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Case Report

Mitral Valve Aneurysms Complicating Aortic Valve Endocarditis: A Case Series.

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Abstract:

Background: Mitral valve aneurysms (MVAs) are uncommon conditions frequently associated with aortic valve endocarditis. They may be complicated by perforation and severe mitral regurgitation (MR). Optimal treatment of MVA, and in particular the best timing for surgery, are uncertain.

Case Presentation: We report three cases of MVAs complicating aortic valve endocarditis:

Case 1: A 56-year-old male with acute pulmonary edema secondary to severe aortic and mitral regurgitation underwent emergency double valve replacement. Despite initial postoperative stability, he later succumbed to complications.

Case 2: A 33-year-old female developed severe regurgitation of both valves and multiple cerebral infarctions post-febrile illness. Due to the COVID-19 pandemic, her double valve replacement was delayed, but she recovered well after surgery.

Case 3: A 41-year-old male, initially evaluated for renal transplant, was incidentally found to have severe aortic regurgitation and MVA. He successfully underwent elective aortic valve replacement and mitral valve repair.

Details: The first patient had Severe AR and MR, presented with pulmonary edema, and underwent double valve replacement. The second patient had a prolonged course of relapsing and remitting fever for one and half years which was initially treated by broad-spectrum antibiotics, complicated by CVA, had severe MR and AR, and underwent double valve replacement. The third patient had unexplained pulmonary edema even after regular dialysis and as a pre-operative check-up had AV endocarditis with MVA causing severe AR and MR and underwent AVR with MV repair. All patients had mechanical valves for replacement and MV repair by pericardial patch.

Conclusions: MVAs are infrequent but potentially severe complications of AV endocarditis. In the absence of definite treatment indications, the correct time for surgery should depend on concomitant clinical and infective features.

Background

Mitral valve aneurysms are rare and occur most commonly in association with aortic valve endocarditis. Transoesophageal echocardiography is the most sensitive imaging modality for the diagnosis of this entity and its potential complications, such as leaflet rupture and acute severe mitral regurgitation, which mandate prompt surgical intervention, however, the optimal treatment for MVAs, and in particular timing of surgery, is not well defined.

We present case series of 3 patients with mitral valve aneurysm associated with aortic regurgitation. Out of the three two cases were infective endocarditis of the aortic valve

We present case series of 3 patients of AV endocarditis with associated aortic regurgitation (AR), initially managed with antibiotic therapy, but complicated by the occurrence of MVA and MR. We hypothesized that the aneurysm developed through direct extension of infection from the aortic valve or from a prolapsing aortic vegetation. Therefore, they underwent Aortic valve (AV) replacement with MV replacement/repair.

Case Series

CASE -1

A fifty-six years old male patient was diagnosed to have culture-negative infective Endocarditis of the aortic valve from outside hospital while being evaluated for fever. While on domiciliary treatment with broad-spectrum antibiotic (elsewhere) patient developed acute dyspnea and hence presented to our emergency room with pulmonary edema.

Although the repeated blood cultures were negative, he had leukocytosis, elevated CRP and, NT Pro- BNP (549.1pg/ml).

After initial treatment of heart failure, he underwent a TEE Test which revealed a bicuspid aortic valve with a large vegetation protruding in the left ventricular outflow tract (LVOT) in diastole (*Image-1).* There was flap dissection of an anterior mitral leaflet with a perforation about 5 mm from the aorta-mitral junction (*Image-2)*. Color Doppler evaluation showed the regurgitant mitral jet entering the mitral valve aneurysm and filling the left atrium through a rent. Subsequently after one week of antibiotics patient underwent replacement of the aortic and also mitral valve as the later was beyond repair due to the damage incurred. Patient was discharged from the hospital with normally functioning valves but 2 months latter brought to the ER in unconscious state after a fall at home and succumbed to death in four days.

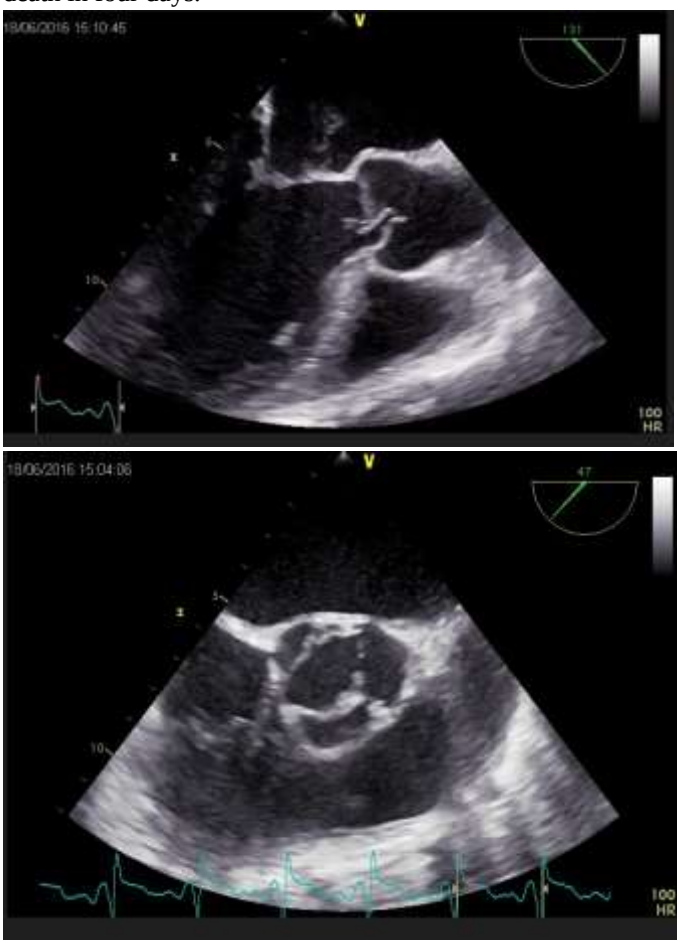

Image 1: Bicuspid aortic valve with vegetation over NCC

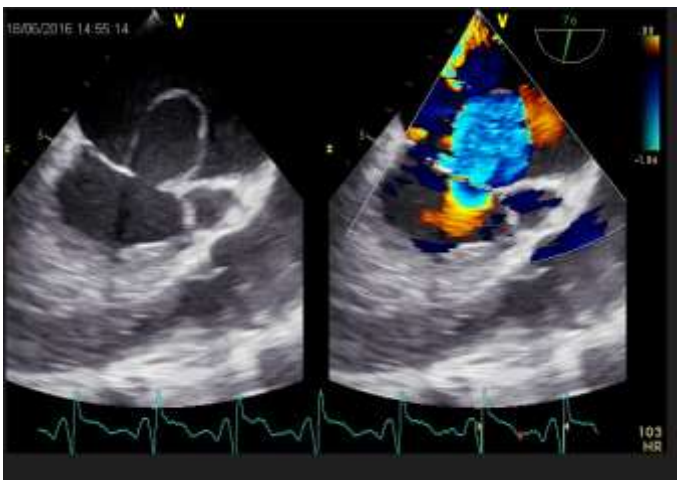

Image 2: Dissection of AML with severe eccentric MR with aneurysm attached to AML

CASE-2

This 33-year-old lady had a lower segment caesarean section, following which febrile illness was treated conservatively. Five months later she presented with sudden onset amnesia and was found to have right hemiparesis. Imaging was suggestive of multiple cerebral infarcts. A cardiac evaluation revealed tri leaflet aortic valve with multiple vegetation, moderate aortic regurgitation, mild mitral regurgitation, and mild pulmonary arterial hypertension. A Culture negative endocarditis diagnosis was made and she was advised to take antibiotics thereafter for 6 weeks. Towards the end of the antibiotic course, she developed heart failure requiring admission to another hospital and, was found to have worsening aortic regurgitation with large vegetations on aortic leaflets with moderate mitral valve insufficiency. Her valve replacement was postponed due to the COVID pandemic for about 10 months and had one more admission elsewhere for heart failure

She was admitted for her valve surgery and clinical features suggestive of volume overload state. Trans thoracic Echo showed vegetations attached to the aortic valve with severe AR, severe MR with suspicious anterior mitral valve aneurysm *(Image-3).* During the pre-operative work TEE was done to assess the valvular involvement. This revealed large vegetations attached to all three cusps of the aortic valve (*Image-5)* which prolapsed to LVOT during diastole with severe AR (*Image-4).* Mitral valve showed mild thickening with an aneurysm 1cmx 1 cm attached towards the medial commissure Severe MR jet spilling the left atrium through the aneurysm (*Image-3).*

Subsequently, she underwent double valve replacement with a mechanical prosthetic valve and was discharged (*Image-6*). Six months later at follow up she was asymptomatic with normally functioning prosthetic valves.

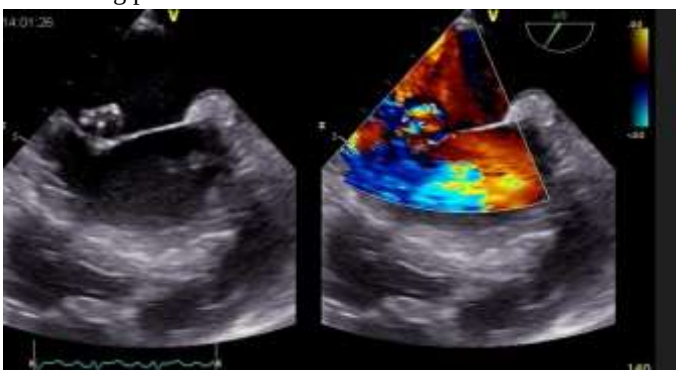

Image 3: Perforation of AML with aneurysm attached to AML

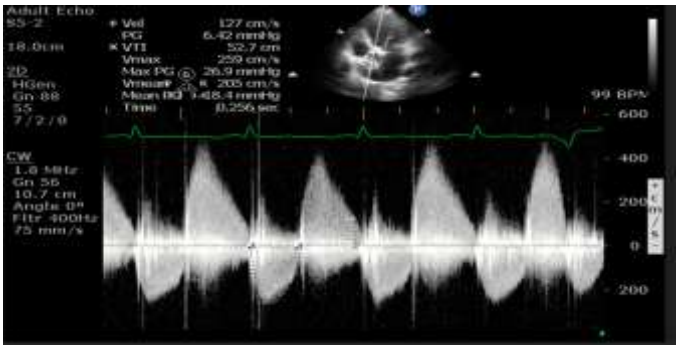

Image 4: Severe AR with triangular JET and PHT 89 MSEC

Image 5: Large vegetations attached to all 3 cusps of aortic valve prolapsing into LVOT during diastole

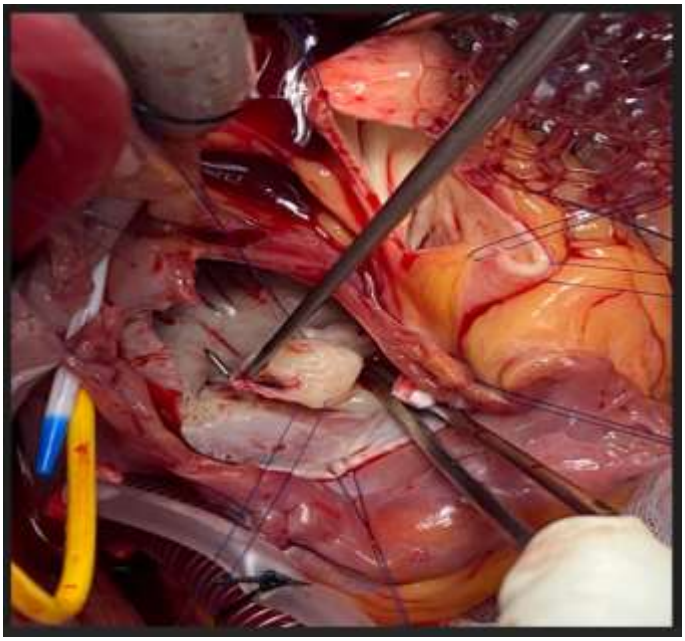

Image 6: Primary Surgery: DVR - AV - #17 SJM Regent MV - #23 TTK Chitra

CASE-3

The third case was a 41-year-old gentleman with multiple issues -Type II Diabetes Mellitus, Systemic Hypertension, Coronary Artery Disease with PCI, Chronic Renal Failure on Renal Replacement Therapy and Post COVID infection. He was found to have Aortic regurgitation during his pre-operative workup for renal transplant. Trans thoracic echo suggestive of a torn right coronary cusp with severe AR(*Image-8) (Image-9)* and an aneurysm of AML (*Image-7*) with severe MR. Infective endocarditis was considered as etiology but the work up including blood cultures was negative.

The patient underwent elective aortic valve replacement (23 mm St Jude regent valve) and AML perforation closure with a fresh pericardial patch. The post-operative period was uneventful.

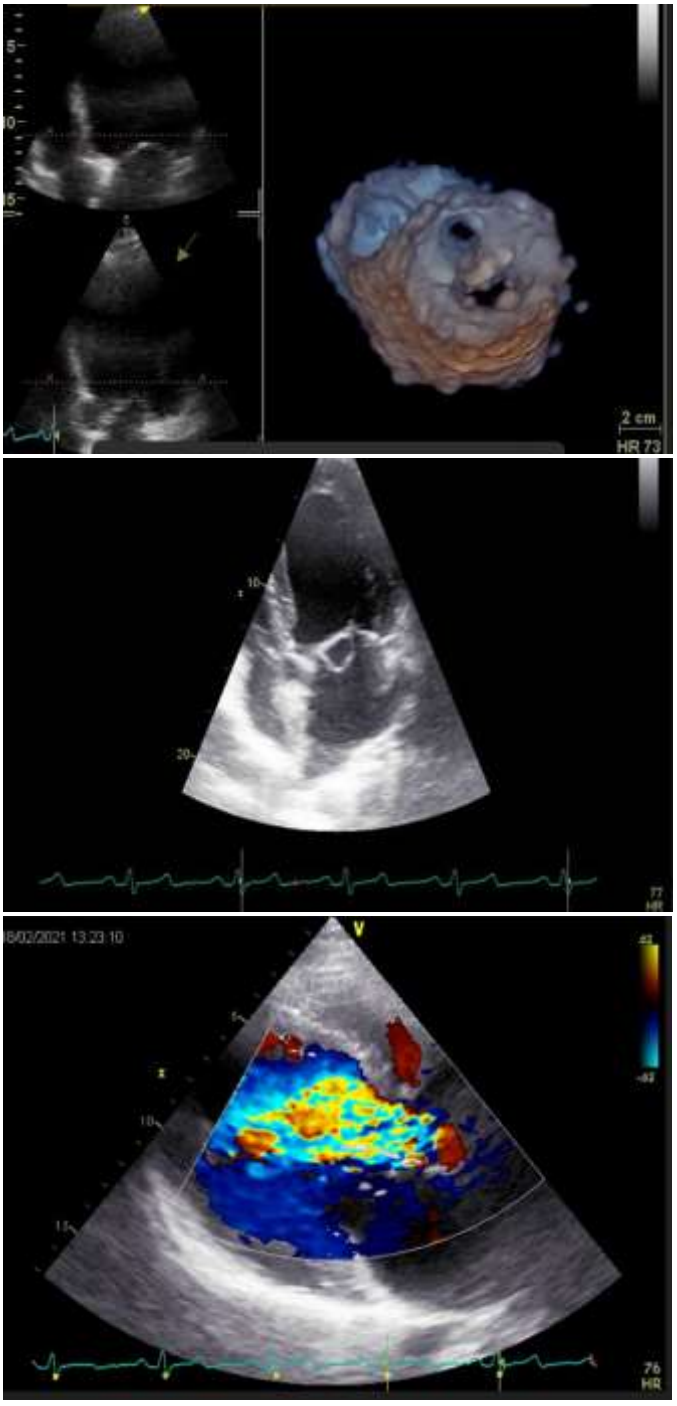

Image 7: AML aneurysm with perforation; secondary to endocarditis causing severe MR.

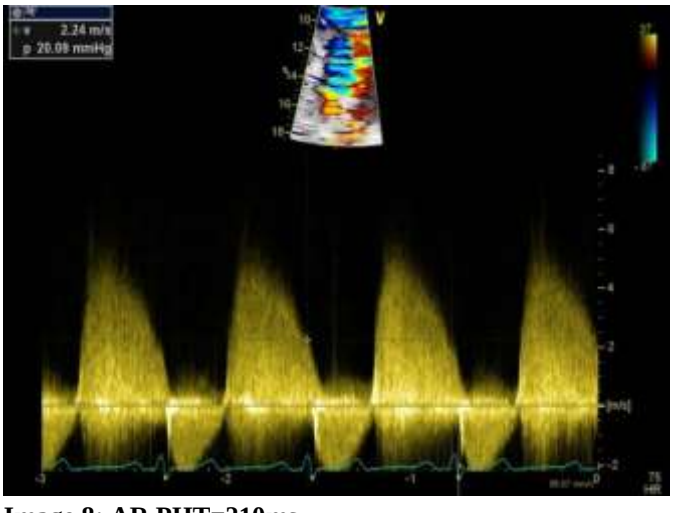

Image 8: AR PHT=210ms

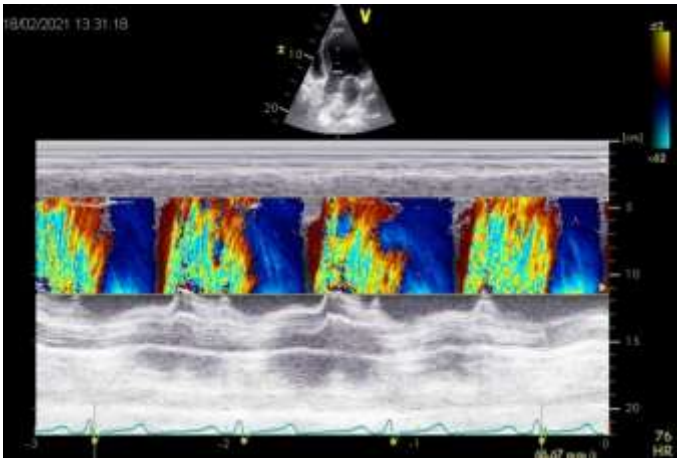

Image 9: Severe AR with diastolic flow in m mode

Discussion

In 1729, Morand described the first case of MVA as a saccular structure that bulged into the left atrium with systole expansion and diastolic collapse. [1] MVAs are rare, with an incidence of 0.2%–0.3% on echocardiographic examinations in general. Of the several causative mechanisms reported for MVA (among them connective-tissue disorders, pseudoxanthoma elasticum, and myxomatous valve degeneration), IE is the most prevalent. In our case series, two out of three were due to IE. Substantially, they recognized that the probable mechanism of its formation is the destruction of the aortic valve which results in a regurgitant jet that strikes the anterior leaflet of the mitral valve, creating a secondary site of infection leading to the development of an aneurysm. Perforation of these aneurysms may occur, resulting in mitral regurgitation and pulmonary edema from a ventricle already volume-overloaded from aortic regurgitation.[2] Nevertheless, in most patients with aortic valve endocarditis, the infection may spread to the mitral-aortic intervalvular fibrosa.[3] Piper *et al.*[4] defined "mitral kissing vegetation" the large aortic vegetations prolapsing into the left ventricular outflow tract during diastole and contacting the anterior mitral leaflet thus causing it to be secondarily infected. This process causes an abscess, aneurysm and, eventually perforation into the left atrium. Aneurysm perforation occurred in 72% of the reported cases. In our cases, all three AML aneurysms were ruptured and were associated with significant mitral regurgitation. Guler *et al*. affirmed that larger aneurysm size does not necessarily correlate with a higher risk of perforation. [5] The moment of aneurysm perforation might be a crucial point for peripheral embolization.

The diverse clinical presentation of this clinical entity could be due to complications of valvular involvement along with features of infective endocarditis. One patient in our case series diagnosed to have moderate AR with IE presented with acute pulmonary oedema probably due to sudden volume overload secondary to rupture of mitral valve aneurysm. The second case presentation was a cerebrovascular accident that could be due to embolization either from the aortic or mitral valve. The third case was a rare presentation with incidental detection of this entity without symptoms and evidence of endocarditis.

TTE may occasionally identify subtle valvular abnormalities, the better resolution provided by TEE yields a more definitive identification of these rare lesions. MVA can be confused with several abnormalities including myxomatous degeneration of the MV, MV prolapse, flail mitral leaflet, papillary fibroelastoma, myxomas involving the MV, and non-endothelial cyst of the MV. Colour flow Doppler distinguishes an aneurysm from other abnormalities by demonstrating direct communication between an aneurysm and the left ventricle. We could identify the abnormality and reason for MR as a mitral valve aneurysm in two cases with transthoracic Echocardiography. According to statistical analyses, the sensitivity of vegetation detection by transthoracic echocardiography is 60% to 75%, and the sensitivity of vegetation detection by transoesophageal echocardiography is >95% The site of perforation, size of the aneurysm, exclusion of other mitral valve anomalies, and the site of entry of regurgitant jet into the left atrium were clearly delineated only with TEE. Published studies have shown that the frequency of valve infection is positively proportional to the risk of valve injury. Valves under high-pressure blood flow are subjected to the highest shear stress, and thus, left heart valve involvement has been observed in most IE patients. [9]

Early detection and prompt intervention are important to prevent the complications of valvular aneurysms, which include rupture, embolism, and endocarditis. MVAs can also cause severe mitral regurgitation due to perforation of the aneurysm or as a result of leaflet coaptation defect caused by the mass effect of the aneurysm, and may precipitate rapid deterioration of hemodynamic status. In our case series two out of three already had complications of mitral valve aneurysm rupture as acute pulmonary oedema and stroke. Only one underwent elective surgical treatment

In the reported cases of IE with MVAs, most patients (75%) ultimately underwent surgical treatment, although the timing of surgery was usually unclear. Ruparelia *et al*. suggested, planning surgery as soon as the abnormality is observed, to prevent aneurysm rupture, the development of severe mitral regurgitation, and embolization. [6] On the other hand, Vilacosta *et al*. suggested the possibility of conservative management, with surgical intervention only in case of cardiac deterioration. [7] Other authors have recommended a similar approach. Rarely, when there are no other reasons for surgery and fever is easily controlled with antibiotics, small abscesses or false aneurysms can be treated conservatively under close clinical and echocardiographic follow-up. Therefore, unless severe comorbidity exists, the presence of locally uncontrolled infection is an indication for early surgery in patients with IE. When surgeons plan surgery in complicated aortic valve IE, they should consider possible extra valvular involvement, in particular on the aortic root and the mitral-aortic intervalvular fibrous body. Given the extent of abnormalities associated with MV-leaflet aneurysm development, surgical MV replacement is often necessary; however, repair should be performed, if possible, because of the lower risk of recurrent IE. In our cases series one patient had undergone mitral valve repair (less severe mitral involvement and no evidence of IE in this case) and the rest replacement Therefore, in patients with MVAs, repair or replacement of the valve during aortic valve replacement/repair

should be performed.

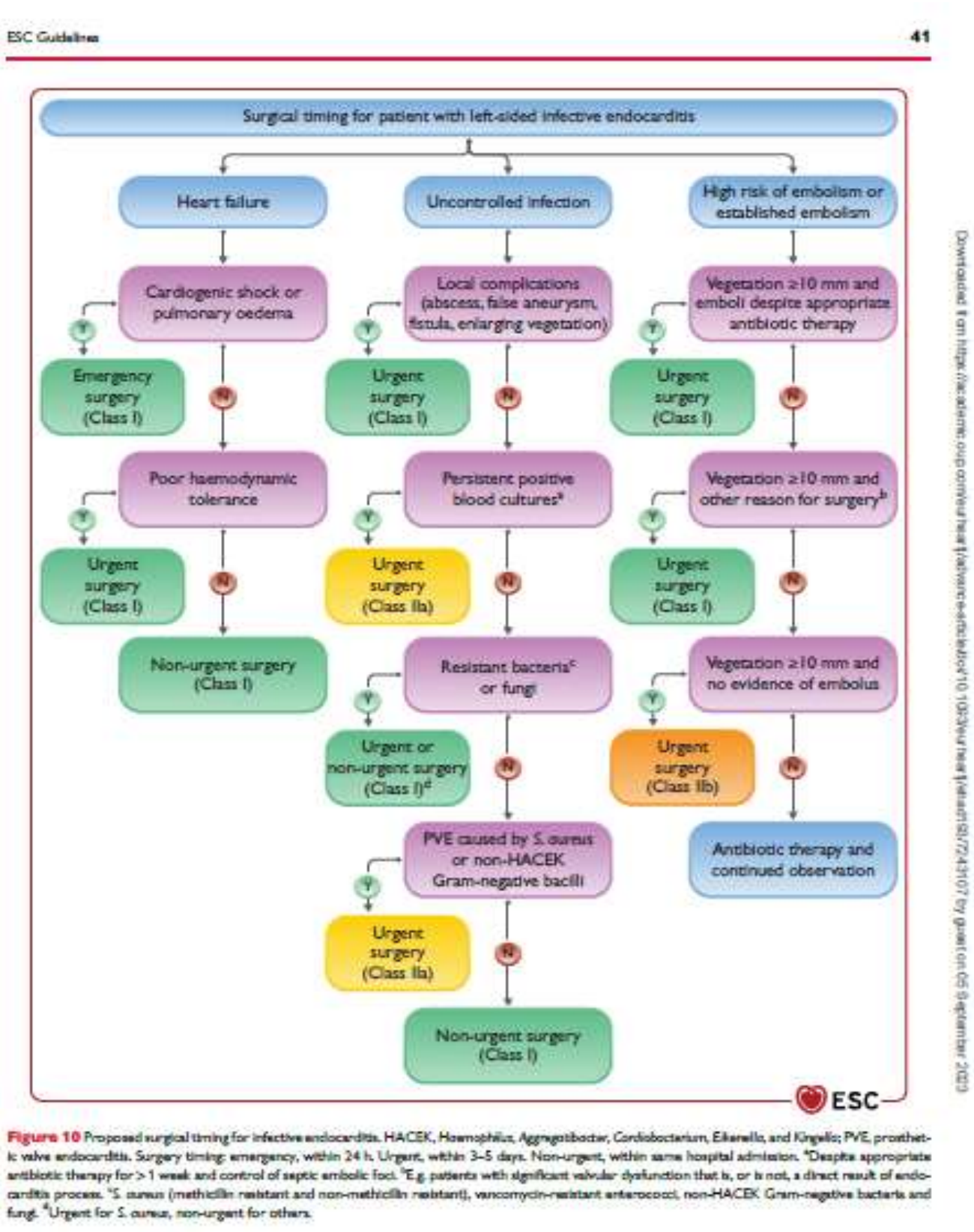

Figure 10 Proposed surgical timing for infective endocarditis. HACEK, Haemophilus, Aggregatibacter, Cardiobacterium, Eikenella, and Kingella; PVE, prosthetic valve endocarditis. Surgery timing: emergency, within 24 h. Urgent, within 3–5 days. Non-urgent, within same hospital admission. [a]Despite appropriate antibiotic therapy for >1 week and control of septic embolic foci. [b]E.g. patients with significant valvular dysfunction that is, or is not, a direct result of endocarditis process. [c]S. aureus (methicillin resistant and non-methicillin resistant), vancomycin-resistant enterococci, non-HACEK Gram-negative bacteria and fungi. [d]Urgent for S. aureus, non-urgent for others.

Fig 1: 2023 ESC Guidelines for the management of endocarditis: **Indications for surgery and Management of Main Infective Endocarditis Complications (8)**

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Conclusion

MVAs are infrequent but potentially severe complications of AV endocarditis. They may occur as a consequence either of direct extension of infection to the MV or of significant AR with an eccentric jet directed toward the AML. Severe MR or embolization are possible consequences of MVAs that may worsen the clinical course and the hemodynamic stability of the patient. Given the uncertainty about the optimal treatment of IE with this specific complication, the correct timing of surgery in MVA should depend on concomitant clinical and infective features

Learning Points

- Mitral valve aneurysms (MVAs) are rare complications often linked to aortic valve endocarditis, necessitating awareness for timely intervention.
- Transoesophageal echocardiography (TEE) is more effective than transthoracic echocardiography (TTE) for identifying MVAs and their complications, ensuring accurate diagnosis.
- MVAs can cause severe mitral regurgitation, rupture, and embolization, leading to significant clinical deterioration.

- Managing MVAs associated with endocarditis effectively requires a coordinated approach involving cardiology, infectious disease, and cardiothoracic surgery.

Conflicting interest- None declared

Patient Consent- Obtained

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