Case Report

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Modified fibrinolytic therapy as treatment of mechanical aortic valve thrombosis

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Abstract

Prosthetic valve thrombosis is a rare phenomenon with limited treatment options. Current management choices include anticoagulation with or without fibrinolysis or surgical valve replacement for appropriate candidates. We report an alternative fibrinolytic and anticoagulation regimen resulting in successful treatment of a patient presenting with mechanical aortic valve thrombosis.

Keywords

Prosthetic, valve, thrombus, stenosis, alteplase, lytic

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Introduction

Mechanical prosthetic valve thrombosis (PVT) is rare with a reported incidence of symptomatic obstruction ranging from 0.3% to 1.3% per year but as high as 6% yearly in patients with subtherapeutic anticoagulation.[1] Clinical manifestations of PVT are affected by the location and severity of the thrombus. If the lesion alters valve function to a hemodynamically significant degree with resulting stenotic and/or regurgitant pathology, the PVT is deemed critical and requires immediate medical attention to reduce complications such as heart failure, embolic events, and death. Management options include anticoagulation, thrombolysis, surgical thrombectomy, or repeat surgical valve replacement. Ideal therapy must be individualized to each patient depending on factors such as valvular obstruction, valve location, and thrombus size.[2,3] For patients requiring urgent management due to left-sided valve thrombus, surgery or fibrinolytic therapy is recommended at the discretion of the overseeing heart valve team. Through extensive literature review, we cite the PROMETEE (PROsthetic MEchanical valve Thrombosis and the prEdictors of outcomE) trial which showed an overall treatment success rate of 90% with alteplase 25 mg delivered via intravenous (IV) infusion over 25 h without a bolus followed by a 6-h infusion of therapeutic heparin with a target activated partial thromboplastin time (aPTT) of 1.5–2.0.[4] Here we report an alternative fibrinolytic and anticoagulation regimen resulting in successful treatment of a patient presenting with mechanical aortic valve thrombosis.

Case presentation

A 56-year-old man presented to the emergency department due to increasing dyspnea and a productive cough for 2 weeks. Initial vitals were blood pressure (BP) 127/93 mm Hg, heart rate (HR) 99 beats/min, temperature 86.6°F, respiratory rate 28/min with 97% saturation on 2L O2 by nasal cannula. Exam showed an anxious man, with jugular venous distention to the mandible, bilateral rales and wheezing, regular cardiac rhythm with no evident murmurs, S3, or S4, left lower extremity below the knee amputation, right lower extremity with 1+ pitting edema. The initial differential diagnosis was acute decompensated congestive heart failure versus decompensated chronic pulmonary disease. Treatment was initiated with furosemide 80 mg IV in addition to nebulized bronchodilator therapy and methylprednisolone

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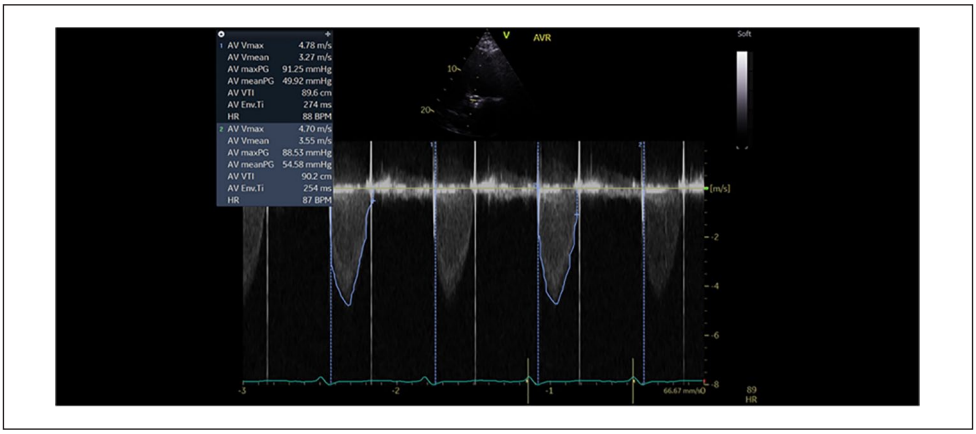

Image 1. Initial transthoracic echocardiogram demonstrating severe stenosis of mechanical aortic valve with peak velocity of 4.7 m/s and mean pressure gradient of 52 mm Hg.

125 mg IV by the emergency room physician. Despite these measures, his respiratory status rapidly declined, and he was admitted to the intensive care unit (ICU) for bilevel positive airway pressure (BiPAP) and additional treatment. Upon arrival to the ICU, he developed shock with multisystem organ failure and hypoxemic and hypercapnic respiratory failure refractory to BiPAP. The patient was subsequently intubated and started on vasopressor therapy.

Past medical history

Nonischemic cardiomyopathy with left ventricular ejection fraction of 20%–25%, status post biventricular implantable cardioverter defibrillator, status post 25 mm CarboMedics bi-leaflet mechanical aortic valve placed secondary to severe symptomatic calcific aortic stenosis, paroxysmal atrial fibrillation on warfarin complicated by intermittent noncompliance and labile INR values, chronic hypertension, hyperlipidemia, tobacco abuse with ongoing 1.5 ppd (packs per day) use, chronic kidney disease stage IIIb, non-insulin-dependent diabetes mellitus, major depressive disorder with history of psychotic features, suicidal ideation, and recurrent noncompliance with medical therapy.

Differential diagnosis

Acute decompensated heart failure, pulmonary thromboembolism, decompensated chronic pulmonary disease with cor pulmonale, septic shock, prosthetic valve dysfunction, infectious endocarditis, and acute coronary syndrome were considered.

Investigations

Transthoracic echocardiogram revealed mechanical aortic valve stenosis with peak velocity of 4.7 m/s, acceleration time of 110 ms, mean gradient of 52 mm Hg and Doppler velocity index of 0.25, as well as mild aortic regurgitation (Image 1). The patient was taken to catherization unit for Swan-Ganz placement, intra-aortic balloon pump insertion, and fluoroscopy of the mechanical aortic valve which showed a fixed nonmobile leaflet (Image 2) with presumed thrombosis given his history of medication noncompliance.

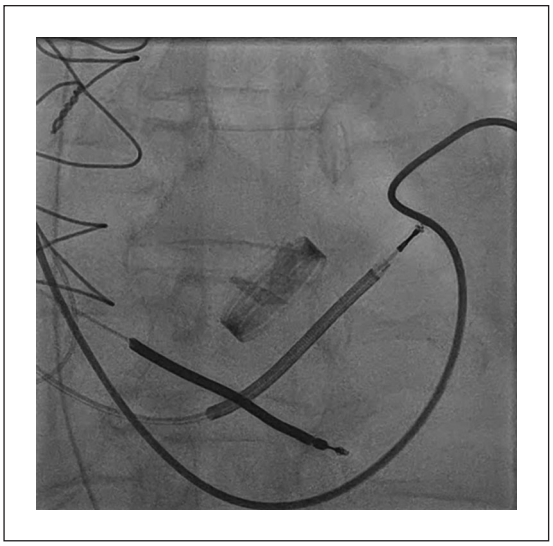

Image 2. Fluoroscopy of the bi-leaflet mechanical aortic valve revealing restricted mobility of one leaflet.

Management (medical/interventions)

Due to the fluoroscopic findings, cardiothoracic surgery was consulted, the patient was felt to be prohibitively high surgical risk and was promptly started on fibrinolytic therapy. He was given alteplase 10 mg IV bolus with an additional 90 mg IV infusion over the course of 20 h. Adjuvant therapeutic anticoagulation with heparin infusion guided by aPTT at 1.5–2.0 times the control value was also administered. Serial transthoracic echocardiograms performed over the ensuing 4 days showed some improvement of mechanical aortic valve function (Image 3).

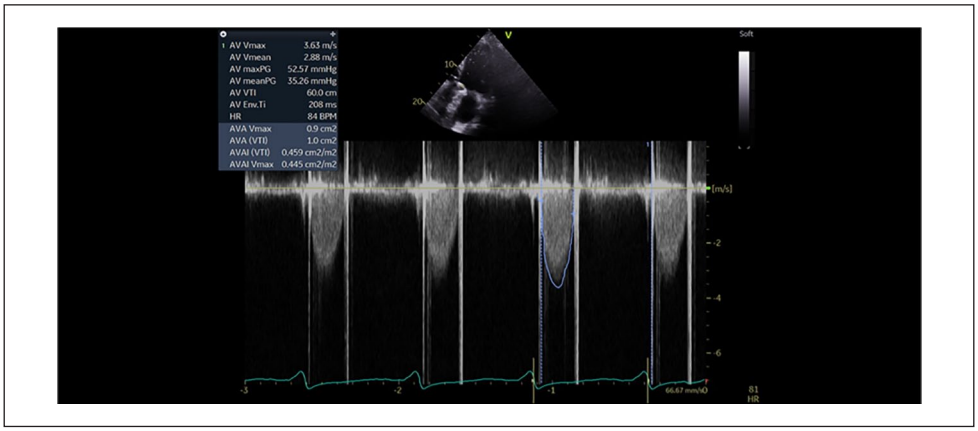

Image 3. Transthoracic echocardiogram after initiation of thrombolytic and anticoagulation therapy. Mechanical aortic valve with a peak velocity of 3.6 m/s and mean pressure gradient of 35 mm Hg.

Repeat fluoroscopic evaluation demonstrated normal bi-leaflet motion of the mechanical prosthetic aortic valve suggesting successful thrombolysis and restoration of function (Image 4).

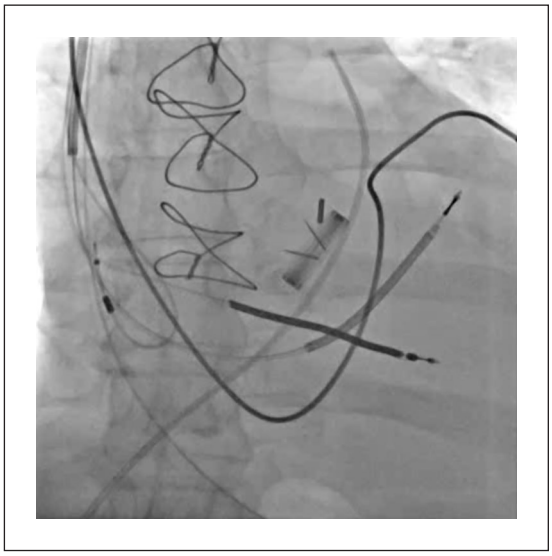

Image 4. Fluoroscopy of the previously thrombosed mechanical bi-leaflet aortic valve showing unrestricted leaflet motion after receiving thrombolytic therapy.

Follow-up

The patient had no major bleeding events or other complications during his course of treatment and continued to improve through his hospital course. He was successfully extubated and subsequently discharged with strict instructions to comply with his warfarin therapy to reduce the risk of repeat mechanical valve thrombosis. Follow-up transthoracic echocardiogram 3 months later showed a normal functioning mechanical aortic valve with a peak velocity of 2.3 m/s and a mean pressure gradient of 11 mm Hg.

Discussion

Current recommendations from the 2017 update of the 2014 AHA/ACC (American Heart Association/American College of Cardiology) valvar disease guidelines call for urgent initial treatment with either slow-infusion low-dose fibrinolytic therapy or emergency surgery for patients with thrombosed left-sided mechanical prosthetic heart value with signs of obstruction.[5] There are many patients like ours who are not surgical candidates and unfortunately, at present there is limited data available to guide pharmacologic treatment of PVT. An exact protocol of initial fibrinolytic therapy and duration of therapy is lacking in the guidelines.

After exhaustive literature review for randomized trials of prosthetic mechanical valve thrombosis, we found that this area of research was limited and not much guidance was found. We also reviewed the ACC/AHA valvular guidelines and did not find reference to large volume randomized trials to treat mechanical valve thrombosis. What we were able to find was, the PROMETEE trial showed an overall treatment success rate of 90% with ultraslow alteplase 25 mg delivered via IV infusion over 25 h without a bolus followed by a 6-h infusion of therapeutic heparin infusion with a target aPTT of 1.5–2.0 times the control value.[4] While PROMETEE offers guidance, it is limited by the low number of patients (n = 114) and the single center unblinded design. Our use of a modified fibrinolytic treatment regimen and successful resolution of our patient's mechanical aortic valve stenosis secondary to PVT adds to the available data and proposes an additional treatment option for patients with PVT. Additional studies would be beneficial to aid in treatment recommendations of PVT.

Conclusion

Although rare, PVT has a multitude of presentations and complications with limited management options. Due to the potentially life-threatening nature of PVT, rapid diagnosis and treatment is paramount. A high index of suspicion must

be maintained for all patients presenting with new symptoms and a prosthetic heart valve. Our case of mechanical aortic valve thrombosis due to medical noncompliance illustrates various diagnostic options and provides a modified treatment regimen with alternative alteplase dosing combined with therapeutic heparin infusion that was well tolerated without complications. It must be cautioned, however, that each case is unique, and our successful resolution of PVT may not be applicable to all patients.

Declaration of conflicting interests

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

Written informed consent was obtained electronically from the patient(s) for their anonymized information to be published in this article.

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