CASE REPORT
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Surgery in infective endocarditis post-transcatheter aortic valve replacement in two low-risk cases

Cirugía en endocarditis infecciosa postreemplazo valvular aórtico transcatéter en dos casos de bajo riesgo

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ABSTRACT

Percutaneous aortic valve replacement has evolved from a procedure for high-risk surgical patients to an accepted procedure approved by the FDA in 2019 for patients with medium and low risk worldwide. Most cases of post-TAVI endocarditis occur within the first year of the procedure, with an incidence ranging from 0.5 to 2%. We present two cases of early-onset infective endocarditis following transcatheter aortic valve replacement in two low-risk surgical patients.

Keywords: aortic valve, complications, endocarditis, operative low-risk, TAVI, surgery.

RESUMEN

La colocación de válvulas aórticas percutáneas ha pasado de ser un procedimiento para pacientes quirúrgicos de alto riesgo a un procedimiento aceptado en 2019 por la FDA para pacientes de riesgo medio y bajo a nivel mundial. La mayoría de las endocarditis posteriores a TAVI se presentan antes del primer año del procedimiento. Su incidencia es de 0.5 a 2%. Presentamos dos casos de endocarditis infecciosa temprana postreemplazo valvular aórtico transcatéter en dos casos de bajo riesgo quirúrgico.

Palabras clave: *válvula aórtica, complicaciones, endocarditis, bajo riesgo operatorio, TAVI, cirugía.*

Abreviaturas:
CTA = computed tomography angiography
LAD = left anterior descending
LVEF = left ventricular ejection fraction
PCI = percutaneous coronary interventions
RCA = right coronary arteries
SAVR = surgical aortic valve replacement
STS = Society of Thoracic Surgeons
TAVI = transcatheter aortic valve implantation

INTRODUCTION

Recently, there has been a marked surge in Transcatheter Aortic Valve Implantation (TAVI) procedures globally, driven by the findings of clinical trials demonstrating the non-inferiority of transcatheter aortic valve replacement compared to surgical intervention in low-to-intermediate

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risk patients, as determined by the STS score and Euroscore. Paralleling this trend, an increasing number of patients are presenting with prosthetic valve endocarditis following transcatheter implantation. This represents a serious complication, with an incidence ranging from 1.7 to 2% within the first year post-implant.[1,2] Here, we present two cases of early-onset post-TAVI endocarditis, highlighting the importance of vigilance and prompt management in this patient population.

CASE DESCRIPTION

Case 1

A 63-year-old male presented with a 30-year history of smoking, arterial hypertension, and type II diabetes mellitus. In April 2023, he experienced symptoms of stable angina. Echocardiography revealed severe aortic stenosis with a valve area of 0.96 cm^2, characterized by low flow and low gradient, and a left ventricular ejection fraction (LVEF) of 34%. Coronary angiography demonstrated lesions in the left anterior descending (LAD) and right coronary arteries (RCA). Computed tomography angiography (CTA) showed an aortic valve with a 28 mm aortic annulus and suitable coronary distances for transcatheter aortic valve implantation (TAVI). The Society of Thoracic Surgeons (STS) risk score was calculated to be 1.82%. Subsequent percutaneous coronary interventions (PCI) were performed, with stent placement in the LAD and RCA on August 18, 2023. Three months later, on November 9, 2023, a percutaneous aortic valve replacement was performed via femoral access, utilizing an Evolut™ R 34 mm valve prosthesis (Medtronic, Minneapolis, MN, USA), resulting in a mild paravalvular leak in the non-coronary sinus. Four months post-TAVI, on March 10, 2024, the patient developed a febrile syndrome, petechiae on the lower limbs, decreased visual acuity in the right eye, reversible neurological deterioration, and heart failure, necessitating inotropic support and non-invasive respiratory support in the Intensive Care Unit.

Echocardiography study revealed mild aortic insufficiency with a 14% paravalvular leak, a 17 × 7 mm oscillating vegetation, and a LVEF of 53%. Additionally, anteroseptal hypokinesia, systolic and diastolic dysfunction of the left ventricle, and decreased systolic function of the right ventricle were observed. Blood cultures were positive for *Staphylococcus aureus*, and leukocytosis was present with a count of 13 × 10^9 cel/L. The patient was managed with antimicrobial therapy, and the STS risk score was calculated to be 2.53%. Due to the patient's critical condition, emergency surgery was performed 72 hours after admission. Standard central cannulation was employed, and a high transverse aortotomy was performed, revealing severe inflammatory changes in the tissues adjacent to the aorta. A central obstruction of the prosthetic valve caused by a vegetation of approximately 2 cm was identified *(Figure 1)*. The valve was

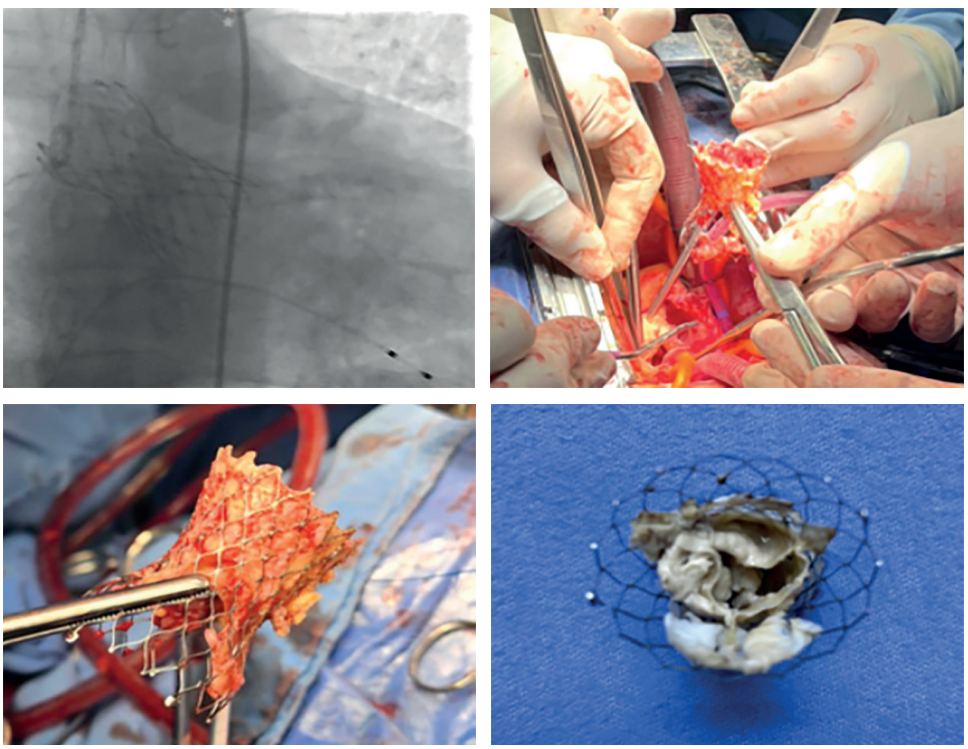

Figure 1:

Case 1. Evolut™ R 34 mm percutaneous aortic valve prosthesis (Medtronic, Minneapolis, MN, USA). A fluoroscopy view in the implant procedure, and three different views of explanted prosthesis with large vegetations.

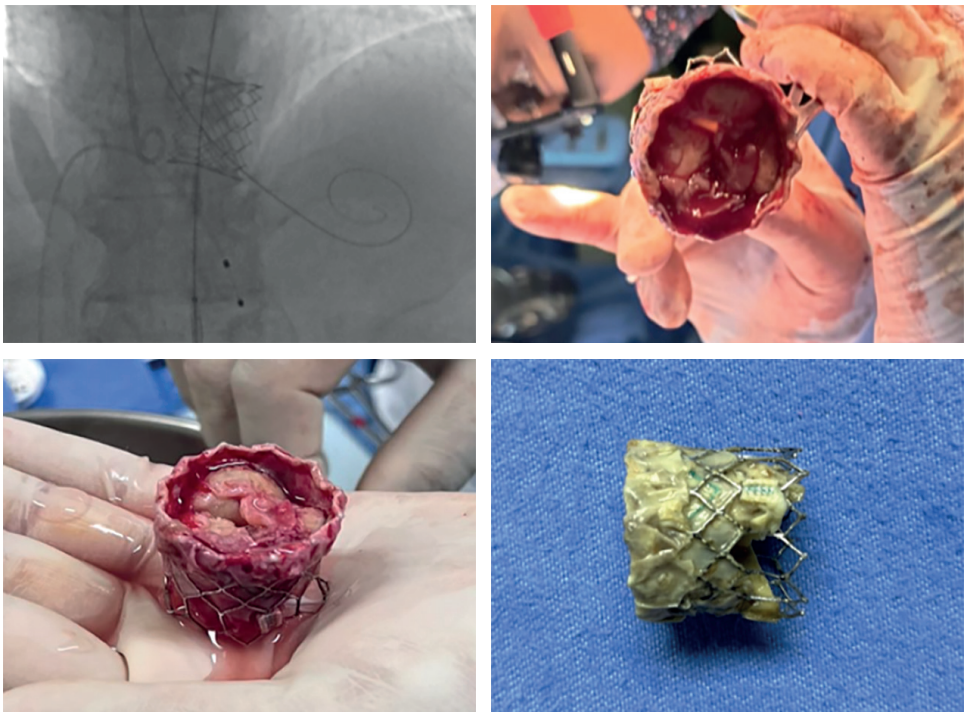

Figure 2:

Case 2. Sapiens3 29 mm percutaneous aortic valve prosthesis (Edwards Lifesciences, Irvine, California). A fluoroscopy view in the implant procedure, and three different views of explanted prosthesis with large vegetations.

carefully removed by manipulating the metal frame towards the central part of the aorta. The native aortic leaflets were excised, and part of the aortic annulus was decalcified. A No. 23 biological prosthesis was then implanted. Following aortic closure, an attempt was made to wean the patient from extracorporeal circulation. However, this was not possible due to ST segment elevation on the anterior and inferior surfaces. Consequently, two venous blood ducts were placed in the anterior descending artery and the right coronary artery, but unfortunately, this did not result in improvement, and the patient succumbed in the operating room on March 11, 2024.

Case 2

A 73-year-old male patient presented with a history of smoking, type II diabetes mellitus, and long-standing hypertension. He had suffered an inferior myocardial infarction in 2009 and remained asymptomatic until a routine check-up in 2023, which revealed an aortic murmur. Subsequent evaluation led to the diagnosis of severe aortic stenosis, with an echocardiogram on June 2, 2023, demonstrating an aortic valve area of 0.4 cm^2, maximum velocity of 4.5 m/s, mean gradient of 54 mmHg, and LVEF of 48%. Cardiac catheterization performed on the same date revealed a 90% lesion in the RCA. On February 3, 2024, a stent was placed in the middle third of the RCA. CTA showed a bileaflet aortic valve with calcification, an aortic annulus of 26.6 mm, and origins of the right and left coronary arteries at 7.7 mm and 13.4 mm, respectively. The STS risk score was calculated to be 1.56%. On June 13, 2024, a Sapiens3 29 mm percutaneous aortic prosthesis (Edwards Lifesciences, Irvine, California) was implanted via the femoral without complications, and the patient was discharged home 24 hours later. However, five days post-procedure, the patient developed signs of systemic inflammatory response, with blood cultures positive for *Staphylococcus aureus*. Despite medical treatment through five weeks, the patient's condition did not improve, and he was readmitted to the hospital on July 25, 2024, with febrile symptoms and critical hemodynamic conditions. An echocardiogram performed on August 2, 2024, revealed regurgitation/stenosis aortic, a prosthetic valve vegetation (19 × 6 mm and 7 × 14 mm), and another one of 5 × 7 mm vegetation on the anterior leaflet of the mitral valve, with leaflet perforation. The patient's condition deteriorated due to septic shock, with leucocytes count of 20 × 10^9 cel/L, and worsening renal function. Emergency surgery was performed five weeks after the onset of symptoms, on August 9, 2024, with a calculated STS risk score of 2.64%. A median sternotomy and central cannulation were performed, and the Sapiens 3 valve was explanted *(Figure 2)*. A 21 mm biological prosthesis was implanted in aortic position, and a 27 mm mitral biological prosthesis was also implanted. Additionally, repair of the left atrial roof with bovine pericardium was necessary. The patient was transferred to the Intensive Care Unit with coagulation disorders and mixed shock. Unfortunately, he died 18 hours after the operation.

COMMENT

TAVI has evolved from a procedure primarily reserved for high-risk surgical patients to a widely accepted treatment option for medium- and low-risk patients globally, following its approval by the FDA in 2019.[3] However, the ESC/EACTS 2021 Guideline for valvular heart disease recommends surgical aortic valve replacement (SAVR) for young, low-risk patients with valvular heart disease, whereas transfemoral TAVI is recommended for patients over 75 years of age or those at high surgical risk. According to the STS risk score, patients with a score < 4% are considered low-risk, as exemplified by the cases presented herein. Notably, TAVI has increasingly been adopted for low-risk patients, with current utilization rates reaching 40% of all TAVI cases in the United States and 62.5% in Asian countries. Correspondingly, mortality rates for low-risk patients undergoing TAVI have been reported to be 5.3% in the US and 3.5% in Asian countries.[4]

The majority of endocarditis cases following TAVI present within the first year after the procedure, with an incidence ranging from 0.5 to 2% for both self-expanding and balloon-expandable prostheses. Notably, the incidence of endocarditis in SAVR is 1.9%, whereas it is 1.7% after TAVI, including low-risk cases. Surgical reinterventions after TAVI are primarily driven by endocarditis, accounting for 40.7% of cases. Associated mortality rates are substantial, with intraoperative mortality reaching 18%, immediate operative mortality at 25%, and all-cause mortality up to 63.3%. Despite the high-risk nature of these patients, medical treatment is often the primary approach for endocarditis after TAVI, despite the presence of surgical indications. However, in low-risk patients, surgical intervention should not be delayed, and valve replacement should be performed promptly.[5,6] Furthermore, the removal of a TAVI prosthesis due to endocarditis is a complex and challenging procedure, frequently requiring reconstruction of the intervalvular fibrous body. Additional procedures, such as mitral valve interventions (14.7% of cases, as seen in Case II), or aortic root replacement, may also be necessary. A recent report by Takuya Ogami (2022) highlighted surgical bailout after TAVI as the most common indication for valve explant (n = 8, 47.1%), followed by infective endocarditis (n = 4, 23.5%) and paravalvular leak (n = 2, 11.8%).[7]

The European Registry of Emergency Cardiac Surgery during TAVI (EuRECS-TAVI) analyzed real-world data from 79 centers, encompassing 27,760 transfemoral TAVI procedures, and reported a slightly higher incidence of emergency conversions, at 0.76%. Single-center studies have documented emergency conversion rates ranging from 1.2 to 4.9%. The EXPLANT-TAVR registry highlights that the surgical risks associated with TAVR explant are significant and should be considered in the long-term management of aortic stenosis. Indications for explant included endocarditis (43.1%), structural valve degeneration (20.1%), paravalvular leak (18.2%), and prosthesis-patient mismatch (10.8%). Redo TAVR was not feasible due to unfavorable anatomy in 26.8% of patients. Urgent or emergency procedures were performed in 53.1% of patients, with 13.4% requiring aortic root replacement and 54.6% undergoing concomitant cardiac procedures. Overall survival at last follow-up was 76.1%. In-hospital, 30-day, and one-year mortality rates were 11.9, 13.1 and 28.5%, respectively, while stroke rates were 5.9, 8.6, and 18.7%, respectively.[8]

Although the indications for reintervention after TAVI are currently limited, this trend is expected to increase as TAVI is now considered a viable option for patients with low surgical risk in aortic stenosis. This shift in paradigm prompts reflection on the evolving role of the cardiac surgeon, as aptly noted by Tomas Modine in 2022. Cardiac surgeons possess a unique combination of skills that enable them to offer a comprehensive range of therapeutic options for structural heart disease. In addition to traditional open surgery, surgeons can provide complex transcatheter interventions, minimally invasive procedures, and redo operations for patients with valvular heart disease, thereby positioning themselves as the ultimate "valve specialist". When performing TAVI, the cardiac surgeon has the flexibility to select the optimal access site for each patient, whether it be the femoral, carotid, axillary, or transapical artery. Furthermore, given that many patients with structural heart disease present with multiple affected structures, surgeons are equipped to provide comprehensive multicomponent therapy for each of these structures in a single setting.[9]

CONCLUSIONS

The incidence of post-TAVI endocarditis requiring explantation is increasing, even among low-surgical-risk patients, and is associated with a high perioperative mortality rate, as illustrated by the two cases presented here. Notably, these findings underscore the importance of prompt surgical intervention, rather than delaying treatment with medical management alone, in order to optimize outcomes in this patient population.

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