JACC: CASE REPORTS VOL. 3, NO. 6, 2021

MINI-FOCUS ISSUE: TRANSCATHETER INTERVENTIONS

INTERMEDIATE

CASE REPORT: CLINICAL CASE

Transcatheter Aortic Valve Implantation in Severe Native Pure Aortic Regurgitation Following Endocarditis With Large Vegetation

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ABSTRACT

We present the case of a 76-year-old man with recently treated infective endocarditis and severe residual native pure aortic regurgitation that was causing recurrent pulmonary edema. In view of his prohibitive surgical risk, he underwent transcatheter aortic valve implant with an excellent clinical outcome. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2021;3:859–63) Crown Copyright © 2021 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 76-year-old man presented with a 6-week history of lethargy, weight loss, fever, and chest pain. Observations demonstrated the following: blood pressure, 94/39 mm Hg; heart rate, 73 beats/min; oxygen saturation, 96%; respiratory rate, 16 breaths/min; and temperature, 38.1°C. Examination revealed a murmur of aortic regurgitation (AR). C-reactive protein was elevated at 39 mg/l. A transthoracic echocardiogram demonstrated good biventricular function and mild AR. Blood culture results were positive for *Streptococcus mitis*. Antibiotic therapy was commenced for presumed infective endocarditis, and a transesophageal echocardiogram (TEE) demonstrated a large vegetation attached to the right coronary cusp, with associated moderate AR. Despite antibiotic therapy, he deteriorated clinically, and serial TEE demonstrated progressive valve insufficiency and a large, highly mobile vegetation on the right coronary cusp of the aortic valve. After prolonged intravenous antibiotic use, his inflammatory markers changed toward normal and pyrexia resolved, but he experienced relapsing pulmonary edema requiring intermittent noninvasive ventilation and high-dose intravenous diuretic therapy.

LEARNING OBJECTIVES

- To consider different treatment options in severe APAR due resulting from infective endocarditis in the presence of a large mobile vegetation.
- To consider methods of ensuring accurate TAVI device positioning in cases of severe NPAR, including the use of TEE.
- To review appropriate selection of TAVI device when treating patients with NPAR.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

Manuscript received October 28, 2020; revised manuscript received February 24, 2021, accepted March 29, 2021.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2021.03.020

ABBREVIATIONS AND ACRONYMS

AR = aortic regurgitation

AS = aortic stenosis

CT = computed tomography

NPAR = native pure aortic regurgitation

TAVI = transcatheter aortic valve implantation

TEE = transesophageal echocardiogram

PAST MEDICAL HISTORY

His most relevant history was of 5-vessel coronary bypass grafting, including a right internal mammary artery graft that crossed the midline to the first obtuse marginal artery. His other grafts were a left internal mammary artery to the left anterior descending artery, left radial artery to the posterior descending artery, and long saphenous venous grafts to the posterolateral vessel and the first diagonal. His other relevant history included peripheral vascular disease, a previous transient ischemic attack, and treated prostate adenocarcinoma.

DIFFERENTIAL DIAGNOSIS

The presence of *S mitis* in 2 sets of blood cultures and the imaging evidence of a vegetation on the aortic valve with an associated regurgitant lesion met the 2 major modified Duke's criteria for definite infective endocarditis.

INVESTIGATIONS

Computed tomography (CT) transcatheter aortic valve implantation (TAVI) showed suitable femoral access and a trileaflet aortic valve with no calcification and a mean annular diameter and perimeter of 26.2 and 85.2 mm, respectively (**Figures 1A to 1D**). A gated CT coronary angiogram could not confirm the patency of all grafts because of extensive metallic clips degrading the image quality. The multidisciplinary heart team strongly believed that angiography of the grafts and coronary arteries was required to stratify surgical risk, so this was performed with extreme care to avoid contact with the aortic valve, thereby confirming the patency of all grafts. We acknowledge that native coronary angiography in this setting is controversial and potentially hazardous and may have been avoided.

TEE showed hyperdynamic left ventricular systolic function with severe AR. The trileaflet aortic valve had no restriction or stenosis but had a large, highly mobile vegetation (13 × 7 mm) associated with the right coronary cusp (**Figures 2A to 2H,** Videos 1 and 2).

MANAGEMENT

Microbiology specialists recommended prolonged treatment with benzylpenicillin on the basis of sensitivities. After 6 weeks, his valve appeared sterilized, but he had relapsing pulmonary edema requiring intermittent noninvasive ventilation. His pre-morbid conditions, his poor clinical state, and the considerable risk of damage to his bypass grafts, especially the right internal mammary artery, from repeat sternotomy were considered to place him at prohibitive surgical risk. Following heart team discussion, the decision was taken to perform TAVI while acknowledging the off-label indication and the high risk of embolism from the large vegetation.

The TAVI procedure was performed with the patient under general anesthesia, with TEE guidance, and with the use of cerebral embolic protection. The cerebral protection device was advanced through the right radial artery, and its position was confirmed with digital subtraction angiography.

A 34-mm TAVI valve was delivered through the right femoral artery over a Safari wire (Boston Scientific, Marlborough, Massachusetts), and the valve's position was confirmed with fluoroscopy and TEE. Rapid right ventricular pacing was initiated through a temporary pacing wire in the right internal jugular vein, and the device was deployed. There was an immediate improvement in hemodynamics following valve deployment, with normalization of the aortic pressure waveform. The diastolic pressure was 20 mm Hg with an absent dicrotic notch predeployment, and it recovered to 60 mm Hg with a normal dicrotic notch immediately post-deployment (**Figures 3A and 3B**).

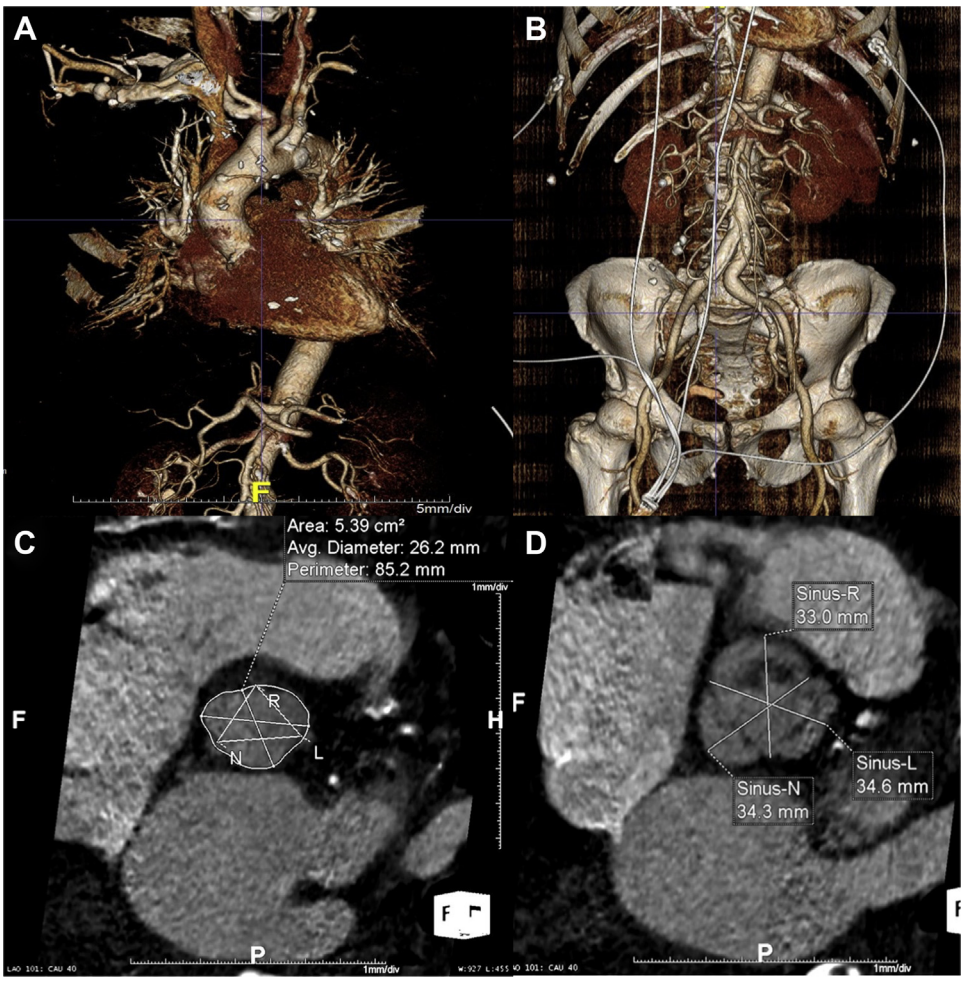
The cerebral protection device was retrieved with no material captured. TEE confirmed that the large vegetation was now trapped behind the device and demonstrated satisfactory implant position with only a small paravalvular leak (**Figures 2G and 2H**). The patient made an excellent clinical recovery in the hospital before he was discharged with a further 2 weeks of oral amoxicillin.

DISCUSSION

This case presented several procedural challenges, chiefly the lack of aortic valve calcification, the lack of aortic stenosis (AS), and the presence of a large, mobile vegetation.

In standard TAVI for AS, the presence of aortic annular calcification acts as a landmark for device positioning and stabilizes the device during deployment; in this case, however, there was no calcification. An alternative is to position 1 or more pigtail catheters against the stenotic valve as a landmark, but this was not possible because of the lack of stenosis. Additionally, there was a desire to avoid contact with the valve, which could embolize the large vegetation. TEE guidance was therefore vital in ensuring accurate device position.

FIGURE 1 **Computed Tomography Transcatheter Aortic Valve Implantation**

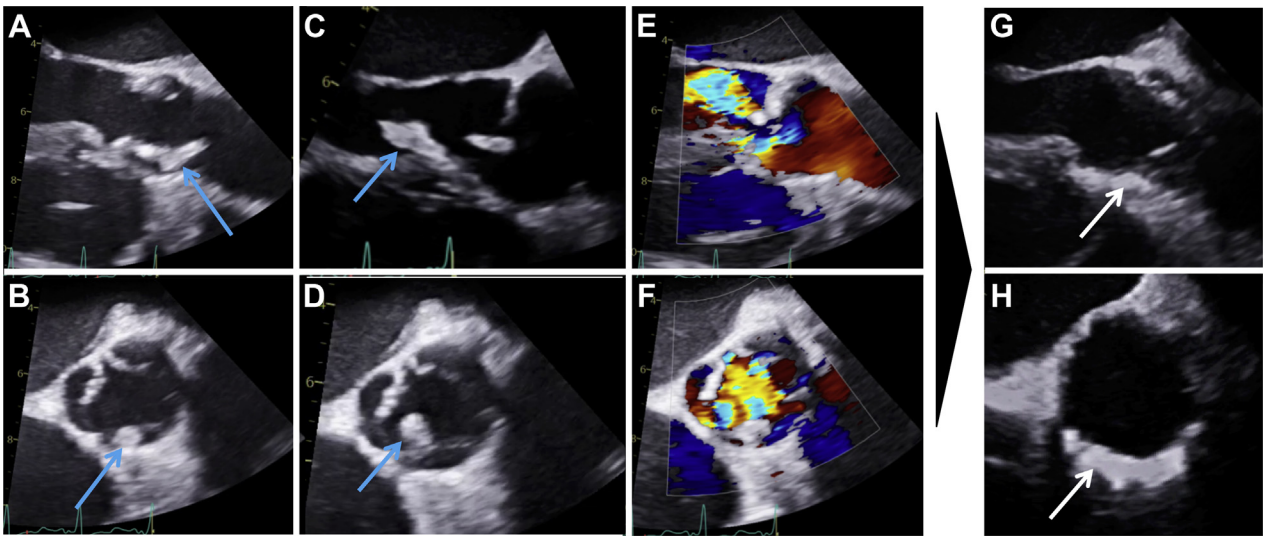


(A and B) Computed tomography transcatheter aortic valve implantation 3-dimensional reconstructions. **(C)** Computed tomography transcatheter aortic valve implantation cross-section at the aortic annulus level and **(D)** at the sinus of Valsalva level. Avg. = Average; Sinus-L = left coronary sinus; Sinus-N = noncoronary sinus; Sinus-R = right coronary sinus.

The increased stroke volume with AR elevated the risk of valve migration or embolization; therefore, appropriate valve selection was crucial. Previously published data suggested a 15% to 20% oversize in this scenario (1). The mean annular diameter was 26.2 mm, and the perimeter was 85.2 mm. Our preference was to use a self-expanding valve to allow significant oversizing while limiting the risk of annular rupture; we therefore elected to use a 34-mm TAVI, which is suitable for up to a 30-mm annular diameter and a 94.2-mm perimeter. Use of this valve in native pure AR (NPAR) has been previously reported in small numbers of patients with reasonable success rates (2).

The large, mobile, sterilized vegetation presented a unique embolization risk, and a cerebral embolization protection device was used to mitigate the risk of stroke. The vegetation may have been too large to be fully captured inside the retrieval sheath of the radial device. Alternatively, a cerebral embolic deflection device to protect the brain circulation, with a risk of seeding infection elsewhere, or a femorally inserted cerebral capture device, with a larger retrieval sheath to remove the vegetation, could be used (3). In our case, the vegetation was successfully trapped behind the frame of the device, and there was no material captured in the embolization protection device.

FIGURE 2 Transesophageal Echocardiography of Vegetations

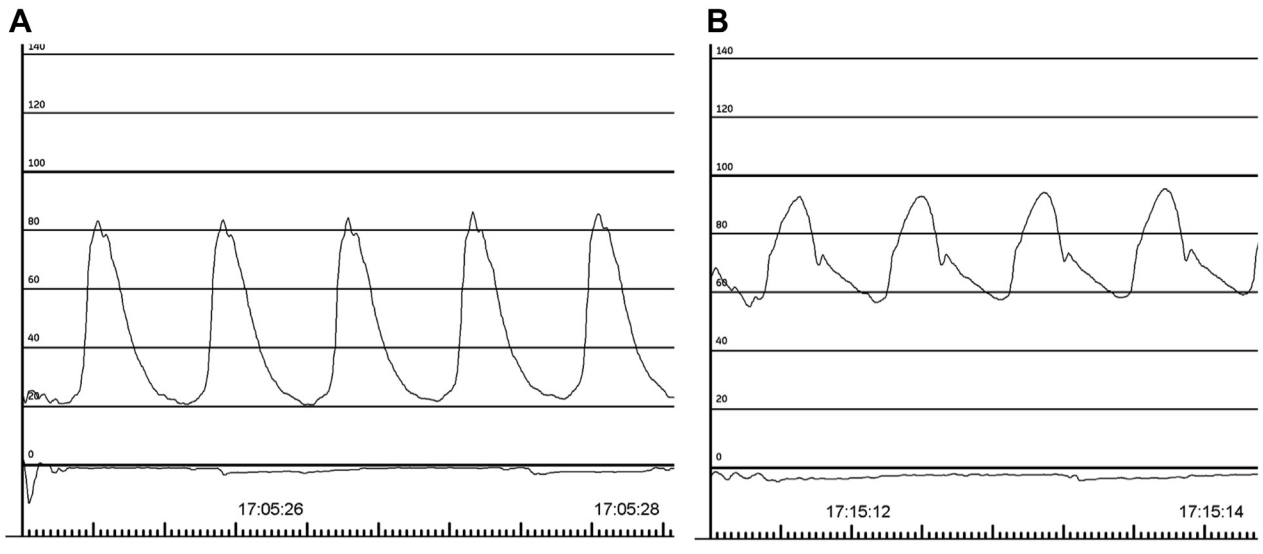


(A to D) Transesophageal echocardiography images showing a large, highly mobile vegetation **(blue arrows)** attached to the aortic valve. **(E and F)** Severe aortic regurgitation. **(G and H)** Vegetation **(white arrows)** trapped behind the transcatheter aortic valve implantation prosthesis.

An antibiotic window was considered to ensure sterility before TAVI treatment; however, in view of the clinically precarious situation, antibiotic treatment was continued. Because the vegetation was not removed but was trapped behind the prosthesis, there was a risk of recurrent infection; therefore, close clinical surveillance was maintained. The patient has remained very well with no evidence of recurrent infection after 12 months of follow-up.

Several recent studies have demonstrated higher procedural success with newer-generation TAVI prostheses for NPAR compared with older devices.

FIGURE 3 Aortic Pressure Waveform



(A) Pre-deployment with diastolic pressure 20 mm Hg. **(B)** Post-deployment of transcatheter aortic valve implantation with diastolic pressure 60 mm Hg and restoration of the diastolic notch.

These favorable results were driven by less valve malposition, a lower degree of post-procedural AR, and lower cardiovascular mortality. It is important to acknowledge that across all studies of TAVI for NPAR, the success rates are considerably lower than contemporary trials of TAVI for AS. Three recent studies reported device success rates ranging from 74.3% to 85% according to Valve Academic Research Consortium (VARC-2) criteria (2,4-6). The main reported complications were high rates of second valve implantation and significant post-procedural AR. In our view, these data underline the need for evaluation of procedural success and quantification of AR with immediate on-table TEE.

FOLLOW-UP

The patient has made an excellent clinical recovery with no evidence of recurrent infection after 12 months of follow-up. He will remain under ongoing surveillance.

CONCLUSIONS

To the best of our knowledge, this is the first reported example of TAVI in a patient with severe native AR secondary to infective endocarditis. There are several important considerations and technical steps outlined to ensure procedural success. This patient had no realistic prospect of survival to hospital discharge without this procedure, and he has subsequently made an excellent clinical recovery.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS aortic regurgitation, infective endocarditis, transcatheter aortic valve implantation

APPENDIX For supplemental videos, please see the online version of this article.