving the diagnostic accuracy of the Duke criteria and increasing sensitivity.[5] Our patient had negative TEE findings on the initial first 3 IE admissions, yet his clinical presentation was highly suggestive of IE, and subsequent 18F-FDG-PET was concerning for pacemaker-associated IE.

TAVR IE carries significant inpatient mortality, reaching in some studies up to 64%, and treatment options are also challenging.[2] Successful IE treatment requires prolonged bactericidal antibiotic therapy and, in some cases, surgery. Current indications for surgery in IE are well defined in the American Heart Association and European Society of Cardiology guidelines and include valve dysfunction that leads to heart failure, uncontrolled infection (defined as a paravalvular extension, abscess, or persistent bacteremia), and recurrent embolism or high risk of embolism.[5] Only ~20% of patients with IE who

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meet the criteria for surgical intervention actually undergo surgery because of the high perioperative mortality. In a recent study, Mangner and colleagues[6] found no difference in in-hospital or 1-year mortality between 111 patients (19%) with TAVR IE who were treated with surgical interventions and 473 patients treated with antibiotics alone. Therefore, we initially opted for a prolonged course of antibiotics (83 days of culture-specific antibiotics) for our patient's persistent bacteremia. However, because the patient continued to have refractory decompensated heart failure despite maximally tolerated medical therapy and antibiotics, the decision was made to proceed with surgical intervention with TAVR explantation and left ventricular assist device insertion.

In conclusion, TAVR IE is a life-threatening complication and is associated with high mortality and a poor prognosis. Despite conflicting data on the benefits of cardiac surgery in these cases, large-scale data are lacking. SAVR could provide the only option if medical treatment fails and could be performed along with left ventricular assist device insertion, as presented in our case of a patient who tolerated the procedure well.

The Videos can be viewed in the online version of this article [https://doi.org/10.1016/j.atssr.2024.07.003] on http://www.annalsthoracicsurgery.org.

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PATIENT CONSENT

Obtained.

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