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Case Report

Prosthetic Endocarditis of the Mitral Valve Caused by *Staphylococcus epidermidis* - Late Manifestation of Unusual Localization of Prosthetic Endocarditis - Case Report

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Abstract

Aim of the Study: The aim of the report is to present a late prosthetic valve endocarditis with an unusual localization, successfully diagnosed and treated with combined imaging modalities and antibiotic therapy.

Case Report: We report a case of a 55-year-old female with a history of rheumatic mitral stenosis, who underwent mitral valve replacement with a mechanical prosthesis ten years earlier. Two months before admission, she developed recurrent episodes of fever, elevated inflammatory markers, and malaise, partially responsive to empirical antibiotic therapy. On admission, she presented with high-grade fever, fatigue, and elevated inflammatory markers. Transthoracic echocardiography (TTE) revealed a mobile mass measuring 4-5 mm beneath the mitral prosthesis, in an unusual sub valvular location. Three-dimensional transthoracic echocardiography (3D TTE) and transesophageal echocardiography (TEE) confirmed the presence of a mobile echogenic structure without interference with prosthetic function. Blood cultures were positive for *Staphylococcus epidermidis*. The patient was treated with dual intravenous antibiotic therapy guided by antibiogram for three weeks, followed by sequential oral therapy for an additional five weeks. Clinical symptoms resolved, inflammatory parameters normalized, and no recurrence was observed during a six-month follow-up.

Conclusion: This case highlights the diagnostic challenges of prosthetic valve endocarditis, particularly with atypical localization of vegetations. It underscores the importance of multimodality imaging, microbiological confirmation, and guideline-directed antimicrobial therapy, as well as the critical role of close follow-up in achieving favorable outcomes.

Keywords: *Prosthetic Endocarditis; Infective Endocarditis; Comprehensive Diagnostic Evaluation; Echocardiography; Staphylococcus epidermidis; Antibiotic Treatment*

Introduction

Prosthetic valve endocarditis (PVE) is the most severe form of IE and occurs in 1 - 6% of patients with valve prostheses, with an incidence of 0.3 - 1.2% per patient-year [1-4]. PVE accounts for 20 - 30% of all cases of IE [1,2] PVE was observed in 21% of cases of IE in a French survey [5], in 26% of cases in the Euro Heart Survey [6] and in 20% of cases in the ICE-PCS [1,7,8].

PVE carries a higher morbidity and mortality compared to native valve endocarditis, with in-hospital mortality rates ranging from 20% to 40% despite advances in diagnosis and therapy [1,9]. PVE is classified as early (occurring within 60 days of surgery) or late (occurring more than 60 days after surgery), with late PVE typically resulting from hematogenous seeding of the prosthetic material [10]. The risk of bed outcome is highest in the first year following valve replacement. The prevalence of prosthetic endocarditis among all cases of infective endocarditis has been increasing due to the growing number of patients undergoing valve replacement surgery and longer life expectancy.

Diagnosis of PVE remains challenging, as clinical presentation is often atypical and echocardiographic findings may be inconclusive due to prosthetic artifacts [1,2,11]. However, transthoracic and transesophageal echocardiography remain the first imaging modalities for the initial assessment of patients suspected of having PVE. Blood cultures are critical for pathogen identification, while multimodality imaging-including transthoracic and transesophageal echocardiography, three-dimensional echocardiography, computed tomography (CT), and positron emission tomography (PET)-improves diagnostic sensitivity [1,12]. Among causative organisms, *Staphylococcus aureus*, coagulase-negative staphylococci, enterococci, and fungi are frequently implicated, with coagulase-negative staphylococci often associated with prosthetic material infection [13].

Late PVE presents additional diagnostic and therapeutic difficulties, as it may occur years after valve replacement and is often associated with indolent pathogens, recurrent fever, and persistent inflammatory markers [9,12]. Management requires prolonged bactericidal antibiotic therapy and, in selected cases, surgical intervention [13]. Despite guideline-directed care, prognosis remains poor, reinforcing the importance of timely recognition, multidisciplinary management, and long-term follow-up [1,11].

Case Report

The aim of our report was to present a case of late prosthetic endocarditis with an unusual localization, which was successfully diagnosed and treated. We present a case of a female patient, born in 1968, who had an artificial mitral valve prosthesis implanted 10 years ago due to rheumatic mitral stenosis. Two months prior to her admission to the University Clinic of Cardiology, the patient experienced a high fever of 39 degrees for several days, elevated CRP >200 mg/l, and leukocytes at 17 x 10^9/l.

The illness began two months before the hospital admission when, due to increased temperature, fever, malaise and fatigue, her primary care physician prescribed antibiotics for 10 days. The symptoms improved, the temperature normalized, and the leukocyte count returned to normal levels, but the CRP remained elevated at 49 mg/l. Over the course of two months, the temperature occasionally increased, prompting several days of antibiotic treatment, which temporarily alleviated the symptoms. The entire clinical picture recurred with a rise in leukocytes and CRP a few days after stopping the antibiotics.

Two months after the onset of symptoms, the patient was admitted to the University Clinic of Cardiology due to a high fever persisting for several days, reaching 39 degrees, along with pronounced malaise, weakness, and fatigue. Laboratory analyses indicated hypochromic anemia, normal leukocyte counts, CRP at 45 mg/l, and troponin I at 10.5 ng/l. An urgent echocardiogram raised suspicion of vegetation under the mitral prosthesis. A mobile mass was visualized under the mitral valve in the left ventricle, at the border with Ao valve (Figure 1), measuring 4 - 5 mm, hyper-echoic, which did not compromise the function of the mitral prosthesis. The function of the mitral prosthesis showed satisfactory parameters (mean transvalvular gradient of 10 mmHg, MVA 1.5 cm^2), mean values because

patient was in atrial fibrillation. Left ventricular function was mildly reduced (EF 45%), while right valve function was normal (TAPSE 23 mm, S wave from Tissue Doppler 11 cm/s). The dimensions of the cardiac chambers were within reference ranges, except for the left atrium, which was slightly enlarged (48 mm, LAVI 37.2 ml/m^2). Although the described shadow did not have the usual localization for vegetation, suspicion was raised for prosthetic endocarditis. A three-dimensional echocardiogram confirmed the described mobile mass. A transesophageal echocardiogram ruled out interference of the described mass with the mechanical prosthesis The diagnostic algorithm was made according to the new 2023 European Society of Cardiology diagnostic algorithm. The three blood cultures taken were positive for *Staphylococcus epidermidis*.

Until the blood culture results were obtained, the patient was empirically started on dual antibiotic therapy. After the blood culture results were obtained, the patient was placed on dual antibiotic therapy according to the antibiogram, which in fact did not differ from the previously administered antibiotic for a total of 3 weeks from the beginning. It was continued initially with dual antibiotics for two weeks, and then one antibiotic for another three weeks based on the antibiogram, with monitoring of inflammatory parameters (leukocytes, CRP) and clinical assessment. The patient has been followed for six months after the cessation of antibiotic therapy and shows no signs of recurrence after the completed eight-week treatment. Symptoms of dyspnea and fatigue have disappeared, and the patient feels well.

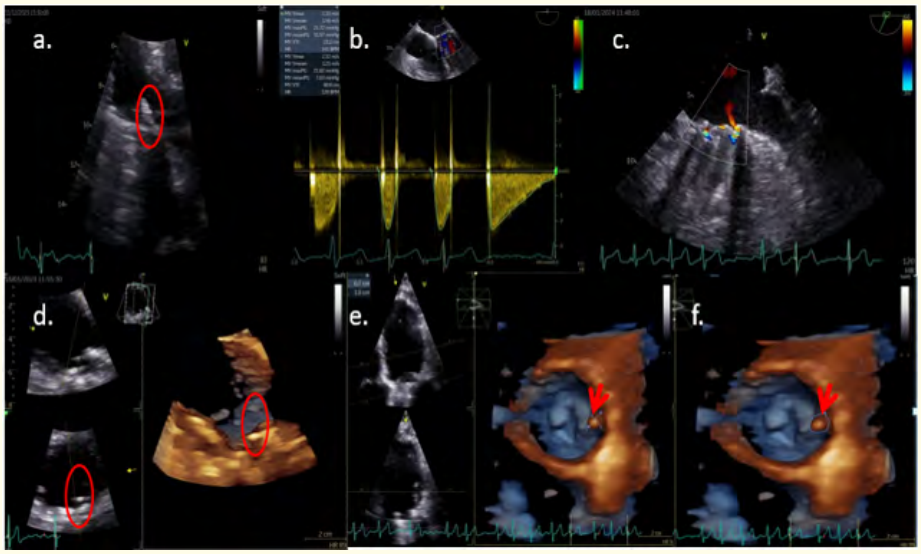

Figure 1: *Comprehensive echocardiographic assessment using two-dimensional transthoracic echocardiography (2D TTE), transesophageal echocardiography (TEE), and three-dimensional TEE (3D TEE). a: On 2D TTE, a mobile mass was visualized in real time, located just beneath the mitral valve and in close proximity to the aortic annulus. b: TEE with continuous-wave Doppler, a slightly increased mean transvalvular gradient was measured, accompanied by a mildly reduced mitral valve area. c: On TEE with color Doppler, flow through the mechanical valve appeared normal. The presence of retrograde flow was noted, which is a normal characteristic of this type of bileaflet prosthetic valve and corresponds to the so-called "wash out phenomenon". d-f: 3D TEE confirmed the presence of the mobile structure initially identified on 2D imaging.*

Discussion

Prosthetic valve endocarditis (PVE) remains a particularly challenging condition in terms of both diagnosis and management. It is one of the most severe complications following valve replacement surgery which is associated with a worse prognosis compared with native valve endocarditis (NVE). In-hospital mortality is high, ranging from 20% to 40% despite advances in imaging and antimicrobial therapy [1,2,9]. Our case highlights the diagnostic and therapeutic challenges of prosthetic valve endocarditis (PVE), particularly when vegetations appear in atypical locations. Our patient, who developed late PVE ten years after mitral valve replacement, presented with recurrent fever, persistently elevated inflammatory markers, and a mobile sub valvular mass detected on echocardiography. These features illustrate how PVE may present insidiously, with non-specific symptoms and unusual imaging findings that can delay diagnosis.

Diagnosis of PVE remains challenging. Clinical presentation is often atypical, particularly in late PVE, where symptoms such as low-grade fever, malaise, and fluctuating inflammatory markers may mimic other systemic illnesses [11,12]. Echocardiography remains the cornerstone of initial diagnostic evaluation, with transthoracic echocardiography (TTE) recommended as the first-line imaging tool. However, its sensitivity is limited due to prosthetic shadowing and artifacts, making transesophageal echocardiography (TEE) mandatory when PVE is suspected [1,13].

According to the 2023 ESC Guidelines for the Management of Endocarditis, the diagnosis of PVE relies on a combination of clinical suspicion, microbiological evidence, and imaging [1]. In our case, multimodality imaging with three-dimensional transthoracic and transesophageal echocardiography was crucial in confirming the presence of a mobile structure, while blood cultures positive for *Staphylococcus epidermidis* established diagnostic certainty. This integration of imaging and microbiology mirrors the guideline-endorsed diagnostic pathway. The diagnostic accuracy of a mobile echogenic mass was further improved by the use of transesophageal and three-dimensional echocardiography, which confirmed the mobility and location of the structure without interference with prosthetic function. The lack of interference with prosthetic valve function and the limited size of the mass ruled out the need for surgical intervention. These findings underscore the importance of multimodality imaging, as recommended by the 2023 ESC Guidelines, which advocate for complementary imaging such as cardiac computed tomography (CT), PET/CT with ^{18}F-flurodeoxyglucose (^{18}F) FDG), or white blood cell single photon emission tomography (WBC-SPECT/CT) in equivocal cases [1,14].

Microbiological confirmation is essential for diagnosis. *Staphylococcus epidermidis*, isolated in our patient, is a coagulase-negative *Staphylococcus* frequently implicated in prosthetic infections due to its biofilm-forming capacity and strong affinity for prosthetic material [15]. Blood cultures remain the gold standard for pathogen identification and are incorporated into both Duke and ESC criteria [1,2]. Positive cultures combined with suggestive echocardiographic findings allowed us to achieve a definite diagnosis in this case.

The treatment of PVE is complex and often requires a combination of prolonged bactericidal antibiotic therapy and surgical intervention. The 2023 ESC Guidelines recommend surgery in patients with uncontrolled infection, heart failure due to prosthetic dysfunction, or peri-annular complications [1]. However, registry data show that surgery is not always performed even in patients with clear indications: in the EURO-ENDO registry, only 73% of patients with PVE and surgical indications underwent the procedure [16]. In our case, surgery was not required, as the prosthesis remained functional and the infection was controlled with antimicrobial therapy. The patient received three weeks of intravenous dual antibiotic therapy guided by antibiogram, followed by oral sequential therapy for a total of eight weeks, consistent with guideline-directed antimicrobial regimens [1,17].

Recent evidence supports the role of oral step-down antibiotic therapy in carefully selected patients with IE. The POET trial demonstrated non-inferiority of partial oral antibiotic therapy compared with continued intravenous therapy in stable patients after initial IV treatment [18]. In our case, the patient transitioned to oral therapy after stabilization, with favorable clinical and laboratory outcomes. Six months after completion of therapy, she remained asymptomatic with normalized inflammatory markers, demonstrating

the potential benefit of this approach when combined with strict follow-up. Treatment in our patient consisted of an eight-week antibiotic regimen, beginning with three weeks of dual intravenous therapy followed by sequential oral therapy. This approach is consistent with guideline-directed antimicrobial strategies and reflects growing evidence supporting partial oral antibiotic therapy in stable patients, as demonstrated in the POET trial [18].

When compared with large-scale data, such as the EURO-ENDO registry, our case had a more favorable outcome. EURO-ENDO reported an in-hospital mortality of 30% in patients with PVE [16], particularly high in staphylococcal infections, and long-term prognosis remained poor with frequent recurrences and late complications. In contrast, our patient achieved complete recovery without surgical intervention, suggesting that prolonged targeted antimicrobial therapy can be effective in selected late PVE cases, especially when close monitoring is ensured.

Overall, this case illustrates the diagnostic and therapeutic challenges of late PVE, especially when vegetations occur in atypical locations. It reinforces the central role of multimodality imaging, microbiological confirmation, and guideline-directed therapy in management. Most importantly, it emphasizes the need for a multidisciplinary "endocarditis team" approach, as strongly advocated by the ESC 2023 Guidelines, to optimize decision-making and improve patient outcomes in prosthetic valve endocarditis.

Conclusion

Prosthetic valve endocarditis remains a severe and life-threatening condition, posing significant diagnostic and therapeutic challenges. This case illustrates the complexity of prosthetic valve endocarditis. Although initial antibiotic therapy led to temporary improvement, the recurrence of symptoms highlighted the need for comprehensive diagnostic evaluation and appropriate treatment. Positive blood cultures and bacterial identification enabled targeted therapy with a dual antibiotic regimen, in accordance with current recommendations for the diagnosis and management of prosthetic endocarditis. The successful resolution of symptoms and normalization of inflammatory markers within six months after completing therapy emphasize the importance of timely intervention and careful follow-up in such cases. The timely recognition, targeted antibiotic therapy, and close follow-up are critical to achieving a favorable outcome. Ultimately, a multidisciplinary approach is indispensable to reduce complications and improve long-term survival."

Conflict of Interest

Nothing to declare.

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