

CASE REPORT

CARDIAC ANESTHESIA

Paravalvular vegetations in prosthetic valve endocarditis with a malignant course: a case report

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Abstract

Prosthetic valve endocarditis (PVE) accounts for 20.1% of all infective endocarditis cases. We report a case of PVE complicated by arrhythmias, embolic phenomenon, and sepsis. A 64-year-old female with history of mitral valve replacement presented to the hospital with febrile episode and malaise. Echocardiography showed vegetation at paravalvular area, and *Staphylococcus aureus* was found on blood culture. Aggressive intravenous antibiotic cover and hemodynamic support were initiated. The management of PVE remains a challenge due to its malignant course and heterogenous complications.

Key words: Prosthetic Valve; Endocarditis; *Staphylococcus Aureus*; Mitral Stenosis; Echocardiography.

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1. Introduction

Although rare, prosthetic valve endocarditis (PVE) is a dire complication of cardiac valve replacement surgery, associated with high morbidity and mortality.¹ Overall incidence of PVE has been reported to be between 0.3 and 1.2% per patient per year.¹ Mechanical and bioprosthetic valves are far more likely to develop endocarditis as compared to allograft. During the course of its disease,

PVE can be complicated with various complications, including thromboembolic events, perivalvular extension, and valvular destruction causing heart failure. Due to its unpredictable nature, the optimal management of PVE is a subject of great debate, needing careful

consideration of risks and benefits in timing of surgical intervention.

Surgical approaches are known to be beneficial when PVE presents with complications such as valvular obstruction, abscess formation, worsening heart failure, prosthetic valve dehiscence, worsening regurgitation or paravalvular leak, persistent bacteremia, or when vegetation size is more than 10 mm.^{2,3} Several features are known to predict worse outcome and are associated with higher in-hospital mortality of 30.5%, such as *S. aureus* PVE, persistent bacteremia, stroke, PVE complicated with heart failure, and hemodynamic and respiratory support.⁴ We report such a complicated case, just to refresh the knowledge and possibilities of such adverse events in the minds of the anesthetists.

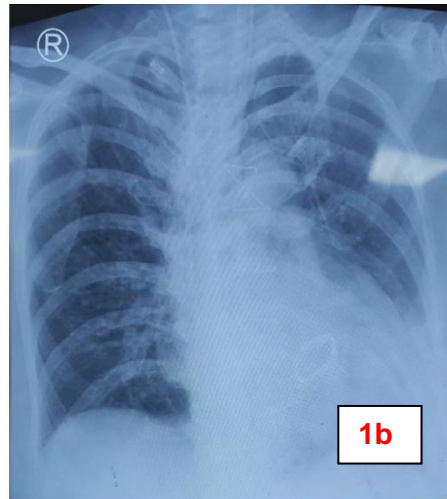
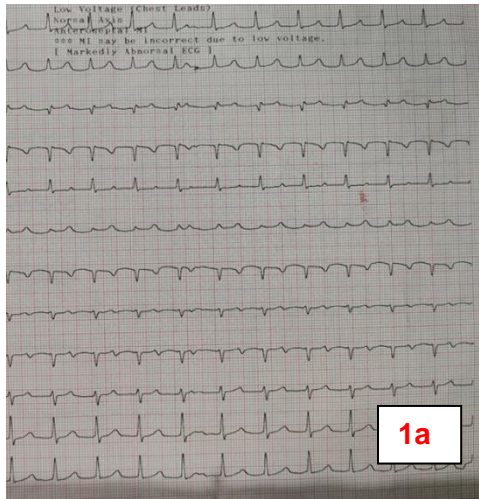


Figure 1a: Electrocardiogram showing junctional rhythm at admission;
1b: Cardiomegaly on chest x-ray.

2. Case Report

A 64-year-old female was admitted to the hospital for 2 weeks of febrile illness and general weakness. She was diagnosed with severe mitral stenosis 2 y ago and underwent mitral valve replacement with the Carpentier-Edwards Magna bioprosthesis valve (Edwards Lifesciences, Irvine, CA).

Her vital signs showed blood pressure of 108/86 mmHg, regular heart rate of 98 bpm, respiratory rate of 22 breaths/min, and oxygen saturation of 98% on room air. Her point of maximal impulse was 0.5 cm lateral to the midclavicular line. There was a grade II/IV diastolic murmur at the midclavicular line in the 5th intercostal space. Her lungs were clear to auscultation, and the rest of her exam was within normal limits. ECG at admission showed transient sinus arrest with accelerated junctional rhythm (Figure 1a). Chest X-ray showed cardiomegaly (Figure 1b). Significant laboratory findings showed leukocytosis; e.g., WBC - 16.470/uL, with dominant neutrophil bands - 88%,

serum creatinine - 0.75 mg/dL, and BUN - 10 mg/dL.

Echocardiographic evaluation showed moderate echodensity mass at mitral paravalvular area, with subacute onset of a febrile episode. The presenting mass might suggest paravalvular vegetation at the prosthetic mitral valve area (Figure 2a and supplementary movie 1). Three sets of blood cultures were positive for *S. aureus* confirming the final diagnosis of ‘prosthetic valve

infective endocarditis’. We excluded pannus and prosthetic valve thrombosis from diagnosis due to high mass mobility and moderate echodense mass without any sign of valve stenosis and lung overload as clinical presentation. Empiric antibiotics using inj. vancomycin 900 mg BID, inj. gentamycin 180 mg OD, rifampicin 2x450 mg were administered with poor response. Patient was planned for surgery, but her clinical condition worsened in the subsequent days.

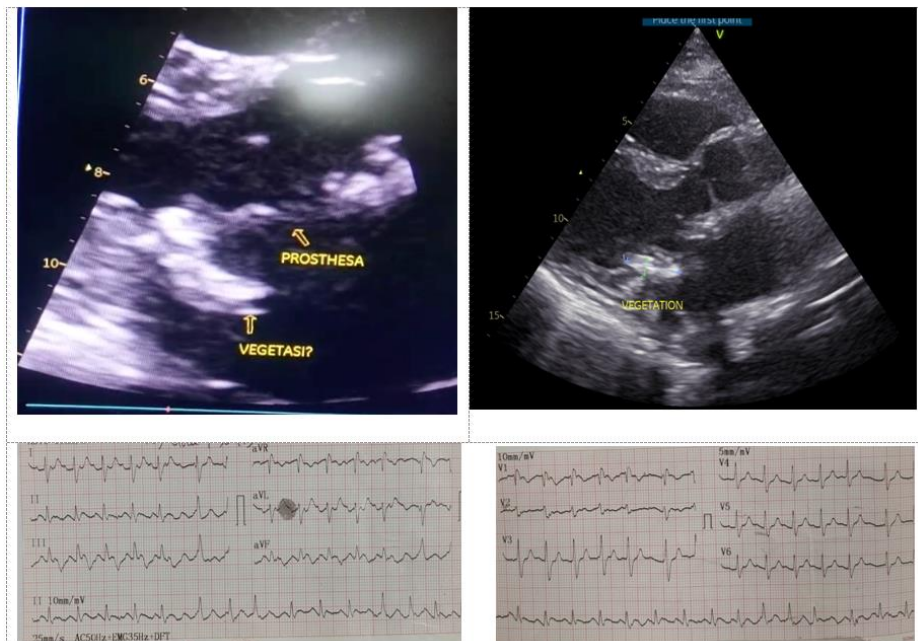


Figure 2a (above): Echocardiograph showing paravalvular vegetations at mitral valve
Figure 2b (below): Electrocardiogram on the 6th day of admission showing new onset atrial flutter

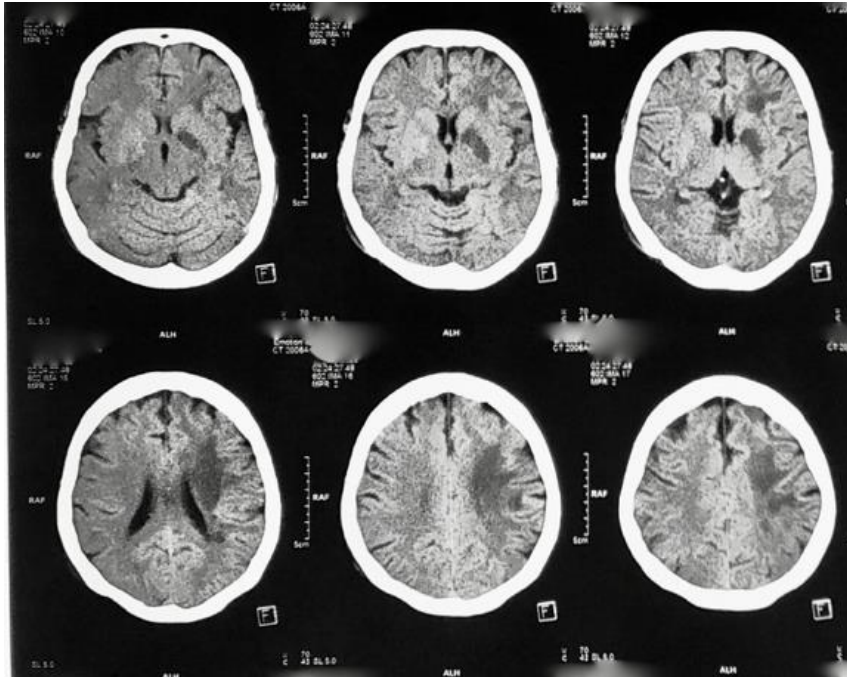


Figure 3: Cerebral infarction on computed tomography scan.

On the 6th day of admission, she developed new onset of atrial flutter with unstable hemodynamic profile (Figure 2b). Cardioversion was performed, the rhythm converted to the sinus rhythm. She was then transferred to the Intensive Cardiac Care Unit (ICCU) and soon needed to be intubated due to respiratory distress, hemodynamic instability, and decreased consciousness level. Empiric antibiotics (vancomycin, gentamycin, and rifampicin) were continued. Repeated laboratory blood analysis during ICCU admission showed impending type-1 respiratory failure with metabolic acidosis, sepsis, and acute kidney injury. The findings were; pH 7.12; PCO₂ 26 mmHg; PO₂ 71 mmHg; TCO₂ 9.3 mmol/L; Base excess -20.8 mmol/L; SpO₂ 92%; HCO₃ 8.5; WBC 31.240 /uL; neutrophil band 92.6%; platelets 124.000; BUN 68 mg/dL; serum creatinin 3.25 mg/dL. Her hemodynamic status kept on worsening despite aggressive vasopressor and inotropic support. CT scan showed cerebral infarction involving right cortical, subcortical, and frontotemporoparietal lobe (Figure 3). Surgical approach was not opted due to the very labile cardiopulmonary and neurological status, and very high operative risk. Despite aggressive antibiotic therapy and hemodynamic support, the patient deceased after 9 days of admission due to respiratory failure and septic shock.

3. Discussion

Our patient presented with healthcare-associated intermediate-onset PVE. The interaction between Microbial Surface Components Recognizing Adhesive

Matrix Molecules (MMSGRAMs) of *S. aureus* and host extracellular matrix initiates colonization in the prosthetic valve area. Local production of tissue factor and cytokines induce an inflammatory response and the coagulation cascade, that leads to polymerization of fibrinogen into fibrin strands. Vegetation may become fragmented by mechanical stress and dissolution by proteolytic enzymes, thereby inducing an embolic event.⁵ Sepsis and multiple emboli may derange multiple organ functions and deteriorate cardiopulmonary status, thereby worsening the prognosis in PVE patients.⁶

Embolism may complicate 20-50% of infective endocarditis course and carries a high morbidity and mortality risk. Our patient displayed several features of high

embolic risk feature, such as vegetation size and vegetation on mitral perivalvular area. She experienced a sudden decrease in her consciousness level and lateralization pertained to cerebral embolism.⁵

Our patient displayed several predictor of poor early outcome such as, preoperative septic shock, catecholamine infusion, mechanical circulatory support, and peri-annular complication. Surgical management was not done in our patient due to the deterioration of hemodynamic and cardiopulmonary status, which increased the operative risk.⁷

Conduction abnormalities may complicate 1-15% of cases of infective endocarditis and also predict increase of mortality and morbidity.⁸ Conduction block is associated with the spread of infection into the conduction pathways and pertains to a paravalvular complication in the form of abscesses or fistula. Conduction block is also more related to left-sided valve (aortic - 36%; mitral - 33%),⁸ due to anatomical relationship between the anterior mitral leaflet, the non-coronary aortic cusp, and the atrioventricular node.^{6,9}

Our patient manifested with sinus arrest, atrioventricular block, and paroxysmal atrial fibrillation on initial evaluation. Atrial fibrillation may have arisen due to her preoperative mitral stenosis causing left atrial dilatation and interstitial fibrosis. These chronic changes induced structural, electrical, and neural remodeling, creating suitable substrate for arrhythmia. Atrial fibrillation is more prevalent in elderly and significantly associated with an increased embolic risk, together with other risks

including age, diabetes, previous embolism, vegetation length, and *S. aureus* infection, and poor prognosis.^{10,11}

A cerebral embolic event in infective endocarditis is related to higher operative mortality due to cardiopulmonary bypass (CPB) induced systemic hypotension and heparinization, which may cause worsening of cerebral edema or transformation of an ischemic into a hemorrhagic stroke. Maruyama et al. have shown an adverse result with cardiac surgery in patients with cerebral emboli from vegetations. The vascular injury at the site of the embolus leads to conversion of an ischemic into a hemorrhagic stroke resulting from systemic heparinization for CPB. Surgery in the setting of stroke becomes imperative in cases of recurrent thromboembolism, persistent vegetations, and hemodynamic instability.⁶

4. Conclusion

In conclusion, the development of PVE is often viewed as a catastrophic event ascribable to its association with devastating complications and substantial risk for operative morbidity and/or mortality. Various predictors and comorbidities may magnify the prognosis of PVE. Hence, multidisciplinary decision making is necessary to determine individualized treatment to provide the patient with the best opportunity for a cure.

5. Supplementary video

Parasternal long axis view showed paravalvular vegetation at prosthetic mitral valve area.
<https://doi.org/10.6084/m9.figshare.14651292.v1>

6. Conflict of interest

The study utilized a grant by Faculty of Medicine, Universitas Indonesia, and no external or industry funding was involved.

7. Authors' contribution

DS: Idea/Concept, Design, Analysis/Interpretation, Literature Review, Drafting/Writing, Critical Review

AL: Idea/Concept, Design, Critical Review

EC: Data Collection/Processing, Analysis/Interpretation, Drafting/Writing

TSP: Design, Collection/Processing, Literature Review, Drafting/Writing

EPBM: Analysis/Interpretation, Literature Review, Drafting/Writing, Critical Review

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