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CASE REPORT

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A rare case of concurrent mitral and aortic valve aneurysms in the setting of infective endocarditis

Majd Al Deen Alhuarrat[1] | **Sumant Pargaonkar**[1] | **Amrin Kharawala**[1] | **Rosy Thachil**[2] | **Nidhish Tiwari**[3]

[1]Division of Internal Medicine, Jacobi Medical Center, Albert Einstein College Medicine, Bronx, New York, USA

[2]Department of Cardiology, Mount Sinai School of Medicine/Elmhurst Hospital Center, Queens, New York, USA

[3]Department of Cardiology, University of Nebraska Medical Center, Omaha, Nebraska, USA

Correspondence
Majd Al Deen Alhuarrat, Internal Medicine Resident, Jacobi Medical Center, Albert Einstein College of Medicine, 1400 Pelham Parkway South, Bronx, NY 10461, USA.
Email: mhuarrat@hotmail.com

Key Clinical Message

Mitral valve aneurysm is a rare imaging finding most caused by infective endocarditis. The concurrent presence of an aortic valve aneurysm is unique and foretells a severe presentation that would require valve replacement during the same admission.

Abstract

A 42-year-old male patient presented with intermittent fever, night sweats, and weight loss for 2 months. TEE showed a rare finding of concurrent mitral and aortic valve aneurysms, and blood cultures grew streptococcus mutans. His infective endocarditis was successfully treated with antibiotics and placement of mechanical mitral and aortic valves.

KEYWORDS

aortic valve aneurysm, cardiovascular disease, infectious disease, mitral valve aneurysm, subacute infective endocarditis

1 | INTRODUCTION

Infective endocarditis (IE) is an infection of the heart endocardium with an annual incidence of 0.003%–0.01%.[1] Despite advancement in its management over the past decades, IE remains associated with an in-hospital mortality rate of up to 24%,[2] and severe complications,[3] that can range from cerebral, renal, cardiac, splenic, musculoskeletal, and pulmonary ones. Cardiac complications are the most common in IE occurring in around 50% of patients, with congestive heart failure carrying the most impact on prognosis.[4] One such uncommon complication is valvular aneurysms which can affect the aortic valve, but also rarely the mitral valve.[5] We have observed a unique case of valvular aneurysm concurrently occurring on both the aortic and mitral valves, and we aim to present it with the following key learning points: (1) investigate the mechanism and most common cause behind a mitral valve aneurysm; (2) outline the importance of keeping subacute IE within the differential diagnosis in patients presenting with embolic events to the brain, lung, or spleen; (3) understand the role of imaging, particularly echocardiography, in both the diagnosis and management of mitral and aortic valve aneurysms; and (4) appreciate the role of surgical intervention in patients presenting with concomitant mitral and aortic valve aneurysms.

2 | CASE DESCRIPTION

A 42-year-old male patient without significant past medical history presents to the primary care clinic complaining

of intermittent headaches and fever. His symptoms started 2 months ago after a flu-like illness with fever, cough, sore throat, headaches, and myalgias. Although most of his symptoms subsided, he continued to have night sweats, malaise, and occasional bouts of fever with chills, noting a weight loss of approximately 40 lbs. His headaches were described as intermittent, at the occipital region, 7/10 in intensity, and worse in the morning. Acetaminophen provided only temporary relief. Headache was not associated with aura, blurry vision, photophobia, nausea, or vomiting. However, he noted palpitations, epistaxis for 1 week, and arthralgia on review of systems. He has a 1-pack-year smoking history and no pertinent family or travel history. He denied unprotected sexual activity and other toxic habits. He had no recent dental evaluations but denied toothache and dental problems. He received the first two doses of the COVID vaccine and had a negative test result 3 weeks prior.

Vitals in the clinic were 116/67 blood pressure, 113 heart rate, 98.1°F temperature, and 20 respiratory rate with 97% saturation on room air. Physical examination was significant for regular tachycardia with systolic and diastolic murmurs best heard at the aortic area and tenderness of the joints and muscles without swelling or erythema. CBC was significant for thrombocytopenia without leukocytosis, and a complete metabolic panel (CMP) was within normal limits while a coagulation panel showed a mildly increased INR at 1.4 (Table 1). ESR and CRP were elevated at 126 and 41, respectively. QuantiFERON gold test was positive, while the hepatitis panel, syphilis screen, HIV, COVID, and chlamydia/gonorrhea amplification testing were negative. Initial ECG showed sinus tachycardia with borderline left axis deviation.

CT head was ordered urgently from the clinic and showed multifocal punctate hyperattenuations, prompting an ED referral. Due to high suspicion of IE, blood cultures were obtained, and antibiotics were initiated (Ceftriaxone and Vancomycin). MRI showed numerous non-enhancing hemorrhagic foci (Figure 1). Transthoracic echocardiography (TTE) showed severe mitral regurgitation (MR) and moderate aortic regurgitation (AR) with vegetations suggestive of Libman–Sacks endocarditis. Initial differential diagnosis included infective, autoimmune, or cancerous origin for the vegetations. TEE showed multivalvular endocarditis with a mitral valve aneurysm (MVA) at the anterior mitral valve leaflet and an aortic valve aneurysm (AVA) at the left aortic valve cusp with resultant severe mitral and aortic valves regurgitation (Figure 2 and Video S1). Following concern for endocarditis embolic events, CT abdomen was ordered and showed marked splenomegaly with acute small infarcts and small foci of wedge hypoenhancements seen in bilateral kidneys. Head CT angiography showed no evidence of aneurysm, vascular malformation, stenosis, or occlusion. Further laboratories included a positive RNP (ribonucleoprotein), ANA (anti-nuclear antibody) with speckled pattern and cardiolipin antibodies (AB) with negative Tick-borne AB panel, direct antiglobulin test, Beta2 glycoprotein, Diluted Russell Viper Venom Time (dRVVT), Protein S activity, and Silica clotting time.

Blood cultures resulted positive for pan-sensitive streptococcus mutans, and the antibiotics regimen was then modified from Vancomycin/Ceftriaxone (given for 4 days) to Penicillin G (which he continued for 24 days before discharge). Rheumatologic origin of his presentation was less likely since his Cardiolipin titer was not elevated enough to fulfill criteria, other antibodies were negative for antiphospholipid syndrome, and blood cultures were positive. Furthermore, abdominal and chest CT were not suggestive of occult malignancy. Cardiothoracic valve repair procedure was initially delayed due to the risk of intracranial hemorrhage; however, after the cerebral angiography results were negative for mycotic aneurysms, the cardiothoracic procedure was eventually performed 2 weeks post initial presentation. During the procedure, perforation and vegetation were found on the left coronary cusp of the aortic valve. The mitral valve, however, showed vegetation on both leaflets. A 14 of 2/0 pledgets suture was

TABLE 1 Detailed representation of lab results.

Complete blood count						
Patient	WBC: 6.16	Neutrophils: 75.4	RBC: 2.84	Hb: 9.4 g/dL	MCV: 98.9	Platelets: 45
Normal values	4.8–10.8 ×10(3)/μL	44%–70%	4.7–6.1 ×10(6)/μL	14–18 g/dL	80–99 fL	150–450 ×10(3)/μL
Comprehensive metabolic panel						
Patient	Na: 138	K: 3.6	BUN: 23	Creatinine: 0.6	Total bilirubin: 1.7	Calcium: 8.1
Normal values	135–145 mmol/L	3.6–5.2 mmol/L	5–26 mg/dL	0.7–1.2 mg/dL	0.1–1.2 mg/dL	8–10.4 mg/dL
Coagulation panel						
Patient	PT: 16.5		INR: 1.4		PTT: 42.8	
Normal values	10.5–13.4 s		0.88–1.13 ratio		25.9–38.9 s	

placed circumferentially on the mitral valve annulus post removal of leaflets and a 25/33 mm On-X Mitral valve was sutured through the sewing cuff. This was followed by a 21 mm On-X Aortic valve with annular sutures placed through the sewing cuff and seated in a supra-annular fashion. An intraoperative TEE confirmed prosthetic valves function and position post-implantation. The patient was then transferred intubated on dobutamine to the post-surgery care unit, remained hemodynamically stable and extubated overnight. Specimens collected from both cusps showed myxoid degeneration with acute endocarditis and vegetations cultures were negative for fungi, acid-fast bacilli, or bacteria (of note, the specimen was collected 16 days post antibiotics initiation). Patient spent 30 days in-patient and was discharged in good health to a skilled nursing facility with a recommendation to continue Penicillin G for a total of 6 weeks, along with metoprolol tartrate, furosemide (due to volume overload), aspirin, and warfarin. At his first postoperative visit 2 weeks after discharge, the patient was doing well with no complaints and no neurologic deficits. By this time, the patient had completed his antibiotics course and a repeat TTE showed mechanical mitral and aortic valves in place with mild stenosis, normal ejection fraction of 60% and normal left ventricular wall motion (Figure 3).

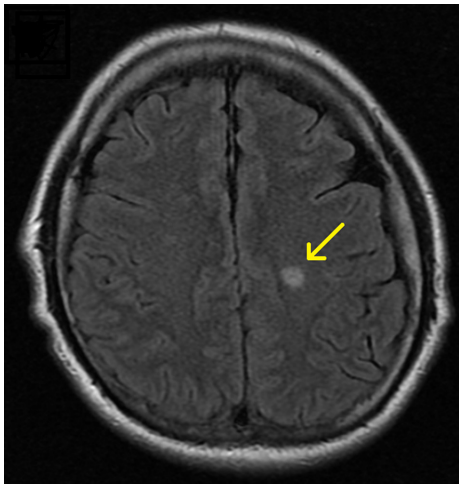

FIGURE 1 Brain MRI with numerous, scattered, non-enhancing chronic hemorrhagic foci, along with a single focus showing minimal associated edema (yellow arrow).

3 | DISCUSSION

As per ESC guidelines for the management of IE, up to 25% of IE patients have embolic complications at time of diagnosis.[6] Emboli represent one of the severe and most frequent complications of IE, and their risk is highest in the first couple of weeks after diagnosis, with risk decreasing significantly after initiation of therapy. Echocardiographic

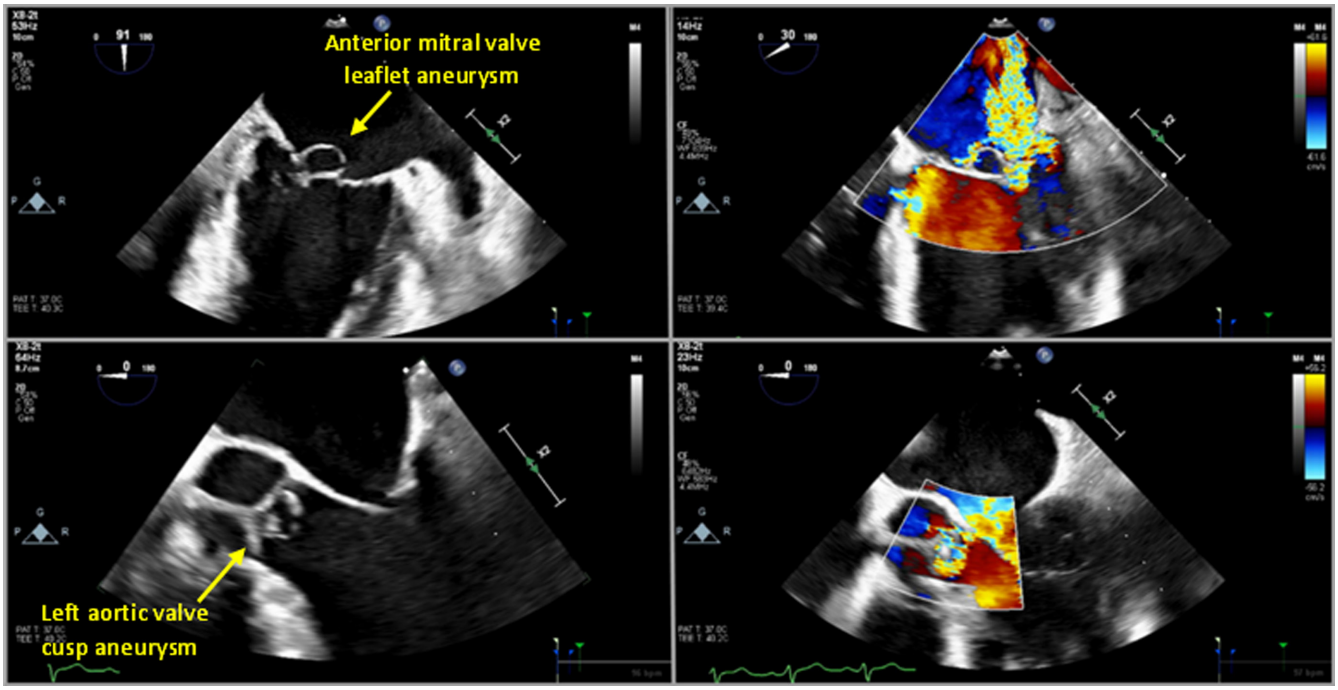

FIGURE 2 Five-chamber mid-esophageal TEE view. The mitral valve showed an eccentric regurgitant get directed posteriorly with a medium-sized vegetation on the tip of the leaflet and an anteriorly positioned aneurysm. The aortic valve showed a severe regurgitation with a medium-sized, highly mobile vegetation on the right and left coronary cusp with a left coronary cusp aneurysm. There were no aortic root abscesses or suspected thrombi. The ejection fraction was estimated at 60% with a moderately dilated left atrium.

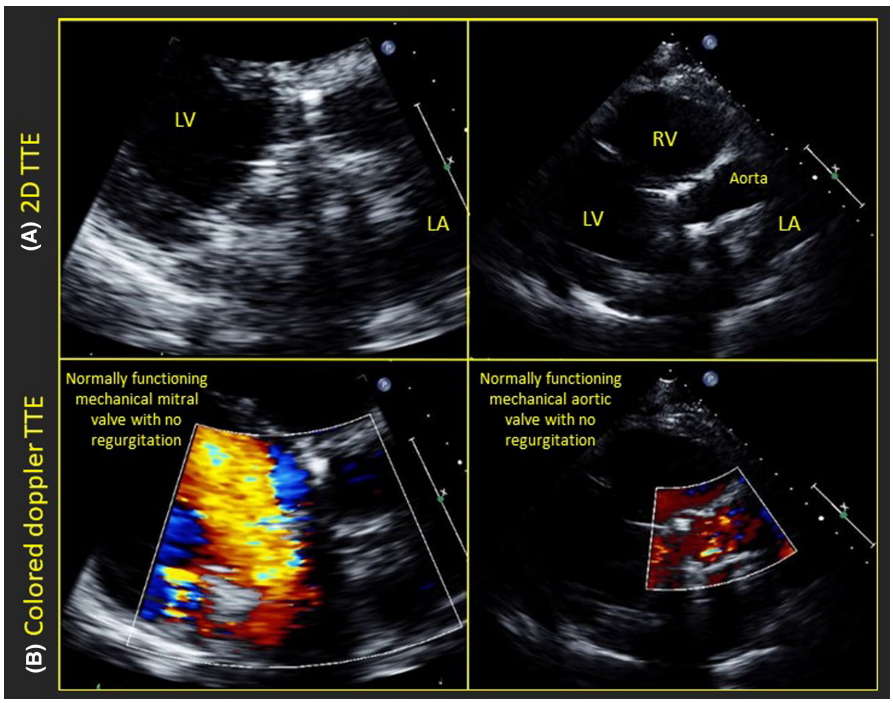

FIGURE 3 Parasternal long axis transthoracic echocardiography (TTE) view of the mitral valve (left) and aortic valve (right). (A) Is a 2D view with a normally calculated ejection fraction. (B) Is a colored Doppler view showing normally functioning mechanical mitral (left) and aortic (right) valves with no regurgitation (of note, views were limited). LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

TABLE 2 Current literature on concurrent aortic and mitral valve aneurysms in infective endocarditis.

Date	Reference	Age	Sex	Management
1998	Harada et al.[8]	57	Male	AVR + mitral valvuloplasty of the anterior mitral leaflet
2002	de Castro et al.[9]	42	Male	AVR + MVR
2010	Azevedo et al.[10]	30	Male	AVR + MVR

Abbreviations: AVR, aortic valve replacement; MVR, mitral valve replacement.

characteristics help predict the possible risk of emboli. In his 2005 study, Thuny et al. showed that large vegetation size (>10 mm), severe vegetation mobility, or both contribute to higher embolic risk.[7] In this current case, the patient presented with headache, constitutional symptoms of infection, and a significant heart murmur worrisome for an intracardiac pathology. Taken together, subacute IE with brain embolic events should be high in the differential.

Valve aneurysms are rare occurrences, with an MVA incidence of 0.204% in people undergoing TEE.[5] An AVA is even more rare, and an MVA/AVA co-occurrence has been, to the author's knowledge, reported only three times in the literature (Table 2). MVA is defined as a saccular bulge facing the left atrium that occurs, in most cases, in the anterior mitral leaflet collapsing during diastole, while AVA faces the left ventricle and collapses during systole. Etiologies can be non-infectious or infectious; however, most cases are associated with IE, especially in aortic valve involvement, due to an AR jet.[5]

Although TTE can be suggestive, TEE is considered superior in sensitivity for diagnosing valve aneurysm.[11] The presence of an aneurysm should always raise the possibility of IE, even in the absence of vegetation or abscess, to allow for early interventions and avoid complications.[12] Optimal management is controversial, but surgical intervention is preferred if rupture occurs, significant vegetation exists, or severe regurgitation is identified.[5] In our case, the patient presented with a compensated severe mitral and AR and predominance of IE symptoms. His presentation was complicated by thromboembolic events affecting brain, spleen, and kidneys. Following early recognition of his severity and elevated risk of decompensation, we opted for an early surgical intervention.

4 | CONCLUSION

Our case highlights the importance of keeping IE high on the differential diagnosis when a patient presents with embolic events and constitutional symptoms. Additionally, if IE is complicated by concurrent MVA and AVA, the likelihood of needing a surgical intervention of the valves during the same admission is high.

AUTHOR CONTRIBUTIONS

Majd Al Deen Alhuarrat: Conceptualization; project administration; supervision; writing – original draft; writing – review and editing. **Sumant Pargaonkar:**

Writing – original draft. **Amrin Kharawala:** Writing – review and editing. **Rosy Thachil:** Supervision. **Nidhish Tiwari:** Supervision.

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CONFLICT OF INTEREST STATEMENT
None of the authors have any conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT
Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

ETHICS STATEMENT
We hereby confirm that the present study conforms to the ethical standards and guidelines of the journal.

CONSENT
A consent form has been obtained and signed by the patient.

ORCID
Majd Al Deen Alhuarrat https://orcid.org/0000-0003-2016-1496

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SUPPORTING INFORMATION
Additional supporting information can be found online in the Supporting Information section at the end of this article.

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