

Transcatheter aortic valve replacement for acute aortic regurgitation due to *Staphylococcus aureus* infective endocarditis complicated with a perivalvular abscess: a case report

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Background

Infective endocarditis is a life-threatening disease associated with high mortality. Appropriate antimicrobial treatment and cardiac surgery, when indicated, are closely related to prognosis. When cardiac surgery is contraindicated, prognosis worsens dramatically. There is few data concerning the use of transcatheter aortic valve replacement after healed aortic valve endocarditis or during active IE. We present the first case report of a transcatheter aortic valve replacement implanted during antimicrobial therapy for a severely symptomatic acute aortic regurgitation due to an infective endocarditis complicated with a perivalvular abscess.

Case summary

A 68-year-old man was admitted due to left hemiparesis and fever. An acute ischaemic stroke with haemorrhagic transformation was diagnosed. Blood cultures were positive for methicillin-susceptible *Staphylococcus aureus* and a transoesophageal echocardiogram revealed an aortic endocarditis with an acute severe aortic regurgitation and a perivalvular abscess. Urgent cardiac surgery was contraindicated due to intracranial haemorrhage. However, the patient developed refractory pulmonary oedema and haemodynamic instability. Despite the perivalvular abscess, a transcatheter aortic valve replacement was successfully performed 15 days after the diagnosis. Nine months after completing antimicrobial therapy, there were no signs of relapse.

Discussion

Transcatheter aortic valve replacement could be considered in selected patients with symptomatic severe aortic regurgitation due to aortic infective endocarditis during antimicrobial therapy when cardiac surgery is contraindicated.

Keywords

Case report • Infective endocarditis • TAVR • Aortic valve endocarditis • Perivalvular abscess • *Staphylococcus aureus*

ESC Curriculum

4.1 Aortic regurgitation • 4.11 Endocarditis • 6.4 Acute heart failure • 7.1 Haemodynamic instability • 4.10 Prosthetic valves

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Learning points

- Prompt recognition and treatment of peripheral vein phlebitis and catheter-related bacteraemia is crucial to prevent infective endocarditis.
- Infective endocarditis is associated with increased morbidity and mortality. In cases of intracranial haemorrhage, cardiac surgery should be postponed for at least four weeks.
- Transcatheter aortic valve replacement could be considered in selected patients with active aortic infective endocarditis and severe haemodynamic compromise secondary to severe aortic regurgitation, as a palliative solution or as a bridge to open-heart surgery once blood cultures have become negative.

Introduction

Infective endocarditis (IE) is associated with high rates of mortality and morbidity. *Staphylococcus aureus* is the most frequently isolated microorganism, and the one most frequently associated with neurological complications.^{1–3} More than 70% of patients of left-sided IE have indication for cardiac surgery, but only 50% are finally operated on. One of the main reasons for rejecting a cardiac surgery is the high surgical risk.⁴ Patients with surgery-indicated-IE but not undergoing cardiac surgery have an increased mortality rate, especially those with heart failure.⁵ A few data exist concerning the use of transcatheter aortic valve replacement (TAVR) after healed aortic valve endocarditis or during active IE. We report the first case of aortic valve endocarditis complicated with severely symptomatic acute aortic regurgitation and a perivalvular abscess in which a TAVR was successfully implanted during antimicrobial therapy.

Timeline

| | |
|---|---|
| Two weeks before admission | Peripheral vein phlebitis |
| Admission | Ischaemic stroke |
| Two days after admission | Intracranial bleeding and diagnosis of IE |
| Two weeks after admission | TAVR |
| Sixteen weeks after TAVR | Reduction of perivalvular thickening. Negative blood cultures End of antibiotic therapy |
| One, four and sixteen weeks after the end of antibiotic | Negative blood cultures |
| Nine months after the end of antibiotic | No signs of relapse in the last follow-up |

Case report

A 68-year-old man was admitted due to syncope and weakness. His past medical history included hypertension and dyslipidaemia. Two weeks before the admission, he had been hospitalized for a SARS-CoV2 pneumonia complicated with a cephalic vein phlebitis. No blood cultures were performed, and it was treated with levofloxacin and linezolid for five days. On admission, blood pressure was 158/77 mmHg and heart rate was 126 beats per minute. Temperature was 39.5 Celsius and oxygen saturation was 96% on 2 L of supplementary oxygen. Neurological examination revealed left hemianopsia, anosognosia, and left hemiparesis and hemisensory loss. Cardiopulmonary auscultation showed a third heart sound associated with a sistodiastolic murmur and signs of

pulmonary oedema. Violaceous nodules were also found on the pads of the fingers.

A 12-lead electrocardiogram showed sinus tachycardia, PR interval of 200 ms, narrow QRS complex with no signs of acute ischaemia (Figure 1). Laboratory exams demonstrated normocytic anaemia, absolute neutrophil count of 7700 mm³, C-reactive protein of 29 mg/dL (normal 0–0.5 mg/dL), normal renal function, and normal lactate levels (<2 mmol/L). Two sets of blood cultures were collected. A cerebral computed tomography (CT) showed hypodense areas in the right occipital lobe, medial temporal lobe, and thalamus consistent with a recent right posterior cerebral artery (PCA) stroke. Supportive care was started.

On the second day of admission, the patient had sudden onset global aphasia with decreased consciousness level, requiring urgent intubation and mechanical ventilation. A new cranial CT revealed an acute ischaemic infarct in the left middle cerebral artery, as well as a left frontal lobe haemorrhage and a haemorrhagic transformation of the established PCA stroke (Figure 2). Respiratory status deteriorated dramatically due to severe pulmonary oedema. Methicillin-susceptible *S. aureus* was isolated from blood cultures, and a transoesophageal echocardiogram (TEE) revealed thickened and phlegmonous aortic valve leaflets with a central perforation causing an acute severe regurgitation, and a perivalvular abscess (Figure 3, Supplementary material online, Videos 1–2). Left ventricular ejection fraction was preserved. Definite IE was diagnosed according to modified Duke criteria, and 2 g of cefazoline/8 h was started, which cleared the bacteraemia within two days. However, the patient presented an unfavourable course with haemodynamic instability, worsening renal function and refractory pulmonary oedema despite inotropic drugs and continuous renal replacement therapy. The case was discussed in the endocarditis team meeting. Neurological status was difficult to assess since the patient was intubated and haemodynamically unstable. Cardiac surgery was considered contraindicated for at least four weeks because of intracranial haemorrhage. However, after starting cefazoline, the patient remained without fever and blood cultures were repeatedly negative. Then, although the persistence of a perivalvular abscess, a TAVR MyValve of 32 mm was implanted two weeks after admission to improve haemodynamic situation and as a bridge to open-heart surgery if neurological status allowed it. After TAVR, no conduction disturbance or paravalvular leaks were documented and the patient could be successfully weaned from ventilation and inotrope drugs. Unfortunately, after sedation withdrawal, neurological sequelae became apparent, especially behavioural disturbances, and cardiac surgery was ruled out.

Subsequently, antibiotic treatment was maintained, and the patient did not present new episodes of fever. Likewise, TEE monitoring was performed to guide duration of antibiotic treatment. Sixteen weeks after TAVR, a TEE showed a normal bioprosthetic aortic valve (Supplementary material online, Video 3) and a significant reduction of the perivalvular thickening compared to initial exploration (Figure 4), and cefazoline was stopped. However, despite the persistence of a periprosthetic thickening, follow-up blood cultures a week, a month, and four months after completing antibiotic remained negative. Currently, at nine months follow-up, he persists with no signs of relapse.

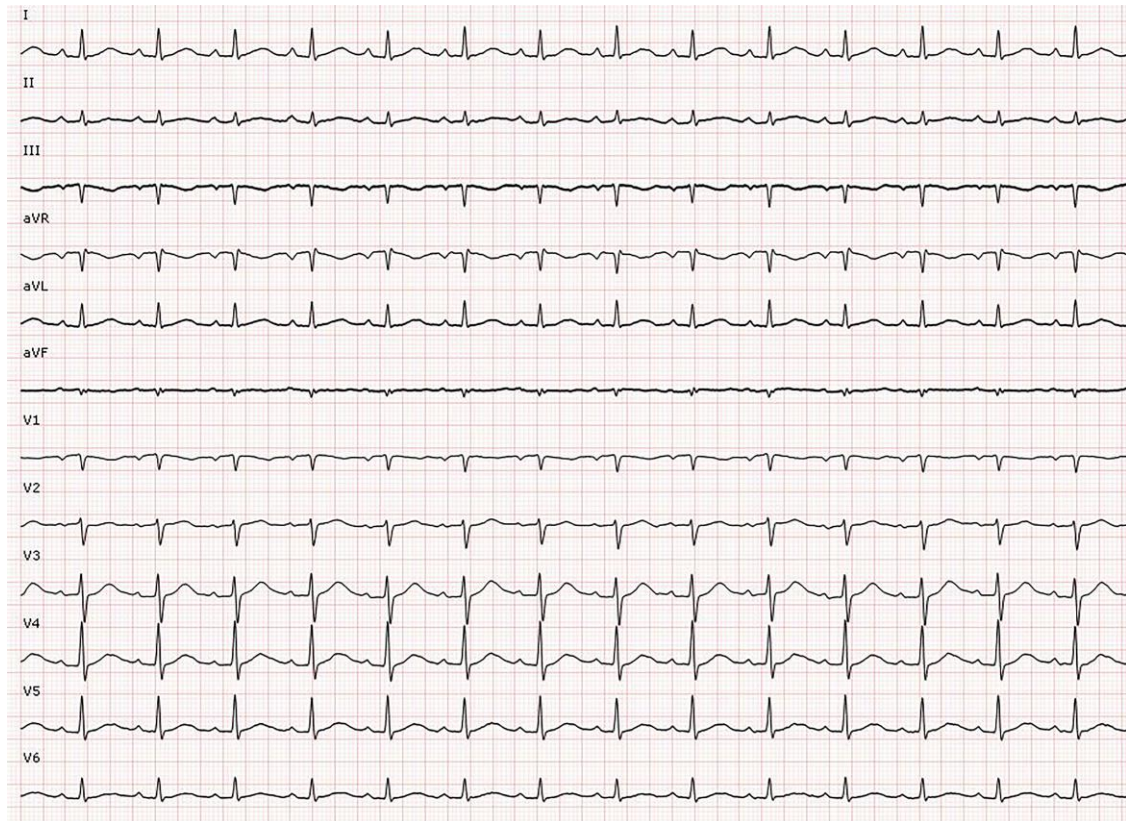


Figure 1 Electrocardiogram with sinus rhythm, a PR interval of 200 ms and narrow QRS complex.

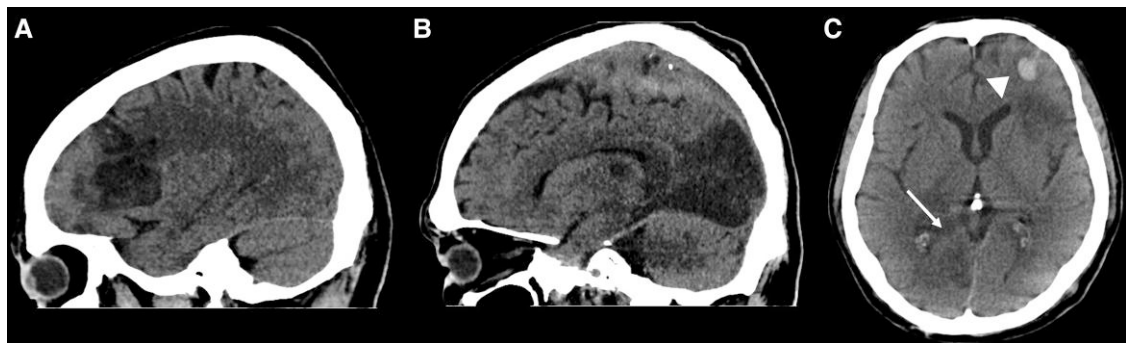


Figure 2 Computed tomography scan showed ischaemic infarcts in the left middle cerebral artery (A) and right posterior cerebral artery (B); as well as a left frontal lobe haemorrhage (C, arrowhead) and an incipient haemorrhagic transformation of the posterior cerebral artery stroke (C, arrow).

Discussion

To the best of our knowledge, this is the first case report in which a TAVR was implanted in a patient with active aortic IE complicated with perivalvular abscess. Previously, a few cases of TAVR implanted in the setting of an active IE have been reported in the literature,⁶⁻⁷ but none of them had peri-annular complication. Current IE guidelines⁴ recommend early surgery in patients who have heart failure, perivalvular abscess or severe prosthetic valve dysfunction. Mortality is high if these conditions are not treated surgically, especially in patients with heart

failure.⁵ However, in some cases, cardiac surgery is not performed due to a high surgical risk, leaving us with no further therapeutic options.

Although new-generation TAVR has demonstrated safety and feasibility when used in patients with pure aortic regurgitation,⁸ current guidelines do not consider the use of TAVR in cases of IE, since it does not allow physical removal of infected material and perivalvular tissue. However, recently, TAVR has shown to be a safe therapeutic alternative for residual valvular lesions after successfully healed endocarditis.⁹

In our case, the patient had a *S. aureus* IE with severe aortic regurgitation causing a critical haemodynamic and respiratory condition

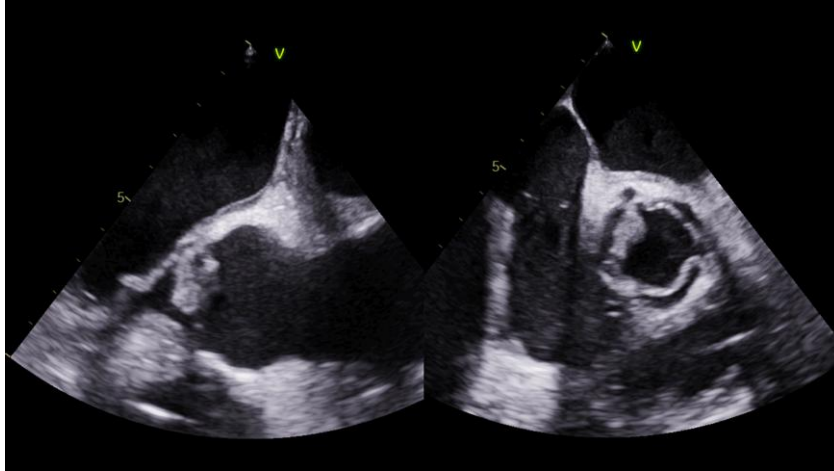


Figure 3 A transoesophageal echocardiogram showed thickened and phlegmonous aortic valve leaflets with a perivalvular abscess in long-axis view (left) and short-axis view (right). Diameter of aortic root was 40 and 27 mm in sinus of Valsalva.

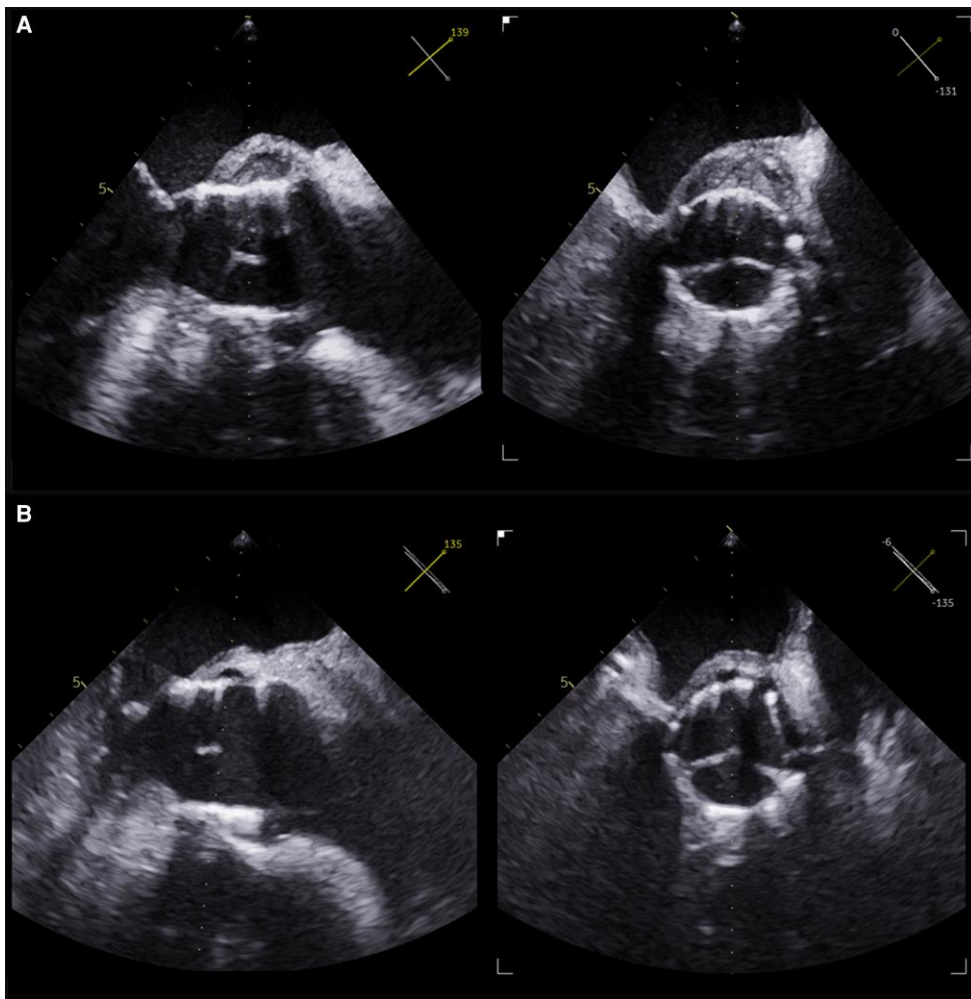


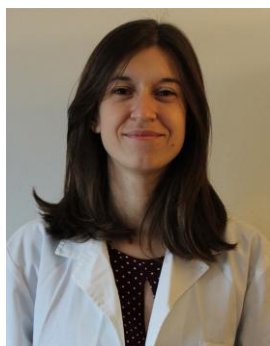
Figure 4 Mid-esophageal aortic valve long-axis view (left) and short-axis view (right) 1 month (A) and 4 months after transcatheter aortic valve replacement (B). Of note, the improvement of the perivalvular thickening during follow-up.

despite optimal medical therapy. Moreover, he presented a peri-annular aortic abscess, but blood cultures were repeatedly negative under antimicrobial therapy. An open-heart surgery was prohibitive due to prior intracranial bleeding and neurological status was uncertain. Despite the high risk of local active infection,¹⁰ we performed TAVR to improve haemodynamic situation as a bridge to open-heart surgery. Fortunately, the patient not only improved from a haemodynamic point of view, but also did not present evidence of uncontrolled infection or relapse during follow-up.

The duration of antimicrobial treatment was broadly discussed in the Endocarditis Team and guided by TEE monitoring. After observing a significant improvement in the perivalvular thickening four months after TAVR, cefazoline was discontinued. Although the patient could be considered at a high risk of relapse due to peri-annular abscess and *S. aureus* infection, no clinical signs of relapse were documented at nine months follow-up. Unfortunately, the patient persisted with neurological disabilities that could not have been predicted in the acute phase.

In conclusion, TAVR could be considered in selected patients with active IE and severe haemodynamic compromise secondary to severe aortic regurgitation, as a palliative solution or as a bridge to open-heart surgery once blood cultures have become negative.

Lead author biography



Rosa Vila Olives received her medical degree from University of Lleida in 2018. She is currently in her fourth year of residency in Cardiology at University Hospital Vall d'Hebron, in Barcelona.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal—Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Patient consent: The patient did not have mental capacity to consent to publication, so written consent was obtained from the patient's wife in accordance with COPE guidelines.

Conflict of interest: None declared.

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Data availability

The data underlying this article are available in the article and in its online supplementary material.

References

1. Murdoch DR, Corey GR, Hoen B, Miró JM, Fowler VG Jr, Bayer AS, et al. Clinical presentation, etiology, and outcome of infective endocarditis in the 21st century: the International Collaboration on Endocarditis-Pro prospective Cohort Study. *Arch Intern Med* 2009;**169**:463–473.
2. Fernandez-Hidalgo N, Almirante B, Tornos P, Pigrau C, Sambola A, Igual A, et al. Contemporary epidemiology and prognosis of health care-associated infective endocarditis. *Clin Infect Dis* 2008;**47**:1287–1297.
3. García-Cabrera E, Fernández-Hidalgo N, Almirante B, Ivanova-Georgieva R, Noureddine M, Plata A, et al. Group for the Study of Cardiovascular Infections of the Andalusian Society of Infectious Diseases; Spanish Network for Research in Infectious Diseases. Neurological complications of infective endocarditis: risk factors, outcome, and impact of cardiac surgery: a multicenter observational study. *Circulation* 2013;**127**:2272–2284.
4. Habib G, Lancellotti P, Antunes MJ, Bongiorni MG, Casalta JP, Del Zotti F, et al. 2015 ESC guidelines for the management of infective endocarditis: the task force for the management of infective endocarditis of the European Society of Cardiology (ESC). Endorsed by: European Association for Cardio-Thoracic Surgery (EACTS), the European Association of Nuclear Medicine (EANM). *Eur Heart J* 2015;**36**:3075–3128.
5. Ramos-Martínez A, Calderón-Parra J, Miró JM, Muñoz P, Rodríguez-Abella H, Valerio M, et al. Spanish Collaboration on Endocarditis—Grupo de Apoyo al Manejo de la Endocarditis Infecciosa en España (GAMES). Effect of the type of surgical indication on mortality in patients with infective endocarditis who are rejected for surgical intervention. *Int J Cardiol* 2019;**282**:24–30.
6. Shen CP, Munsayac MA, Robinson AA, Stinis CT. Transcatheter aortic valve replacement: a palliative approach to infective endocarditis. *BMJ Case Rep* 2022;**15**:e248951.
7. Albu C, Swaans MJ, ten Berg JM. With the back against the wall: TAVI in a patient with endocarditis. *Catheter Cardiovasc Interv* 2013;**82**:E595–E597.
8. Takagi H, Hari Y, Kawai N, Ando T, Group A. Meta-analysis and meta-regression of transcatheter aortic valve implantation for pure native aortic regurgitation. *Heart Lung Circ* 2020;**29**:729–741.
9. Santos-Martínez S, Alkhodair A, Nombela-Franco L, Saia F, Muñoz-García AJ, Gutiérrez E, et al. Transcatheter aortic valve replacement for residual lesion of the aortic valve following “healed” infective endocarditis. *JACC: Cardiovasc Interv* 2020;**13**:1983–1996.
10. García-Granja PE, Amat-Santos JJ, Vilacosta I, Olmos C, Gómez I, San Román Calvar JA. Predictors of sterile aortic valve following aortic infective endocarditis. Preliminary analysis of potential candidates for TAVI. *Rev Esp Cardiol (Engl Ed)* 2019;**72**:428–430.