CASE REPORT

Anterior mitral valve aneurysm: a rare sequelae of aortic valve endocarditis

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Summary

In intravenous drug abusers, infective endocarditis usually involves right-sided valves, with Staphylococcus aureus being the most common etiologic agent. We present a patient who is an intravenous drug abuser with left-sided (aortic valve) endocarditis caused by Enterococcus faecalis who subsequently developed an anterior mitral valve aneurysm, which is an exceedingly rare complication. A systematic literature search was conducted which identified only five reported cases in the literature of mitral valve aneurysmal rupture in the setting of E. faecalis endocarditis. Real-time 3D-transesophageal echocardiography was critical in making an accurate diagnosis leading to timely intervention.

Learning objectives:

- Early recognition of a mitral valve aneurysm (MVA) is important because it may rupture and produce catastrophic mitral regurgitation (MR) in an already seriously ill patient requiring emergency surgery, or it may be overlooked at the time of aortic valve replacement (AVR).
- Real-time 3D-transesophageal echocardiography (RT-3DTEE) is much more advanced and accurate than transthoracic echocardiography for the diagnosis and management of MVA.

Background

Mitral valve aneurysm (MVA) is an uncommon condition that can occur as a complication of infective endocarditis of aortic valve or the mitral valve. Rupture of the aneurysm is the most feared complication, which can result in severe mitral regurgitation (MR) causing rapid hemodynamic deterioration especially in heart failure patients (1, 2, 3). A timely diagnosis using Real-time 3D-transesophageal echocardiography (RT-3DTEE) and appropriate treatment such as surgical repair or replacement of the valve can prevent this catastrophic complication (2, 3). We present a case of anterior MVA after aortic valve endocarditis and emphasize the role of RT-3DTEE in the early diagnosis and management of this condition.

Case presentation

A 41-year-old Caucasian male with history of intravenous drug use, chronic obstructive pulmonary disease and colorectal abscesses presented with a 3-week history of worsening shortness of breath. At the time of presentation, the patient endorsed extreme fatigue, night sweats, orthopnea and dyspnea. The patient denied chest pain, cough, nausea, or vomiting. Cardiac examination revealed a diastolic murmur along the left sternal border. Initial workup included computed tomographic angiogram (CTA) of the chest, which showed no evidence of pulmonary emboli. The 2D-transthoracic echocardiogram (TTE) demonstrated a 2.1 cm aortic valve vegetation as well as an abnormal ring-like structure on the mitral valve (Fig. 1A
and B). Left ventricular ejection fraction (LVEF) was 65%. The patient was started on empiric antibiotics, including vancomycin, ceftriaxone and gentamicin immediately after blood cultures were obtained. The patient was transferred to a tertiary center for higher level of care, further evaluation, and management of endocarditis. Upon arrival, an RT-3DTEE was performed, revealing vegetations on all three cusps of the aortic valve, the largest measuring 2.7 cm. There was malcoaptation of the aortic valve cusps with severe aortic regurgitation. 3D zoom view from the left atrial side demonstrated an aneurysm involving the A2 scallop of the mitral valve (Fig. 1C). The view from the left ventricular side revealed a perforation in the A2 scallop (Fig. 1D). Blood cultures returned positive for Enterococcus faecalis bacteremia. The bacteremia was attributed to the use of rectal methamphetamine suppositories complicated by rectal abscesses.

Based on RT-3DTEE findings of severe symptomatic aortic regurgitation and anterior mitral valve aneurysm the patient underwent urgent surgery. Intraoperatively, the patient was found to have a large 2 x 2 cm perforation through A2 of the mitral valve (Fig. 2A). There was a large ballooning piece of tissue seen over the perforation in the A2 scallop of the anterior leaflet, corresponding to the preoperative 3DTEE findings. The excess aneurysmal tissue and leaflet were resected. The aortic valve had several vegetations with ragged edges (Fig. 2B), and there was malcoaptation of the leaflets as demonstrated
on RT-3DTEE. The patient underwent successful aortic and mitral valve replacements. Cultures of the valves also grew *E. faecalis*. The patient was subsequently discharged on ampicillin and streptomycin for 6 weeks and infectious disease follow-up.

**Discussion**

Our patient developed aortic valve enterococcal endocarditis, most likely due to use of rectal methamphetamine suppositories. The patient subsequently developed colorectal abscesses, requiring a colostomy. Enterococcus is the third leading etiological agent for bacterial endocarditis after viridans streptococci and staphylococci, and accounts for approximately 8% of all cases of bacterial endocarditis (4). The patients at the highest risk for developing enterococcal endocarditis include elderly men subjected to multiple genitourinary procedures, young women with postpartum and genitourinary infections, and intravenous drug users (5). These patients commonly present with fever, night sweats, weight loss, malaise, heart murmurs and symptoms due to cardiac failure.

MVA is a rare condition with reported incidence of 0.29% on 4500 TEE examinations (12). On TTE it looks like a saccular bulge of the mitral leaflet protruding toward the left atrium with systolic expansion and diastolic collapse. The diastolic expansion may occur with AR or after rupture of the MVA (13). Anterior MVA is more commonly observed than the posterior MVA (13, 14). The development of MVA is likely due to the infected aortic regurgitant jets striking the ventricular surface of the anterior mitral leaflet (Fig. 1E) causing physical trauma and possible occult mitral leaflet infection. This is manifested by valvulitis and the formation of sac-like outpouchings due to formation of scar tissue and granulation tissue on microscopic examination. The extension of infection to the mitral–aortic intervalvular fibrosa results in abscess or aneurysm formation (1, 2, 10). However, the posterior MVA occurs as a result of weakness of the mitral valve secondary to myxomatous degeneration and latent infective endocarditis (15). The MVA is of variable shape and size and can easily be confused with other mitral valve masses. According to Gular and coworkers, these aneurysms range in size from 5 to 12 mm in diameter during ventricular systole. The differential diagnosis of MVA includes mitral valve prolapse, myxomatous degeneration of the mitral valve, flail mitral leaflet, papillary fibroelastoma, myxoma involving the mitral valve, and mitral valve blood cysts without endothelization and mitral valve diverticulum (13). The potential complications of MVA include endocarditis, thromboembolization and rupture of the aneurysm or perforation of the valve leaflet leading to acute, severe mitral regurgitation and pulmonary edema.
Table 1  Cases reported of MVA in the setting of Enterococcus faecalis endocarditis.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Study (year)</th>
<th>Age (years) and sex</th>
<th>Predisposition</th>
<th>Presentation</th>
<th>Cardiac examination findings</th>
<th>Causative organism</th>
<th>MV cusps involved</th>
<th>Echocardiography findings</th>
<th>MVA perforation</th>
<th>AV replacement</th>
<th>MV replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kholeif et al. (2002)</td>
<td>33 M</td>
<td>Nephrotic syndrome, Steroid use</td>
<td>Fever</td>
<td>PSM at apex and diastolic murmur at aortic area</td>
<td>Enterococcus faecalis</td>
<td>AMV</td>
<td>TEE: Thickened MV with an echo-dense mass, 3 large vegetations on AV, moderate MR and severe AR</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Körber et al. (2001)</td>
<td>65 M</td>
<td>AR</td>
<td>Pulmonary edema</td>
<td>Grade IV PSM over mitral area</td>
<td>Enterococcus faecalis</td>
<td>AMV</td>
<td>TEE: Aneurysm on AMV, severe MR</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Rachko et al. (2001)</td>
<td>63 M</td>
<td>UTI</td>
<td>Chest pain, dyspnea, dizziness</td>
<td>Unknown</td>
<td>Enterococcus faecalis</td>
<td>AMV</td>
<td>TTE: Thickened AV and MV leaflets TEE: AV vegetation, saccular structure with a narrow neck attached to AMV, severe MR and AR</td>
<td>0</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Seratnahaei et al. (2015)</td>
<td>29 M</td>
<td>Enterocutaneous fistulas, Fever and delirium</td>
<td>Unknown</td>
<td>Enterococcus faecalis</td>
<td>AMV</td>
<td>TEE: MV vegetation and aneurysm perforation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Seratnahaei et al. (2015)</td>
<td>61 M</td>
<td>Clostridium difficile infection</td>
<td>Fever</td>
<td>Unknown</td>
<td>Enterococcus faecalis</td>
<td>AMV</td>
<td>TEE: MV vegetation and AMV aneurysm perforation</td>
<td>+</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Positive, +; Negative, 0; AMV, anterior mitral valve; MV, mitral valve; PMV, posterior mitral valve; AS, aortic stenosis; AR, aortic regurgitation; MR, mitral regurgitation; TTE, transthoracic echocardiography; TEE, transesophageal echocardiography.
### Table 2 Cases reported of MVA in the setting of *Enterococcus faecium* endocarditis.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Study (year)</th>
<th>Age (years) and sex</th>
<th>Predisposition</th>
<th>Presentation</th>
<th>Cardiac examination findings</th>
<th>Causative organism</th>
<th>MV cusps involved</th>
<th>Echocardiography findings</th>
<th>MVA perforation</th>
<th>AV replacement</th>
<th>MV replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dominguez et al. (1998)</td>
<td>34</td>
<td>Ulcerative colitis</td>
<td>Fever</td>
<td>Diastolic murmur and ESM at aortic area, S3</td>
<td><em>Enterococcus faecium</em></td>
<td>AMV</td>
<td>TTE: AMV aneurysm, Doppler: severe AR and moderate MR</td>
<td>+</td>
<td>+</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Hotchi et al. (2011)</td>
<td>77 F</td>
<td>–</td>
<td>Incidental</td>
<td>Unknown</td>
<td><em>Enterococcus faecium</em></td>
<td>PMV</td>
<td>TTE and TEE: severe MR and AR, cystic mobile lesion on the PMV</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Pederzolli et al. (2009)</td>
<td>67 M</td>
<td>Aortic stenosis</td>
<td>Chest pain and dyspnea</td>
<td>PSM at apex and grade-III diastolic murmur at LPB</td>
<td><em>Enterococcus faecium</em></td>
<td>PMV</td>
<td>3DTEE: severe MR due to large perforated aneurysm of the posterior leaflet (Scallop P3)</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Positive, +; Negative, 0; AMV, anterior mitral valve; MV, mitral valve; PMV, posterior mitral valve; AS, aortic stenosis; AR, aortic regurgitation; MR, mitral regurgitation; TTE, transthoracic echocardiography; TEE, transesophageal echocardiograph.

### Table 3 Cases reported of MVA in the setting of enterococcal endocarditis (unspecified).

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Study (year)</th>
<th>Age (years) and sex</th>
<th>Predisposition</th>
<th>Presentation</th>
<th>Cardiac examination findings</th>
<th>Causative organism</th>
<th>MV cusps involved</th>
<th>Echocardiography findings</th>
<th>MVA perforation</th>
<th>AV replacement</th>
<th>MV replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Isidre Vilaco et al. (1999)</td>
<td>55 F</td>
<td>Heart failure</td>
<td>Dyspnea</td>
<td>Unknown</td>
<td><em>Enterococcus</em></td>
<td>AMV</td>
<td>TEE showing MVA of 2 × 3 mm with severe MR and severe AR</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>Isidre Vilaco et al. (1999)</td>
<td>55 F</td>
<td>Heart failure embolism</td>
<td>Dyspnea</td>
<td>Unknown</td>
<td><em>Enterococcus</em></td>
<td>AMV</td>
<td>TEE showing MVA of 12 × 16 mm with severe MR and moderate AR</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Positive, +; Negative, 0; AMV, anterior mitral valve; MV, mitral valve; PMV, posterior mitral valve; AS, aortic stenosis; AR, aortic regurgitation; MR, mitral regurgitation; TTE, transthoracic echocardiography; TEE, transesophageal echocardiograph.
Mitral valve aneurysm in infective endocarditis

Funding
This research did not receive any specific grant from any funding agency in the public, commercial or not-for-profit sector.

Patient consent
Written informed consent was obtained from the patient for publication of the submitted article and accompanying images.

Author contribution statement
R J: Conception and design, and final approval of manuscript. M U K: Conception and design, and drafting of manuscript. I B R: Conception and design, and approval of manuscript.

References

Declaration of interest
The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of this case report.

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