Acute Myocardial Infarction, Pulmonary Embolism, and a Suspicious Aortic Mass: A Case of Complex Differential Diagnosis and Management

Mihai Teodor Bica[1], Claudia Irina Nitu[1], Andrei Iosifescu[1,2], Carmen Cristiana Beladan[1,2]*, Bogdan A. Popescu[1,2]

Abstract
Introduction: Ascending aorta floating thrombus is a rare entity. Without rapid and specific management this condition has potential catastrophic consequences.
Case presentation: We report the case of a young woman diagnosed with acute ST elevation myocardial infarction (STEMI) and pulmonary embolism (PE) which revealed the existence of a suspicious aortic mass with a high embolic risk. The definite treatment was surgical resection, and the etiology of the mass was confirmed by histopathological examination. In this case, protein C deficiency was the only significant factor predisposing to thrombus formation.
Conclusions: This case illustrates the importance of performing a rapid and comprehensive cardiovascular evaluation, even when the initial presentation seems to suggest a clear diagnosis. Ascending aortic floating thrombus requires individualized management, and in specific situations a surgical approach is recommended.

Keywords
ascending aortic mass, floating thrombus, protein C deficiency

Rezumat
Introducere: Aorta ascendentă reprezintă o localizare rară a trombului flotant, patologie cu complicații potential letale în lipsa unui management rapid și specific.
Prezentarea cazului: Prezentăm cazul unei paciente tinere, diagnosticată cu infarct miocardic acut cu supradenivelare de segment ST și embolie pulmonară, la care bilanțul cardiologic a evidențiat existența unei formațiuni mobile la nivelul aortei ascendente, cu risc embolic înalt. Tratamentul a fost chirurgical, iar etiologia formațiunii a fost confirmată prin examen histopatologic. În cazul de față, deficitul de proteină C a fost singurul factor cu potențial protrombotic identificat.
Concluzii: Cazul prezentat subliniază importanța unui bilanț cardiovascular rapid și complet, chiar și atunci când prezentarea inițială pare să indice un diagnostic clar. Trombul flotant localizat la nivelul aortei ascendente necesită o abordare individualizată și, în anumite circumstanțe, impune tratament chirurgical.

Cuvinte cheie
tromb flotant, tumoră aortă ascendentă, deficit proteină C

Introduction

An ascending aortic mass is an uncommon finding.[1] The mass etiology needs to be rapidly established due to its impact on the evolution and prognosis of the case. Usually, floating aortic thrombus appears either on a pathological aorta or in hypercoagulable hemodynamic conditions. The ascending segment is described as the least common location of an aortic thrombus.[2–4] Due to its low incidence, there are no strong and clear recommendations about the optimal treatment. The management should therefore be individualized, discussed, and concluded by a Heart Team.

*Corresponding author: Carmen Cristiana Beladan, Cardiology Department, University of Medicine and Pharmacy "Carol Davila", Emergency Institute for Cardiovascular Diseases "Prof. Dr. C. C. Iliescu", Fundeni Street, no 258, Bucharest, Romania; E-mail address: carmen.beladan@googlemail.com

[1]Emergency Institute for Cardiovascular Diseases "Prof. Dr. C. C. Iliescu", Fundeni Street, no 258, Bucharest, Romania
[2]University of Medicine and Pharmacy "Carol Davila", Dionisie Lupu Street, no 37, Bucharest, Romania
[3]Fundeni Clinical Institute, Fundeni Street, no 258, Bucharest, Romania

Case Presentation

A 44-year-old female presented to the emergency room of a local hospital with posterior chest pain and dyspnea for 2 weeks. The patient's history was significant for severe anemia secondary to uterine fibroma (confirmed on biopsy) and ilio-femoral-popliteal deep vein thrombosis, with no pulmonary embolism on a CT scan, performed 4 months prior to this presentation. She was on coumadin therapy for 3 months and stopped all medication 1 month before admission. According to the medical records from the emergency room, she was hemodynamically stable, with normal blood pressure (120/80 mmHg), elevated heart rate (110 bpm), normal oxygen saturation level (98%), normal heart sounds, clear lung fields, and no peripheral edema. Screening transthoracic echocardiography revealed a mobile mass in the aortic root, apparently attached to the posterior aortic valve annulus. The patient was admitted, and empirical antibiotic therapy was initiated for suspected infective

https://doi.org/10.2478/rjc-2023-0013

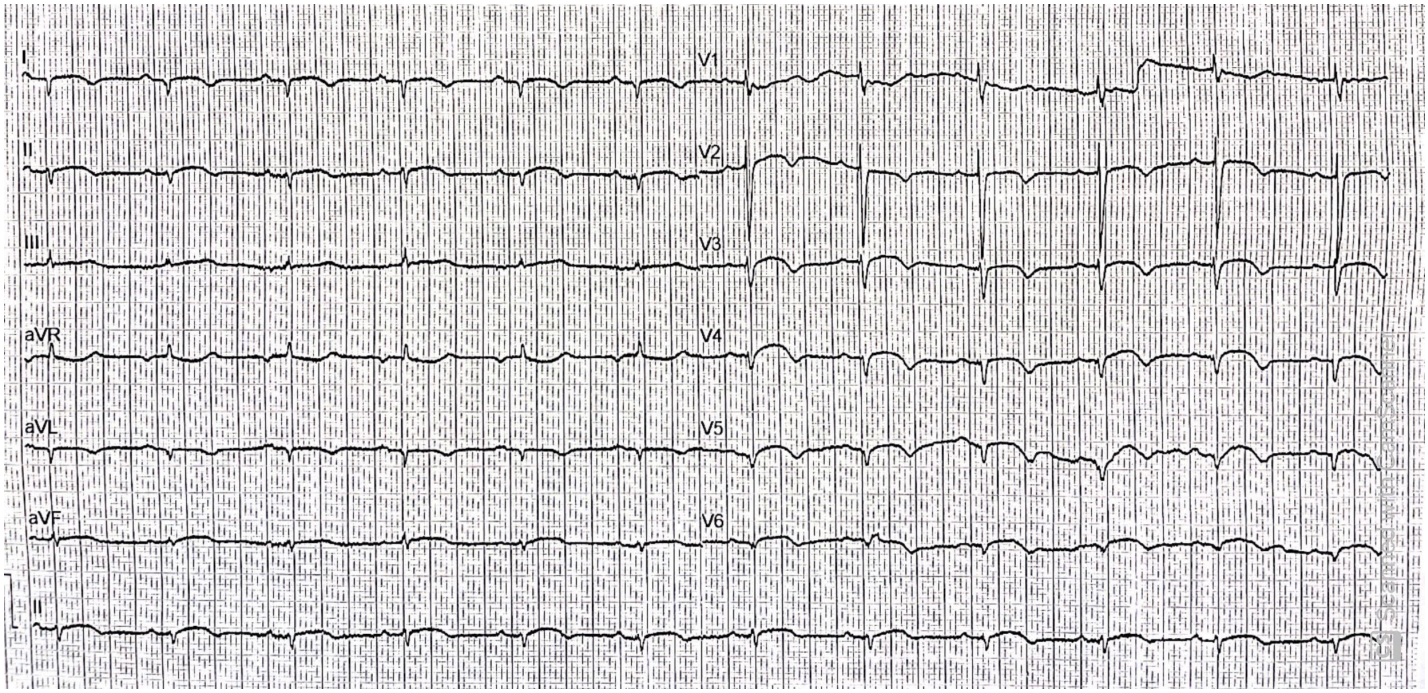

Figure 1 - ECG trace: sinus rhythm, mild ST elevation, and inverted T waves in DI, aVL, V2-V6 and Q wave in DI, aVL, V4-V6.

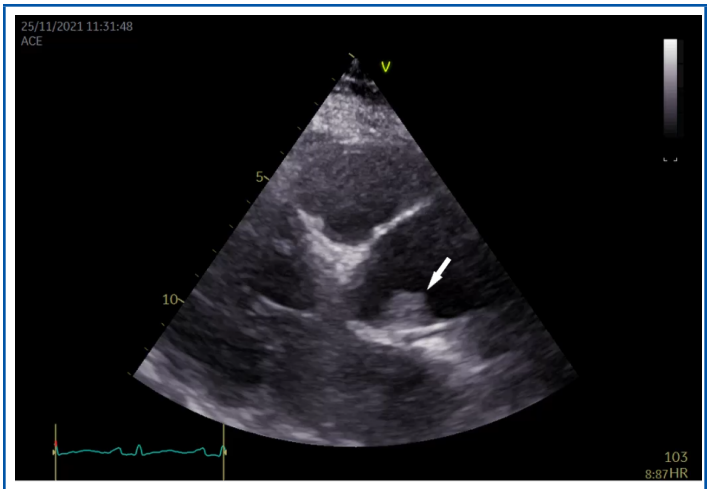

Figure 2 - 2D transthoracic echocardiography – parasternal long axis view. A mobile, irregular mass (arrow), 21/11 mm, attached to the aortic root wall at the level of the left sinus of Valsalva with no impact on the aortic valve.

endocarditis. Within a few hours after admission, the patient developed angina with elevated troponin levels and ST elevation in leads V2 to V6. She was urgently transferred to our cardiology clinic for further evaluation and treatment with a diagnosis of suspected infective endocarditis on native aortic valve and anterior STEMI.

On admission in our clinic the patient was hemodynamically stable, with refractory angina and persistent ST elevation in leads V2 to V6 (Figure 1). Laboratory tests showed elevated troponin levels (hs c-TnI 16203 ng/L) and D-dimers (>5.0 mcg/ml), severe anemia (6 g/dl), and a significant inflammatory syndrome (CRP 98 mg/dl) with normal white blood cell count. Transthoracic and transesophageal echocardiography confirmed the presence of a 2.1/1.1 cm irregular, mobile mass attached to the aortic root wall at the level of the left sinus of Valsalva with no impact on the aortic valve (Figures 2 and 3). Moderate left ventricular systolic dysfunction (LVEF 40%) with anterior wall hypokinesia was also noted. There was no evidence of significant valvular disease or intracardiac vegetations. Due to the proximity of the ascending aortic mass to the left coronary sinus, invasive evaluation of the coronary circulation was deemed impossible, dangerous, with the risk of potential embolization of fragments from the mass into the left main coronary artery. Moreover, since there was a high likelihood of associated pulmonary embolism, we proceeded with a full-body CT scan, which showed multiple renal and splenic infarcts, as well as bilateral peripheral pulmonary emboli; the scan confirmed the ascending aortic mural mass at the level of the left sinus of Valsalva (Figures 4A and B). Coronary CT angiography showed normal epicardial coronary arteries and a Calcium score of 0.

Our working diagnoses were bilateral low risk PE, anterior STEMI (likely embolic), and an ascending aortic mass of unknown etiology. The main differentials for the ascending aortic mass that we considered were floating aortic thrombus, vegetation, and tumor. The patient was started on systemic anticoagulation with unfractionated heparin (targeting both PE and a possible thrombus) and empirical antibiotic treatment as per endocarditis guidelines (given the suspicion of endocarditis and the inflammatory syndrome). Blood cultures were also taken, which turned out to be negative at 24 hours and remained negative after 14 days. A thrombophilia panel was positive for protein C deficiency. At this point, an aortic thrombus seemed very likely and considering the very high embolic risk and

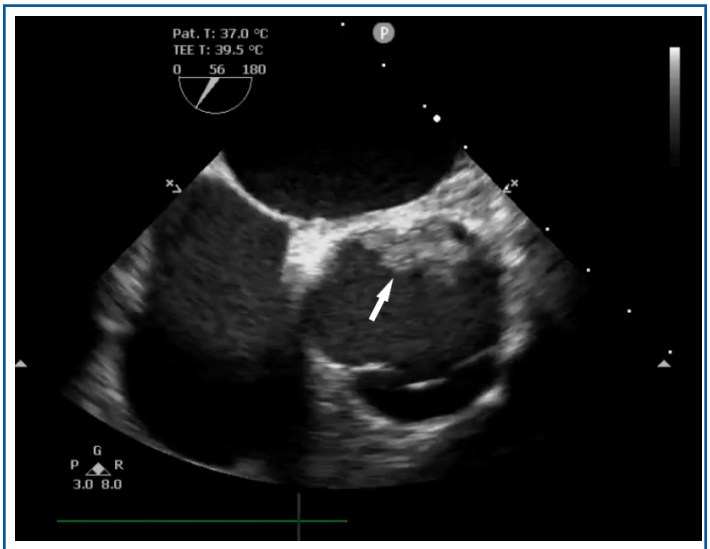

Figure 3 - 2D transesophageal echocardiography – mid-esophageal short axis view. The presence of a mobile mass (arrow), irregular, apparently with a pediculated insertion point near the commissure between the aortic noncoronary and left coronary cusps is confirmed.

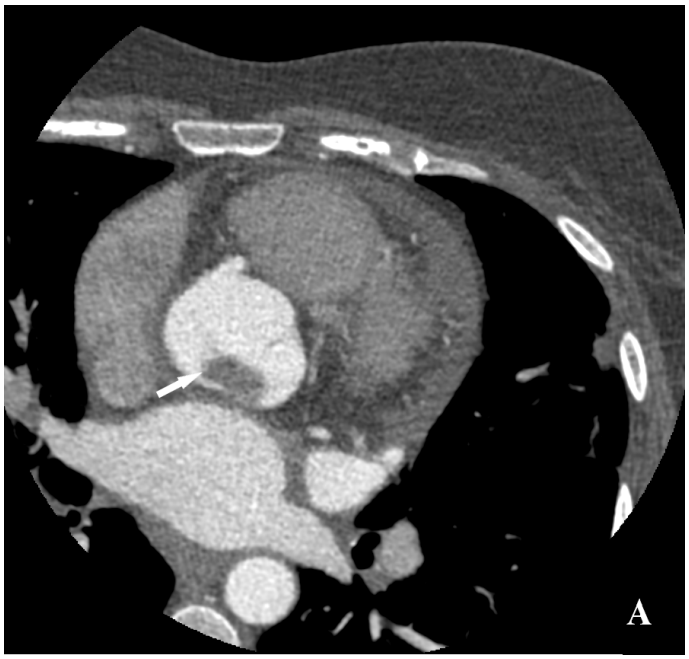

Figure 4A - Thoracic computed tomography – axial plane. The mural irregular mass (arrow) is located in the aortic root at the left sinus of Valsalva level, in the proximity of the left main ostium.
*Courtesy of Dr. Dragoș Caravasile

the lack of response to conservative therapy, the patient was sent to surgery for excision of the aortic mass. No aortic wall abnormalities were noted during surgery (Figure 5). Following successful excision, the histopathological examination confirmed the mass as being a thrombus (Figure 6). The inflammatory markers normalized postoperatively and antibiotic therapy was stopped after 10 days. The patient was discharged on systemic lifelong anticoagulation with vitamin K antagonist and heart failure therapy.

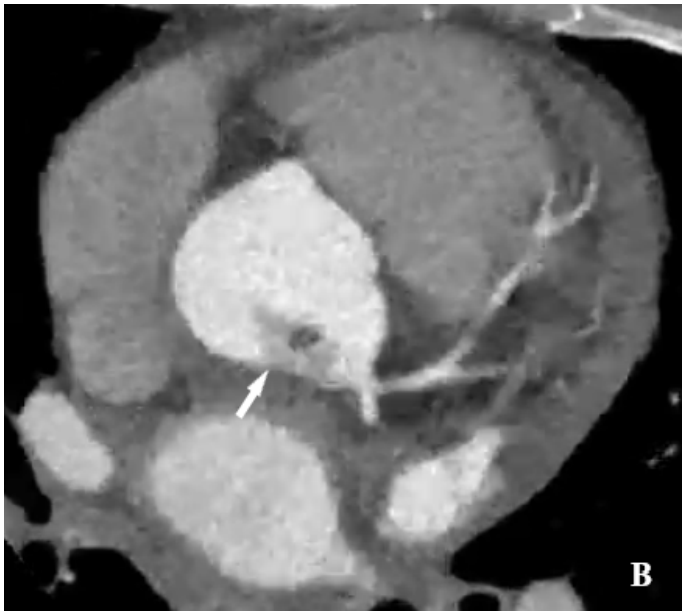

Figure 4B - Thoracic computed tomography – axial plane. The proximity of the aortic mass (arrow) with the left main ostium is revealed.
*Courtesy of Dr. Dragoș Caravasile

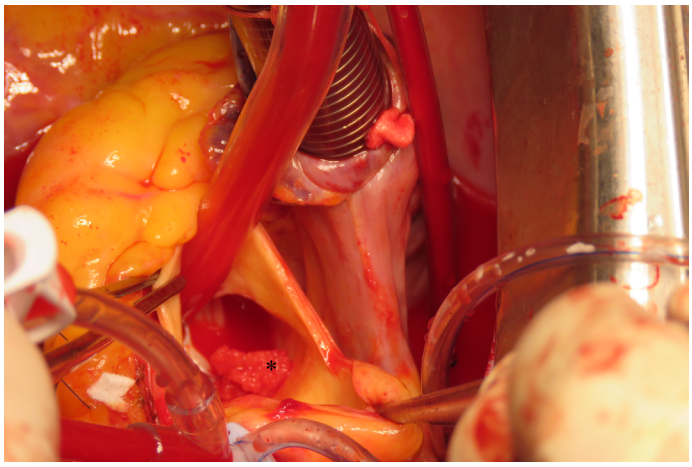

Figure 5 - Intraoperative image – median sternotomy. The aortotomy allows visualization of the aortic mass (asterisk): multilobed, friable, attached on the aortic wall through a pediculated insertion point near the commissure between noncoronary cusp and left coronary cusp.

At discharge, the patient was asymptomatic. Transthoracic echocardiographic evaluation revealed no lesions at the level of the ascending aorta (Figures 7A and B), and persistent anterior wall motion abnormality.

Discussion

This is a case of complex intertwining pathology in a young patient presenting with dyspnea and chest pain. The surprising finding of an aortic mass at the level of the left sinus of Valsalva

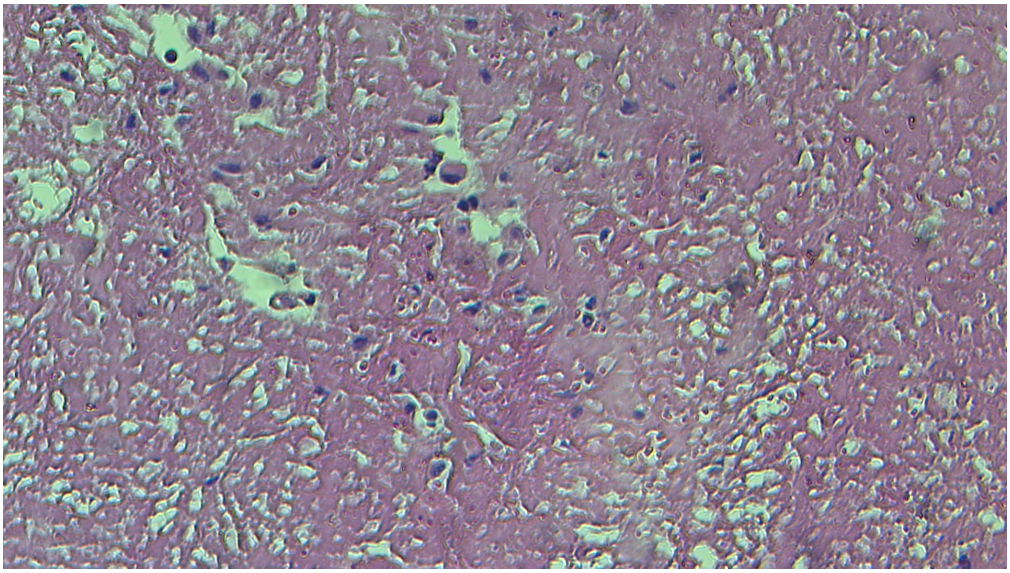

Figure 6 - Histopathological examination of the mass. Hematoxylin eosin coloration reveals organized thrombus mainly composed of fibrin and platelet cells. *Courtesy of Dr. Liliana Parascan

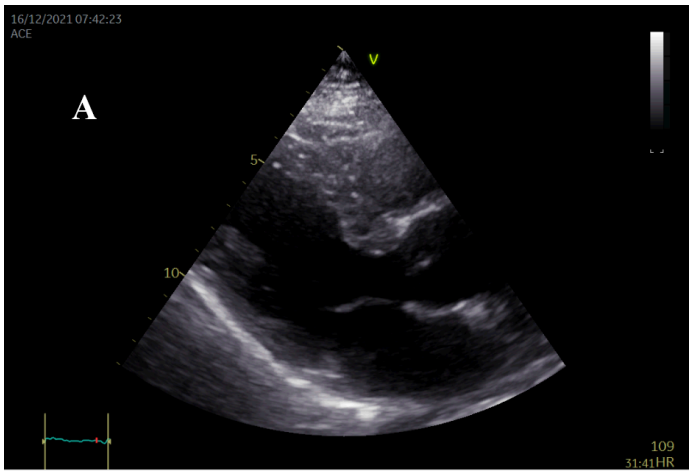

Figure 7A - Postoperative 2D-transthoracic echocardiography. Parasternal long axis view confirms the absence of the previously described mass, with normal function of the aortic valve.

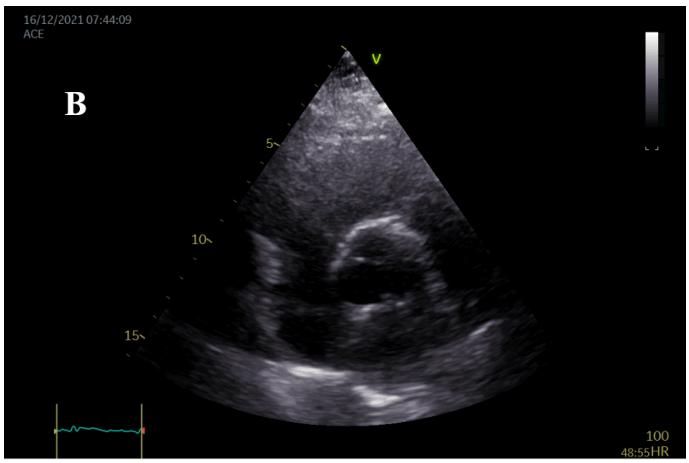

Figure 7B - Postoperative 2D-transthoracic echocardiography. Parasternal short axis view confirms successful aortic thrombus resection with preserved integrity of the aortic valve and wall.

raised important clinical questions with regard to its differential diagnosis and management.

Differential diagnoses included infective endocarditis (albeit the patient did not meet sufficient criteria for definite diagnosis) and tumor of unknown etiology. The definitive confirmation was obtained on histopathology.

In the absence of aortic aneurysm, the incidence of aortic mural thrombi is low (0.45%).[5] Several causes have been linked to their development, including atheromatous aortic disease, structural aortic abnormalities, malignancy, immunological disorders, trauma, and steroid use.[6,7] In our case, the only significant factor predisposing to thrombus formation identified was protein C deficiency.

No definitive guidelines exist on the optimal management of these patients. While conservative treatment with systemic anticoagulants is preferred by many, there is a significant risk of persistence of the aortic mural thrombus (38%) and an important proportion of patients develop recurrent arterial embolization (21%).[2] Thrombolysis carries a significant risk of distal embolization (especially if the attachment site is lysed first) and is generally not considered an option. The experience with minimally invasive endovascular treatment is scarce and it runs the risk of guidewire manipulation as well as unknown long-term effects.[8,9] Surgical treatment remains the definitive choice, especially when embolic events have already occurred,[3] as in the case of our patient. Nonetheless, a literature review comparing anticoagulation to open surgery identified no significant difference in mortality rates, except for situations with hemodynamic instability, which was found to be an independent predictor of mortality.[2]

Conclusions

Although ascending aorta floating thrombus is a relatively rare finding, the condition has potential catastrophic complications in the absence of rapid and specific management. Surgical resection can be the definite treatment modality, especially in situations in which the mass etiology is uncertain, when the thrombus persists with anticoagulant therapy, or presents a high embolic risk.[4,9]

Conflict of interest

None.

REFERENCES

1. Chen YY, Yen HT, Wu CC, Huang KR, Sheu JJ, Lee FY. Aortic thrombus in a nonaneurysmal ascending aorta. Ann Vasc Surg 2021; 72:617–26.

2. Baldini U, Chiaramonti F, Minzioni G, Galli M. A hanging mass in the ascending aorta diagnosed by transthoracic echocardiography in a totally asymptomatic subject. J Am Soc Echocardiogr 2009 Oct; 22(10):1197.e5–7.

3. Yang P, Li Y, Huang Y, Lu C, Liang W, Hu J. A giant floating thrombus in the ascending aorta: a case report. BMC Surg 2020; 20(1):321.

4. Isselbacher EM, Preventza O, Hamilton Black J 3rd, Augoustides JG, Beck AW, Bolen MA, et al. 2022 ACC/AHA Guideline for the diagnosis and management of aortic disease: A report of the American Heart Association/ American College of Cardiology Joint Committee on Clinical Practice Guidelines. Circulation 2022; 146(24):e334–482.

5. Machleder HI, Takiff H, Lois JF, Holburt E. Aortic mural thrombus: an occult source of arterial thromboembolism. J Vasc Surg 1986; 4(5):473–8.

6. Scott DJ, White JM, Arthurs ZM. Endovascular management of a mobile thoracic aortic thrombus following recurrent distal thromboembolism: a case report and literature review. Vasc Endovascular Surg 2014; 48(3):246–50.

7. Noh TO, Seo PW. Floating thrombus in aortic arch. Korean J Thorac Cardiovasc Surg 2013; 46(6):464–6.

8. Erbel R, Aboyans V, Boileau C, Bossone E, Di Bartolomeo R, Eggebrecht H, et al. 2014 ESC Guidelines on the diagnosis and treatment of aortic diseases: Document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The Task Force for the Diagnosis and Treatment of Aortic Diseases of the European Society of Cardiology (ESC) [published correction appears in Eur Heart J. 2015 Nov 1;36(41):2779]. Eur Heart J 2014; 35(41):2873–926.

9. Verma H, Meda N, Vora S, George RK, Tripathi RK. Contemporary management of symptomatic primary aortic mural thrombus. J Vasc Surg 2014; 60(6):1524–34.