ESC European Society of Cardiology

European Heart Journal - Case Reports (2024) **8**, ytae633
https://doi.org/10.1093/ehjcr/ytae633

CASE REPORT
Valvular heart disease

Periannular extension of infective endocarditis with atrioventricular block successfully treated with antibiotic therapy after transcatheter aortic valve implantation: a case report

Yuki Hirata, Shinichi Toriumi, Kenji Harada, Satoshi Hoshide, and Kazuomi Kario *

Division of Cardiovascular Medicine, Department of Medicine, Jichi Medical University School of Medicine, 3311-1 Yakushiji, Shimotsuke 329-0498, Japan

Received 13 October 2023; revised 8 May 2024; accepted 18 November 2024; online publish-ahead-of-print 10 December 2024

Background Although transcatheter aortic valve implantation (TAVI) is performed for very elderly patients in whom surgical aortic valve replacement (SAVR) poses unacceptably high operative risk, some of these patients are ultimately forced to undergo open surgery when TAVI is complicated by infective endocarditis (IE). To our knowledge, there have been no reports of cases with periannular extension of IE and atrioventricular block successfully treated by antibiotics without valve replacement.

Case summary An 80-year-old Japanese man who had undergone TAVI developed IE with loss of consciousness on Day 39 after the procedure. Methicillin-resistant *Staphylococcus aureus* was detected in his blood culture. Electrocardiography (ECG) showed complete atrioventricular block. Transoesophageal echocardiography (TEE) detected vegetation on the anterior mitral leaflet, aorta, and common annulus. Transcatheter aortic valve implantation had been performed rather than SAVR to avoid the associated operative risks. Because his haemodynamic condition was stable, we decided upon antibiotic treatment alone. On Day 42 after admission, TEE showed a reduction in the size of the vegetation, and his ECG recovered to sinus rhythm.

Discussion Medical treatment alone was effective for a periannular extension of IE complicated with complete atrioventricular block in a very elderly patient after TAVI had been performed to avoid high operative risk.

Keywords Case report • Transcatheter aortic valve implantation • Periannular extension of infective endocarditis • Atrioventricular block

ESC curriculum 2.2 Echocardiography • 4.11 Endocarditis

Learning points

- A case of periannular extension of prosthetic valve infective endocarditis with AV block showed improvement of AV block together with a reduction in the size of the valve annular abscess.
- Medical treatment alone was effective for periannular extension of infective endocarditis in a very elderly patient in whom transcatheter aortic valve implantation was performed to avoid risks associated with surgical aortic valve replacement.

* Corresponding author. Tel: +81 285 58 7344, Email: kkario@jichi.ac.jp
Handling Editor: Amir Khalifa
Peer-reviewers: Ryaan El-Andari; Francesco Lo Iudice
Compliance Editor: Nicholas Weight

Introduction

Transcatheter aortic valve implantation (TAVI) is one choice of several for the treatment of aortic valve stenosis (AS). Transcatheter aortic valve implantation is especially suited for very elderly patients in whom surgical aortic valve replacement (SAVR) would present unacceptable operative risk.[1]

Infective endocarditis (IE) is one of major complications after prosthetic valve replacement.[2,3] Although a previous study has reported that the risk of IE after TAVI is comparable with that of after SAVR,[4] its prognosis is extremely poor. Since TAVI is selected for very elderly patients who are not suited for major surgery, surgical treatment of TAVI-IE is challenging; indeed, several TAVI registries showed lower postsurgical survival rates compared to those after SAVR.[2,3]

Periannular extension of IE is often complicated with atrioventricular (AV) block, and for those patients, urgent operative intervention is required.[2,3] To the best of our knowledge, there have been no reports of cases in whom periannular extension of IE complicated with AV block was treated by antibiotics without valve replacement. In this report, we describe a very elderly patient with AS who underwent TAVI that was complicated with IE and complete AV block due to a valve annular abscess, in whom a clinically improved condition was achieved by antibiotics treatment alone.

Summary figure

43 days before	Transcatheter aortic valve implantation was performed at our hospital.
4 days before	Patient had loss of consciousness and antibiotic therapy was started.
Day 0	Re-admission at our hospital. Transesophageal echocardiography (TEE) detected vegetation on the anterior mitral leaflet, aorta, and common annulus. Patient was diagnosed with periannular extension of infective endocarditis. Electrocardiography (ECG) showed complete atrioventricular block. Blood labs revealed a neutrophil count of 8500/μL and a C-reactive protein (CRP) level of 8.37 mg/dL.
Day 6	Blood culture was negative.
Day 38	Patient ECG improved to first-degree atrioventricular block. TEE showed a reduction in the size of vegetation on the common annulus. CRP level was 0.17 mg/dl.
Day 52	Patient was discharged.

Case presentation

An 80-year-old Japanese man with hypertension, asthma, peripheral arterial disease, and lumbar spinal canal stenosis was diagnosed with severe AS and underwent TAVI via a transfemoral approach at our hospital. He was discharged 10 days after TAVI without complications. On Day 39 after TAVI, he presented with a 39.5°C fever and loss of consciousness to a nearby hospital, where he received antibiotic treatment because methicillin-resistant *Staphylococcus aureus* was detected in his blood culture. Under suspicion of IE of the prosthetic valve, he was transferred to our hospital on Day 43 after TAVI. On admission, no heart murmurs were detected, and no findings suggestive of heart failure were observed. There were no peripheral stigmata of endocarditis. His heart rate was 50 b.p.m. Electrocardiography (ECG) showed complete atrioventricular block with a right bundle branch block pattern (*Figure 1A*). Blood labs revealed a neutrophil count of 8500/μL (normal range, 3300–8600) and a C-reactive protein level of 8.37 mg/dL (normal range, <0.14). Transthoracic echocardiography showed no significant findings, but transoesophageal echocardiography (TEE) detected extension of the vegetation onto the anterior mitral leaflet, a thickened aortic root, and a common annulus with a thickened wall (*Figure 1B* and Supplementary material online, *Videos S1–S3*). Thus, we diagnosed periannular extension of prosthetic valve IE complicated with atrioventricular block. The patient's EuroSCORE II (i.e. the risk score of this surgery) was 10.56%. Our heart team's review concluded that the risk of this surgery was higher than expected due to the periannular extension of the patient's IE. Regarding the patient's treatment plan, we decided to perform medical treatment alone without surgery. The planned duration of intravenous antibiotics was 6 weeks. Concerning the follow-up imaging, we decided to perform TEE if the recurrence of a rising fever or serological inflammatory reaction was observed. Immediate transvenous insertion of a temporary pacemaker was performed. We continued antibiotic treatment by cefazolin 2 g every 8 h and gentamicin 100 mg every 12 h. On Day 6 after admission, we switched gentamicin to rifampicin 450 mg, because we had confirmed that the blood culture was negative and were concerned about the risk of acquired resistance to gentamicin.

During the course of this case, no embolism occurred. On Day 42 after admission, TEE showed a reduction in the size of the vegetation on the common annulus (*Figure 2B* and Supplementary material online, *Videos S4* and *S5*). On ECG, complete atrioventricular block disappeared and only a first-degree atrioventricular block remained, with improvement of inflammation (*Figure 2A*). Considering the patient's condition, we decided not to perform valve replacement and to continue with long-term oral antibiotic treatment of cefaclor 500 mg and rifampicin 450 mg every 8 h (*Figure 3*). Four years have passed while the patient has continued the oral antibiotic treatment, and there has been no recurrence of IE or progression of the atrioventricular block.

Discussion

This patient who had developed a complete atrioventricular block due to periannular extension of TAVI-IE was improved by antibiotic treatment alone. In the treatment of IE related to prosthetic valve replacement, guidelines recommend urgent valve replacement for high-risk patients with advanced age, methicillin-susceptible *Staphylococcus aureus* (MSSA) bacteraemia, or periannular extension of IE.[2,3] This was a case in which re-SAVR indication was recommended. However, this case underwent TAVI rather than SAVR to avoid the high operative risks of the latter. In addition, because the patient's haemodynamic condition was stable, we chose treatment with antibiotics alone. The guideline recommends, even if the haemodynamic condition is tolerable, urgent operative intervention for periannular extension of IE,[2,3] which is assumed not to heal with medical treatment alone. Although a few studies have reported that the periannular extension of IE was successfully treated without surgical intervention,[5,6] the patients of those previous studies did not have complications such as atrioventricular block. This is the first case documenting successful treatment of periannular extension of IE with atrioventricular block by antibiotic treatment alone.

In the present case, the complete atrioventricular block improved along with a reduction in the size of the valve annular abscess observed by TEE. The atrioventricular conduction system is anatomically located in the valve annulus, and the periannular extension of IE is likely to cause atrioventricular block.[7] The sensitivity of the new emergence of atrioventricular block for the presence of perivalvular abscess is as low as 45%, while the sensitivity of TEE for defining periannular extension of IE is high as 76%–100%.[8] Our findings about the improvement of perivalvular abscess with atrioventricular block in parallel confirms the cause of atrioventricular block and the efficacy of antibiotic treatment. The remaining first-degree atrioventricular block in our case may indicate the partial fibrosis of the AV system after inflammation had subsided, even though perivalvular abscess could no longer be observed by TEE.

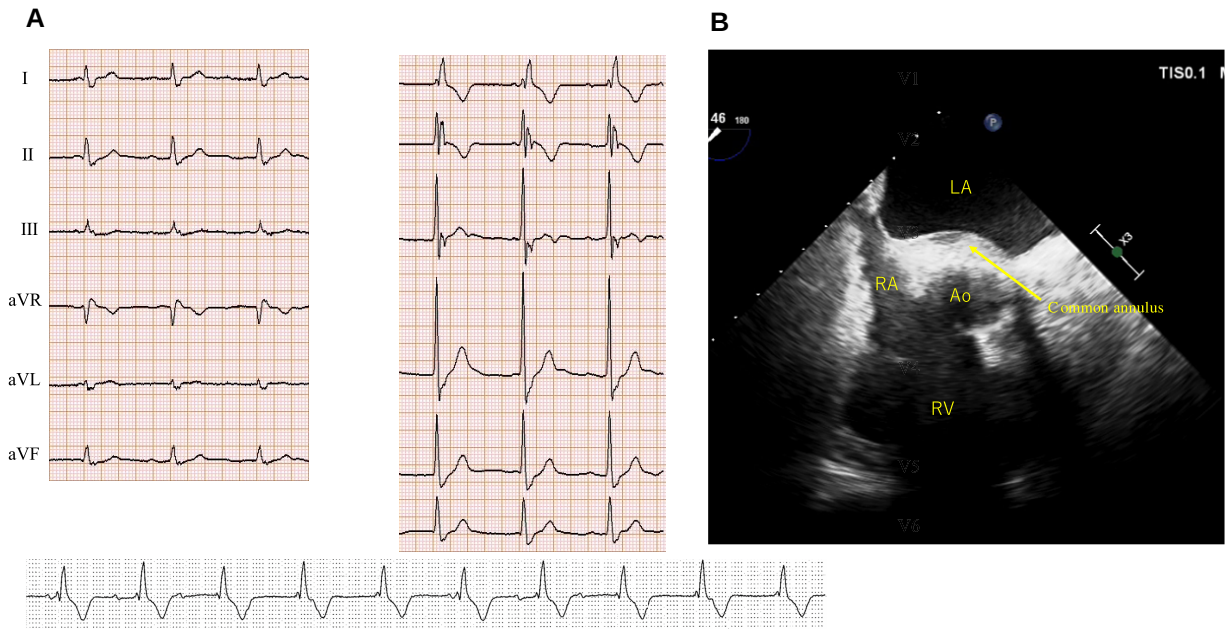

Figure 1 Electrocardiography and transoesophageal echocardiography on re-admission at our hospital (Day 0). (*A*) Electrography showed complete atrioventricular block. (*B*) Transoesophageal echocardiography showed the vegetation on common annulus. Ao, aorta; LA, left atrium; RA, right atrium; RV, right ventricle.

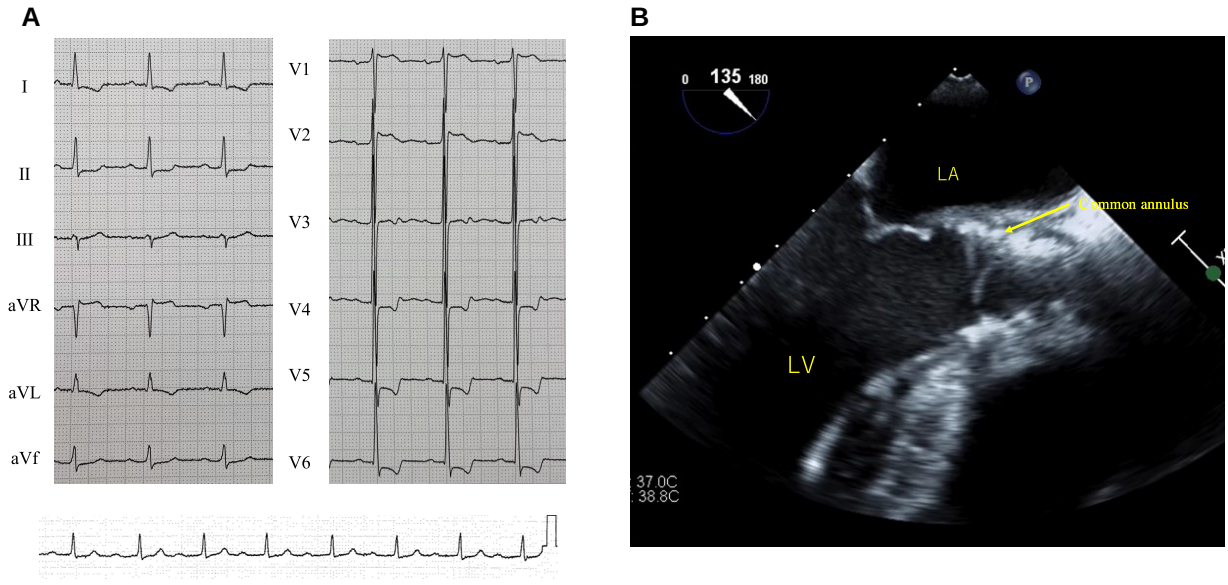

Figure 2 Electrocardiography and transoesophageal echocardiography on Day 42. (*A*) Electrography showed first-degree atrioventricular block. (*B*) Transoesophageal echocardiography showed a reduction in the vegetation on the common annulus. LA, left atrium; LV, left ventricle.

This was a case of prosthetic valve endocarditis after TAVI. In the randomized Placement of Aortic Transcatheter Valves (PARTNER) trial, which enrolled high-risk severe AS patients and randomized TAVI and SAVR groups, the incidence of IE after TAVI was 5.21% per year, which was not different from that of SAVR.[1] However, in a nationwide registry in Sweden, the 5-year survival of IE after TAVI was 29%, significantly lower than that reported for SAVR, with a range of 65%–80%.[9] The incidence of IE after TAVI has been reported to be more likely to occur within 1 year after procedure, especially within 30 days, and perioperative onset of IE carries ~7 times higher mortality risk than later-onset disease.[10] Treatment modalities for IE after TAVI, whether surgical intervention or medical treatment alone, have been an ongoing debate.[11]

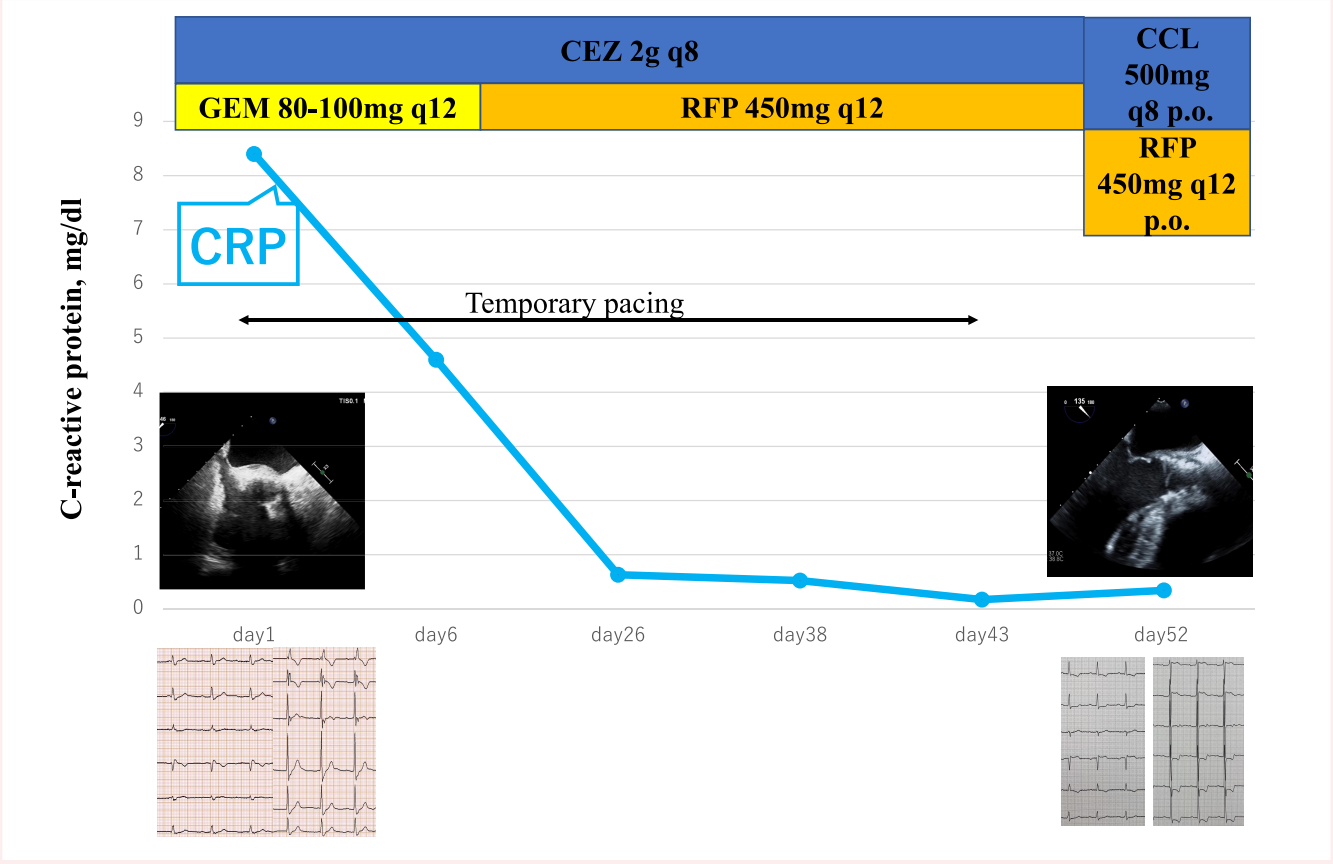

Figure 3 Time course of this case. CCL, cefaclor; CEZ, cefazolin; CRP, C-reactive protein; GEM, gentamicin; REP, rifampicin.

Conclusions

The incidence of IE after TAVI is not different from that after SAVR. However, when some patients undergoing TAVI are complicated with IE, these patients face a situation of being forced to undergo open surgery, even if they underwent TAVI to avoid the risks associated with surgical treatment. Although the strategy of treatment should be determined for each individual case, this case demonstrates that early diagnosis and medical treatment alone may be effective for periannular extension of IE with complete atrioventricular block in very elderly high-risk patient after TAVI.

Lead author biography

Yuki Hirata, MD, is a senior resident in Division of Cardiovascular Medicine at the Jichi Medical University. He graduated from the Kitazato University in 2019. He completed his junior residency programme and started his career as a cardiologist in 2021. Membership: The Japanese Society of Internal Medicine and the Japanese Circulation Society.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: K.K. has received research fundings from Teijin Pharma Limited, Fukuda Denshi Co., Ltd outside the submitted work.

Funding: None declared.

Data availability

The data underlying this article are available in the article. All data are incorporated into the article.

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