

Prosthetic valve endocarditis complicated by an annuloplasty ring abscess due to *Escherichia coli* treated with antimicrobials only

Hiroshi Shimizu, Kazuhiro Sugiyama, Yuichi Hamabe

ABSTRACT

Introduction: Prosthetic valve endocarditis caused by *Escherichia coli* is a rare disease. Because an abscess is a common complication of infective endocarditis (IE), most patients require surgical treatment in addition to antimicrobial treatment. We reported a patient with prosthetic valve endocarditis due to *E. coli* complicated by annuloplasty ring abscess and was treated with antimicrobials only, without surgical intervention.

Case Report: A 72-year-old man was brought to our hospital with consciousness disorder. He had prosthetic valve endocarditis due to *E. coli* complicated by annuloplasty ring abscess, with bilateral thalamic and brainstem infarcts. He was treated with antimicrobials and regular echocardiography. Vegetation and abscess decreased gradually with antimicrobials only, without surgical intervention. Antimicrobial treatment was completed in eight weeks, on day 57, he was transferred to the family hospital for rehabilitation.

Conclusion: Prosthetic valve endocarditis caused by *E. coli* often has an abscess. It is possible to treat it with antimicrobials alone if it is monitored closely with echocardiography in the ICU.

Keywords: Abscess, Antimicrobials, Endocarditis, *Escherichia coli*

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INTRODUCTION

Surgical treatment of valvular heart disease is an increasingly common cardiac intervention; thus, the number of patients at risk of developing prosthetic valve endocarditis (PVE) is growing. Prosthetic valve endocarditis is a serious infection with potentially fatal consequences. It is most commonly caused by *Staphylococcus aureus*, *Streptococcus* spp, and *Enterococcus* spp. Prosthetic valve endocarditis caused by *E. coli* is a rare disease and not well reported. As a common complication of PVE, there is an abscess. Most patients require surgical treatment in addition to antimicrobial treatment.

Here, we report the case of a 72-year-old man who had PVE caused by *E. coli* complicated by annuloplasty ring abscess. He was treated with antimicrobials only, without surgical intervention.

CASE REPORT

A 72-year-old man with consciousness disorder was brought to our hospital by an ambulance. He had a history of hypertension, ischemic heart disease, and mitral valve plasty 9 months prior. On admission, his vital signs were as follows: blood pressure of

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127/87 mmHg; heart rate of 140 bpm; irregular; body temperature of 38.7 °C; a respiratory rate of 30 bpm; SpO₂ of 100% with oxygen delivered through a face mask (10 L/min), and Glasgow Coma Scale Score (GCS) of E3V1M4. Physical examination showed bilateral conjunctival petechiae, but no murmur. Laboratory tests showed white blood cell 17,100/ μ L; hemoglobin 13.3 g/dL; platelet count 19,000/ μ L; and C-reactive protein 22.37 mg/dL. Echocardiography showed vegetation of mitral valve and abscess of the mitral valve annuloplasty ring. A computed tomography (CT) of brain showed no significant abnormality, but a magnetic resonance imaging (MRI) of brain showed infarction in bilateral thalami and brainstem (Figure 1). Cultures of urine, sputum, and three sets of blood culture were carried out on admission. He was intubated and placed on a mechanical ventilator in the Emergency Department for consciousness disorder. He was then transferred to the intensive care unit. We thought that he had PVE with bilateral thalamic and brainstem embolism. Although an abscess on annuloplasty ring was seen, treatment was started with antimicrobials only, without surgical treatment because of consciousness disorder due to infarction of bilateral thalami and brainstem. Intravenous administration of ceftriaxone and vancomycin started from day 1 of hospitalization. On day 2, three sets of blood culture were positive for gram-negative bacilli, so we changed the antimicrobial from ceftriaxone and vancomycin to cefepime and ciprofloxacin. On day 4, *E. coli* was detected in urine culture and blood culture, so we diagnosed it as PVE caused by *E. coli* complicated by an abscess on the annuloplasty ring. Therefore, we changed the antimicrobial from cefepime and ciprofloxacin to ceftriaxone and ciprofloxacin. However, his GCS of E2VTM4 did not change. On day 6, we performed a tracheostomy, and then the mechanical ventilator was weaned. After admission, we evaluated vegetation and abscess by transthoracic echocardiography (TTE) daily. On day 11, transesophageal echocardiography (TEE) showed a reduction of the vegetation of the mitral valve and the abscess on the annuloplasty ring of mitral valve compared to the time at admission (Figure 2). The antimicrobial therapy combination of ceftriaxone and ciprofloxacin continued for three weeks, then only ciprofloxacin continued. The white blood cell and C-reactive protein improved gradually. Vegetation and abscess were evaluated regularly by TTE. On days 24 to 47, TEE showed that vegetation and abscess were reduced further (Figure 2). His consciousness improved gradually. On day 40, he began to take orally. As a sequela of cerebral infarction, abducens nerve palsy, dysarthria, and gait disorder remained. On day 57, he was transferred to the family hospital for rehabilitation. Antimicrobial treatment was completed in eight weeks, and he was discharged from the hospital.

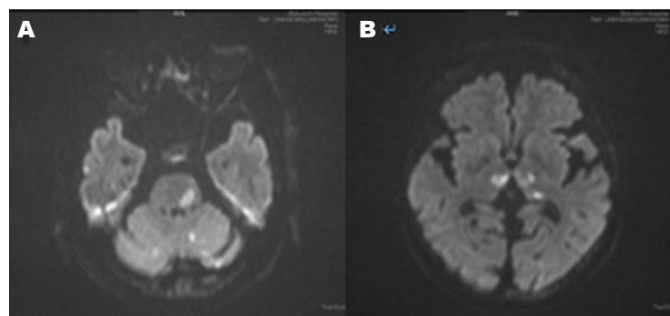


Figure 1: Head magnetic resonance images of a 72-year-old man showing (A) infarction of the brainstem and cerebellum and (B) bilateral thalamus.

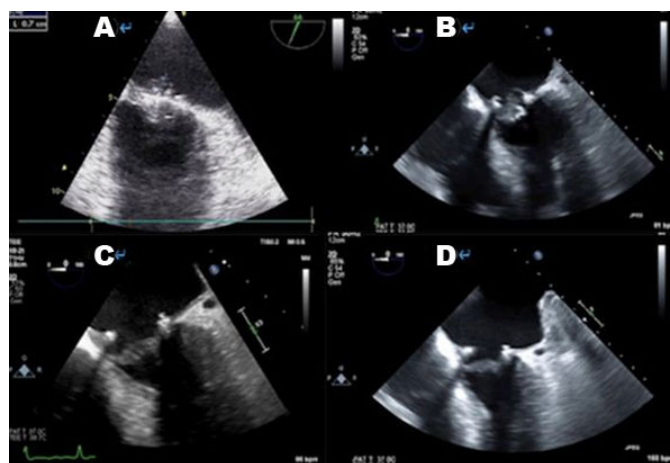


Figure 2: Transesophageal echocardiography images on (A) day 1, (B) day 11, (C) day 24, and (D) day 47.

DISCUSSION

We presented a patient with PVE due to *E. coli* complicated by annuloplasty ring abscess. He was treated with antimicrobials only, without surgical intervention.

Escherichia coli is a common pathogen that causes urinary tract infection and bacteremia, but *E. coli* IE is a rare disease. Although there are few reports on *E. coli* IE, it is estimated to represent 0.51% of IE cases [1]. The risk factors for *E. coli* IE are advanced age, female sex, diabetes mellitus, malignancy, hemodialysis, and the presence of prosthetic valves [2]. The incidence of PVE is reported to be 34% of all IE cases [2]. It has a higher incidence rate than other pathogens of PVE, except for non-HACEK (*Hemophilus*, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens*, or *Kingella*) gram-negative Bacillus [1]. *Escherichia coli* is poorly adherent to the endocardium, but it is thought that the presence of prosthetic material makes it easier to infect. In that report, 56% of the cases were complicated by an abscess [2]. The abscess complication rate of PVE is reported to be 29.7%, but that of PVE due to *E. coli* is approximately double, suggesting that it is more likely to form an abscess than other pathogens, once infected [3]. Our patient had an abscess on the annuloplasty ring with PVE due to *E. coli*.

The common site of annulus abscess after prosthetic valve replacement is mitral-aortic intervalvular fibrosa. Mitra-aortic intervalvular fibrosa is anatomically formed by fibrous tissue, is rich in adipose tissue, has low blood flow, and once infected, it is difficult to treat. The abscess tends to expand with be destroying surrounding tissue. As a result, severe valve regurgitation occurs. The guidelines issued by American Heart Association (AHA) and European Society of Cardiology (ESC) also recommend that the indication for surgical intervention for PVE complicated by abscess [4, 5]. Although five cases with PVE due to *E. coli* complicated by an abscess have been reported so far, all of them had been treated with surgical intervention in addition to antimicrobials [2]. Our case was a rare case to be treated with antimicrobial alone.

There are a few reports of patients with abscesses caused by other pathogens that were treated without surgical intervention [6, 7]. Though the duration of antimicrobial therapy for PVE is uncertain, these patients had a reduction of the abscess during antimicrobial treatment. Similarly, our case showed a reduction of abscess by TEE regularly during antimicrobial treatment. This suggests that it is possible to be treated with antimicrobial alone, even if PVE due to *E. coli* complicated by an abscess. However, abscess may worsen and can cause severe valve regurgitation is a surgical emergency, requiring urgent intervention. Therefore it is requiring that it is monitored closely with serial TEE. But it is unknown how often the evaluation of TEE should be done. The guidelines issued by AHA and ESC recommend that TEE 3–7 days after initial TEE if suspicion exists without a diagnosis of IE or a worrisome clinical course during early treatment of IE [6, 7]. With reference to these guidelines, TEE should be performed within a week. If TEE shows a reduction of the abscess, surgical intervention may be able to avoid. Regarding the frequency of subsequent TEE, further studies are required.

In our case, antimicrobial treatment was completed in eight weeks, but the optimal duration of therapy for PVE is uncertain. The guidelines issued by AHA and ESC recommend that PVE be treated with antimicrobials that is bactericidal for the isolated microorganism for at least six weeks after cultures first become negative [4, 5]. It is considered necessary to treat with antimicrobials at least six weeks and until the abscess disappears by TEE.

Finally, PVE complicated by abscess can worsen rapidly for severe valve regurgitation, so it is necessary to be closely monitored the patient in the ICU until the condition stabilizes, and immediate surgery intervention should be considered if it is worse or there is no improvement. Surgical treatment of valvular heart disease is an increasingly common cardiac intervention and *E. coli* is a common pathogen that causes urinary tract infection and bacteremia, so PVE due to *E. coli* is expected to increase in the future. The experience of this case will be one of the future treatment strategies.

CONCLUSION

Prosthetic valve endocarditis caused by *E. coli* often has an abscess. Surgical intervention is first choice for PVE complicated by abscess, but it is possible to treat it with antimicrobials alone if it is monitored closely with echocardiography in the ICU. Routine TTE and TEE tests could avoid surgical intervention; therefore, further research is warranted in the future.

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Author Contributions

Hiroshi Shimizu – Conception of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Kazuhiro Sugiyama – Conception of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Yuichi Hamabe – Conception of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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