Left Atrial Thrombi Masquerading as Myxomas: Mini Case Series and Literature Review

Osama Mahmoud, MD, William Haynos, MD, and Joyce Rollor, MD, *Danville, Pennsylvania*

INTRODUCTION

Intracardiac masses represent a clinical challenge. The differential diagnosis is extensive, and the gold standard for diagnosis, which is biopsy, is not easily achievable, resulting in an overreliance on noninvasive imaging to establish a diagnosis. We report two patients with left atrial thrombi misdiagnosed on echocardiography as myxomas.

CASE PRESENTATION

Patient 1

A 38-year-old woman with a medical history of hyperlipidemia and migraines presented to the emergency department with dyspnea on exertion, chest pain, and syncope. Vital signs were as follows: blood pressure 100/83 mm Hg, heart rate 111 beats/min, respiratory rate 15 breaths/min, body temperature 37.9°C, and oxygen saturation 96% on room air. Physical examination was significant for jugular venous pressure elevation to the angle of the mandible, reduced breath sounds at the mid and lower right hemithorax, and a grade 2/6 diastolic rumbling murmur over the mitral area. Laboratory blood tests were significant for an elevated white blood cell count of 17,000/μL, as well as alanine transaminase of 795 U/L, aspartate transaminase of 794 U/L, and an international normalized ratio of 1.68. Electrocardiography showed sinus tachycardia, left atrial enlargement, and nonspecific T-wave abnormality. Chest radiography revealed airspace opacities in the right mid and lower lobes. The patient was admitted for a presumptive diagnosis of pneumonia, and treatment with intravenous antibiotics ensued. Because of the physical examination findings, transthoracic echocardiography was performed and showed severe rheumatic mitral stenosis, with a mean gradient of 29 mm Hg, severe right ventricular systolic dysfunction, severe left atrial enlargement, and a 24 × 21 mm left atrial mobile mass attached to the interatrial septum with morphologic features consistent with myxoma (Figures 1-4). Intraoperative transesophageal echocardiography confirmed the findings of transthoracic echocardiography (Figures 5-7, Videos 1-3). The patient subsequently underwent cardiac surgery for mitral valve replacement and myxoma resection. The gross appearance of the left atrial mass was consistent with a thrombus, which was confirmed by microscopic examination.

Patient 2

A 69-year-old woman with a medical history of hypertension, hyperlipidemia, hyperthyroidism, and chronic heart failure with preserved ejection fraction presented to the emergency department with dizziness and back pain of 5 days in duration. Her vital signs were as follows: heart rate 147 beats/min, blood pressure 137/76 mm Hg, respiratory rate 18 breaths/min, body temperature 36.7°C, and oxygen saturation 100% on room air. Physical examination showed a well-appearing average-built woman, with head and neck examination results without jugular venous pressure elevation or carotid bruits. Precordial examination revealed rapid irregular cardiac rhythm with no appreciable murmur, and the lungs were clear to auscultation bilaterally. The rest of the physical examination was unremarkable. Laboratory results showed a white blood cell count of 13,000/μL, hemoglobin of 13.6 g/dL, a platelet count of 228,000/μL, serum creatinine of 0.8 mg/dL, and pro–brain natriuretic peptide of 10,969 pg/mL. Electrocardiography showed atrial fibrillation with a rapid ventricular response of 140 beats/min. Chest radiography did not reveal significant abnormalities.

The patient was admitted for a presumptive diagnosis of acute heart failure exacerbation and new-onset rapid atrial fibrillation. She was treated with intravenous diuretics and systemic anticoagulation with unfractionated heparin infusion. Transthoracic echocardiography showed preserved biventricular systolic function, no significant valvular disease, spontaneous left atrial contrast, and a 1.5-cm left atrial mass attached to the interatrial septum. Chest computed tomographic angiography performed as part of the emergency department evaluation also demonstrated the left atrial mass (Figure 8). Transesophageal echocardiography followed, confirming the presence of 1.4 × 1.5 cm, mobile, polypoid-shaped left atrial mass with a smooth surface and heterogenous appearance as well spontaneous contrast in the left atrial cavity (Figure 9, Video 4). The attachment site was the anteroinferior portion of the interatrial septum via a narrow base. A stalk could not be clearly visualized (Figures 10-14, Videos 5 and 6).

Although the two-dimensional echocardiographic features of the mass were classic for myxoma, contrast echocardiographic evaluation was performed using an ultrasound enhancing agent (Definity; Lantheus Medical Imaging, North Billerica, MA) to further discern the nature of the mass and distinguish a vascular tumor from a thrombus. This step was taken because of the recent diagnosis of atrial fibrillation and heavy spontaneous contrast presence in the left atrial cavity. The periphery of the mass showed contrast enhancement, while the core remained dark without significant contrast uptake (Figures 15 and 16, Video 7). We also delivered several brief high–mechanical index (0.9) ultrasound bursts to observe the perfusion of the mass in real time.

From the Department of Cardiology, Geisinger Medical Center, Danville, Pennsylvania.

Keywords: Intracardiac masses, Left atrial myxoma, Left atrial thrombus, Transthoracic echocardiography, Transesophageal echocardiography, Contrast echocardiography

Conflicts of interest: The authors reported no actual or potential conflicts of interest relative to this document.

2468-6441

https://doi.org/10.1016/j.case.2020.03.009

VIDEO HIGHLIGHTS

Video 1: Patient 1: transesophageal echocardiogram, mid-esophageal bicaval view. A heterogenous 2.4-cm left atrial mass is seen attached to the interatrial septum.

Video 2: Patient 1: transesophageal echocardiogram, mid-esophageal four-chamber view. Mitral valve thickening with restricted opening in diastolic due to commissural fusion (hockey sticking).

Video 3: Patient 1: transesophageal echocardiogram, mid-esophageal two-chamber view, mitral valve inflow color Doppler imaging demonstrates flow turbulence and restricted opening at the mitral leaflets' tips.

Video 4: Patient 2: transesophageal echocardiogram, mid-esophageal four-chamber view. Spontaneous contrast is seen in the left atrial cavity

Video 5: Patient 2: transesophageal echocardiogram, mid-esophageal short-axis view at the aortic valve level demonstrating the mobile left atrial polypoid mass attached to the interatrial septum.

Video 6: Patient 2: transesophageal echocardiogram, mid-esophageal three-dimensional rendering, showing the anatomic orientation of the left atrial mass in relation to the interatrial septum, mitral valve, and tricuspid valve.

Video 7: Patient 2: transesophageal echocardiogram, mid-esophageal four-chamber view. Low–mechanical index imaging following the injection of perflutren lipid microsphere (Definity) ultrasound enhancing agent. Left atrial mass is exhibiting peripheral enhancement and central clearing suggestive of a vascular tumor with necrotic core.

Video 8: Patient 2: intraoperative transesophageal echocardiogram, midesophageal biplane two-dimensional imaging. Left atrial sweep showing resolution of the left atrial mass.

View the video content online at www.cvcasejournal.com.

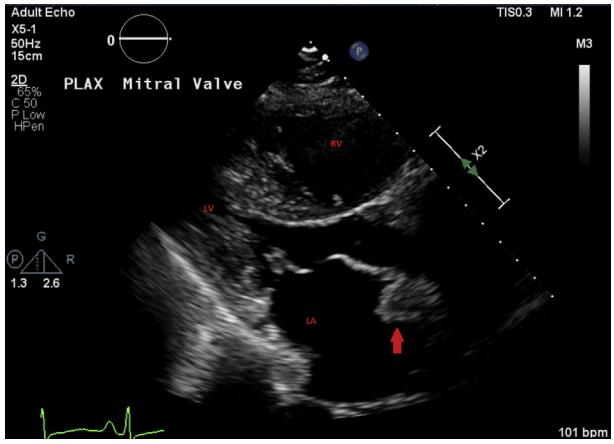

Figure 1 Patient 1: transthoracic echocardiogram, parasternal long-axis view. *Red arrow* points to the left atrial mass. *LA*, Left atrium; *LV*, left ventricle; *RV*, right ventricle.

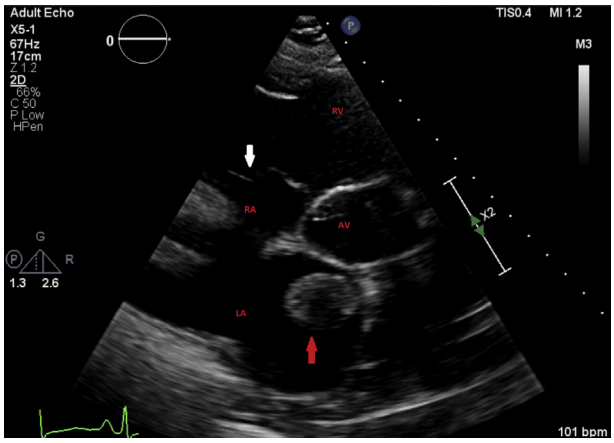

Figure 2 Patient 1: transthoracic echocardiogram, parasternal short-axis view. *Red arrow* points to the left atrial mass. *White arrow* points to the tricuspid valve. *AV*, Aortic valve; *LA*, left atrium; *RA*, right atrium; *RV*, right ventricle.

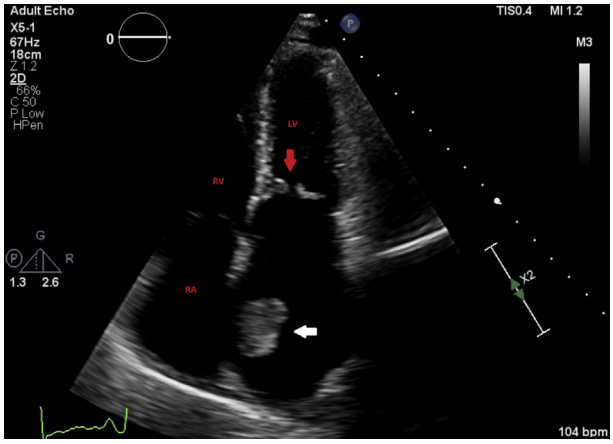

Figure 3 Patient 1: transthoracic echocardiogram, apical four-chamber view. *White arrow* points to left atrial mass. *Red arrow* points to rheumatic stenosis of the mitral valve. *LV*, Left ventricle; *RA*, right atrium; *RV*, right ventricle.

A decision was made to undertake surgical removal of the mass. Six days into the hospital admission and 48 hours after transesophageal echocardiography, the patient was taken to the operating room, where screening transesophageal echocardiography under anesthesia failed to visualize the mass. This was confirmed by a cardiologist, prompting cancelation of the planned surgery (Video 8). The patient was thoroughly examined for evidence of embolization and fortunately was found to have intact neurologic functions and normal peripheral pulses. Head, neck, chest, abdominal, and pelvic computed tomographic angiography were obtained immediately and revealed no evidence of vascular occlusions or organ infarctions.[1,2] This could be only explained by a misdiagnosis of a thrombus, which resolved with anticoagulation, as a myxoma.

DISCUSSION

The differential diagnosis of an intracardiac mass includes thrombus, vegetation, implanted device, tumor, and artifact. Myxoma is the most common primary cardiac tumor, and the diagnosis often relies on morphology and attachment site.[3,4] It appears,

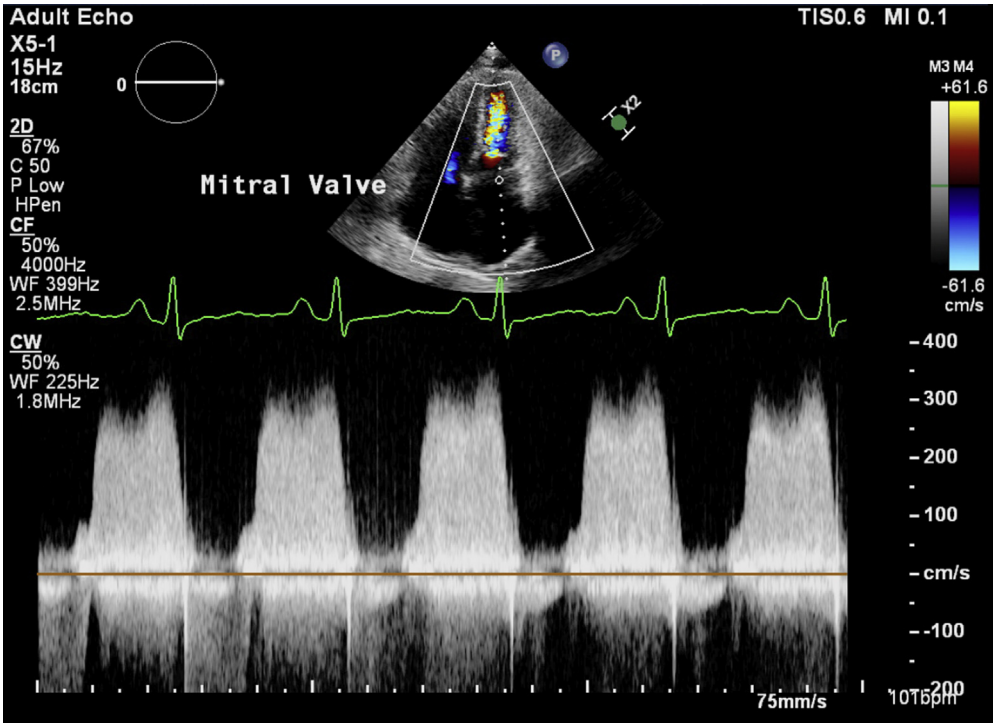

Figure 4 Patient 1: transthoracic echocardiogram, apical four-chamber view, continuous-wave spectral Doppler interrogation of the mitral inflow showing high velocities and gradients.

echocardiographically, as a mobile, heterogenous, polypoid or papillary mass with a lucent core and a smooth or villous surface, with most common site of attachment being the left atrial aspect of the interatrial septum.[3,4] Although often solitary, multiple tumors can occur, especially in association with certain genetic disorders.[5]

Diagnosis of cardiac masses relies heavily on noninvasive imaging, given the inaccessibility to tissue sampling. Of the available cardiac imaging options, echocardiography remains at the forefront. However, and despite the reported high accuracy of echocardiography in diagnosing intracardiac masses,[6-11] misdiagnoses have been reported.[12-14]

Cardiac computed tomography and cardiac magnetic resonance imaging are viable options when echocardiographic findings are inconclusive or technically inadequate, but they are not failure proof.[15-18] Despite the high accuracy of cardiac magnetic resonance in establishing the nature of cardiac masses, on occasion, thrombi confirmed by histology have been misclassified as myxomas.[16,18]

Contrast echocardiographic perfusion imaging has been proposed as an excellent tool in diagnosing cardiac masses given its ability to differentiate vascular tumors, which exhibit contrast enhancement, from avascular masses such as thrombi. The accuracy

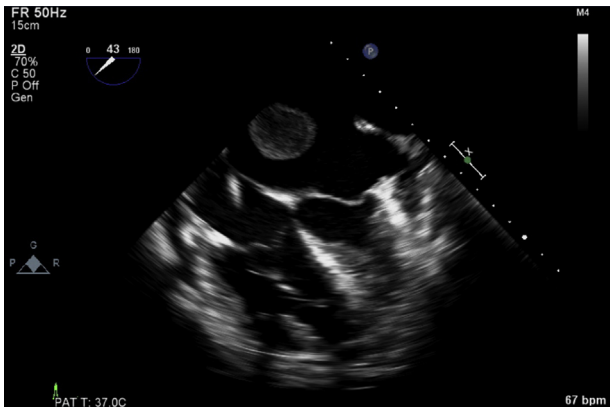

Figure 5 Patient 1: transesophageal echocardiogram, midesophageal four-chamber view. A 2.4-cm heterogenous mass with a well-defined border is seen in the left atrium.

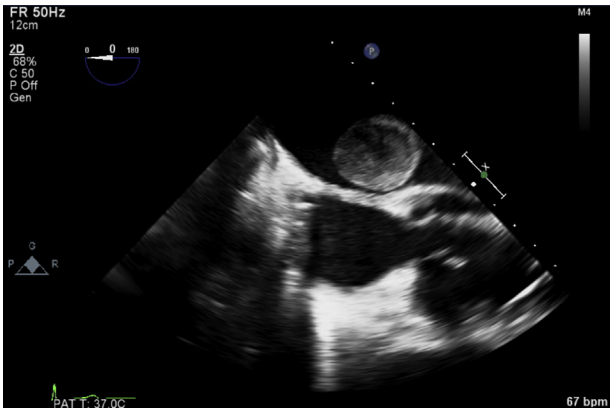

Figure 6 Patient 1: transesophageal echocardiogram, midesophageal four-chamber view, zoomed on the left atrial mass and showing echocardiographic heterogeneity.

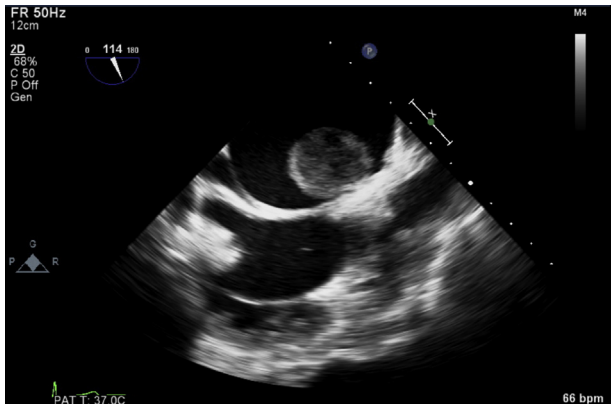

Figure 7 Patient 1: transesophageal echocardiogram, midesophageal bicaval view, demonstrating the attachment of the mass to the interatrial septum.

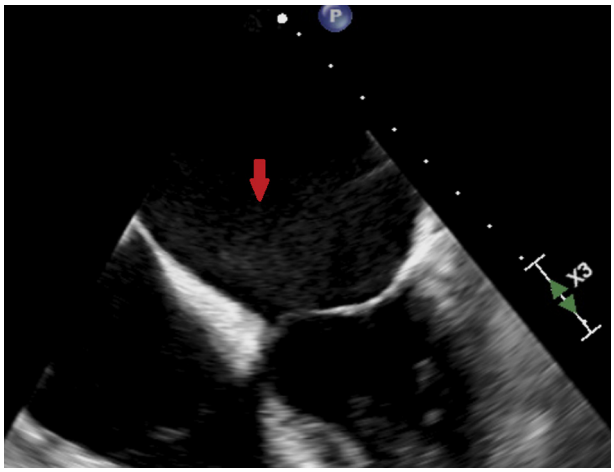

Figure 9 Patient 2: transesophageal echocardiogram, midesophageal four-chamber view. Spontaneous contrast is seen in the left atrial cavity (*red arrow*).

is reported to be as high as 100%, but available evidence stems from small studies.[19-21]

We describe two patients with left atrial thrombi that exhibited typical location and echocardiographic morphology of left atrial myxomas on the basis of the interpretations of experienced echocardiographers.

Atrial thrombi masquerading as myxomas have been reported in the literature, with echocardiography and cardiac magnetic resonance being among the diagnostic modalities used.[22-45] We conducted a PubMed search for reports of left atrial thrombi misdiagnosed as myxomas and found 24 cases, 20 of which had predisposing procoagulant conditions, namely, atrial fibrillation in 11 patients, mitral stenosis in five patients, left ventricular dysfunction in three patients, and systemic lupus erythematosus in one patient. Details were not available for three patients, and one patient had undergone cardiac transplantation.[22-45]

These cases as well as the ones from our mini case series highlight a limitation to the reliance on location, mobility, echocardiographic morphology, and, on occasion, magnetic resonance tissue characterization of a cardiac mass to differentiate myxomas from thrombi.[16,18] This limitation is compounded in those with procoagulant states given the much higher likelihood of thrombus formation, raising the false-positive rate to a potentially unacceptable level.

Contrast echocardiography offers promise, and preliminary data suggest very high accuracy,[19-21] but our second patient's case

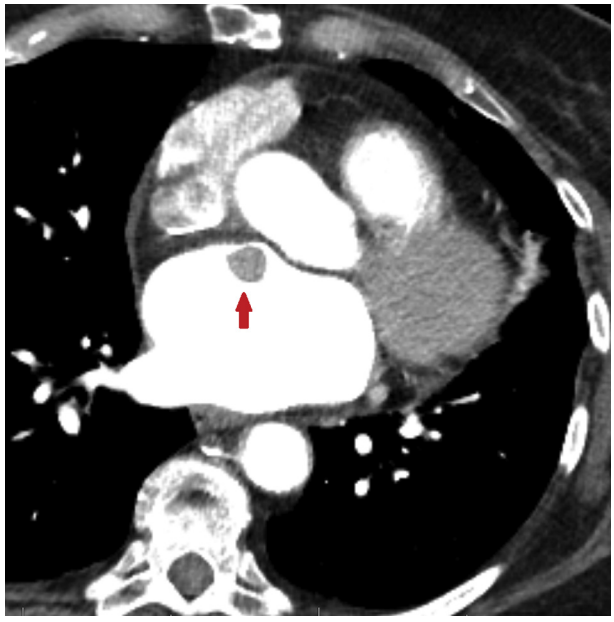

Figure 8 Patient 2: chest computed tomography with intravenous contrast. *Red arrow* points to a left atrial mass attached to the interatrial septum.

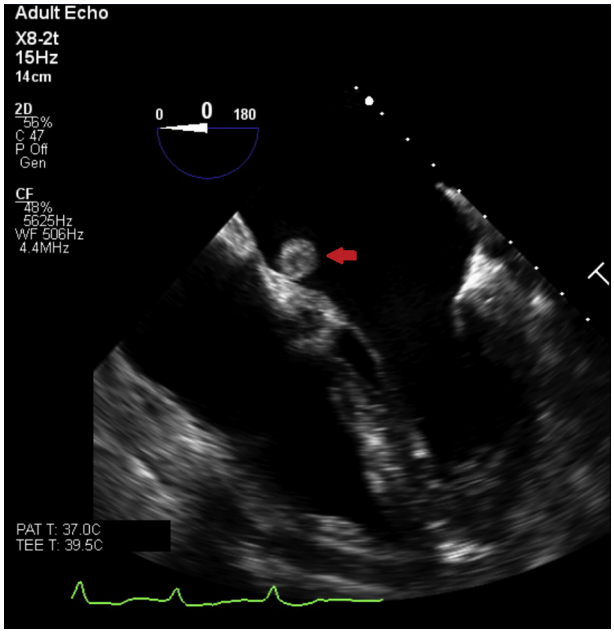

Figure 10 Patient 2: transesophageal echocardiogram, midesophageal four-chamber view. *Red arrow* points to the left atrial mass with regular contour and echocardiographic heterogeneity.

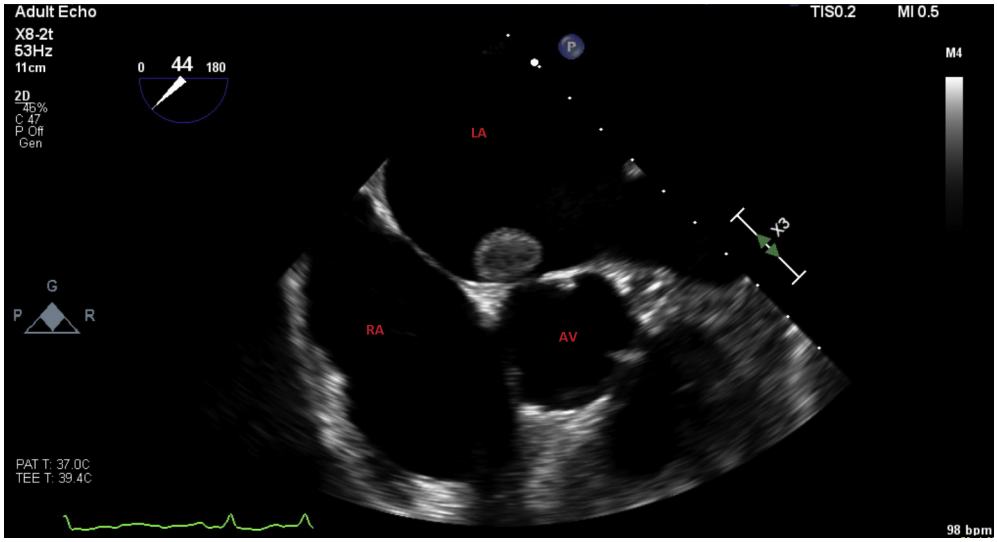

Figure 11 Patient 2: transesophageal echocardiogram, midesophageal short-axis view at the aortic valve (AV) level. Left atrial mass is seen attached to the interatrial septum. *LA*, Left atrium; *RA*, right atrium.

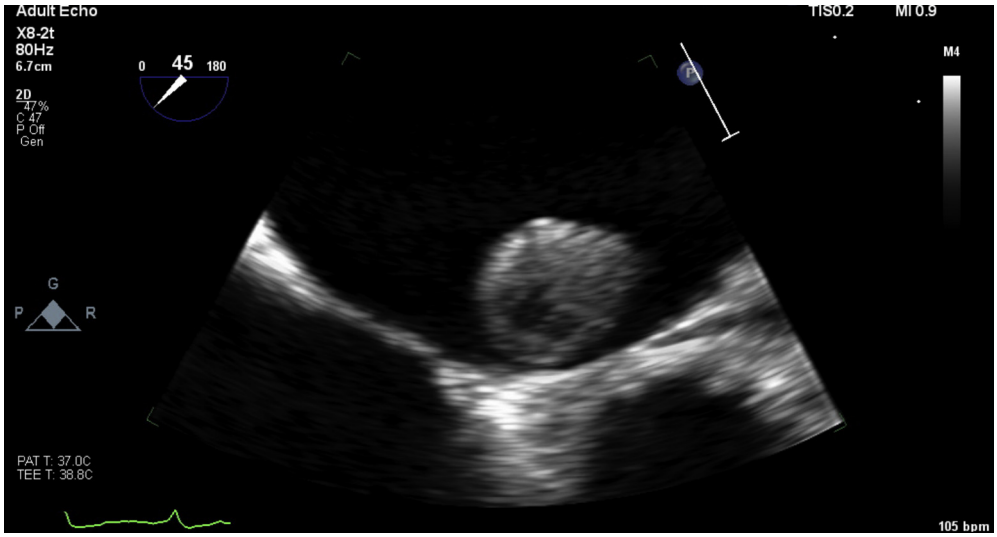

Figure 12 Patient 2: transesophageal echocardiogram, midesophageal short-axis view at the aortic valve level. Left atrial mass is seen attached to the interatrial septum. The mass is heterogenous and has a lucent core characteristic of cardiac myxoma.

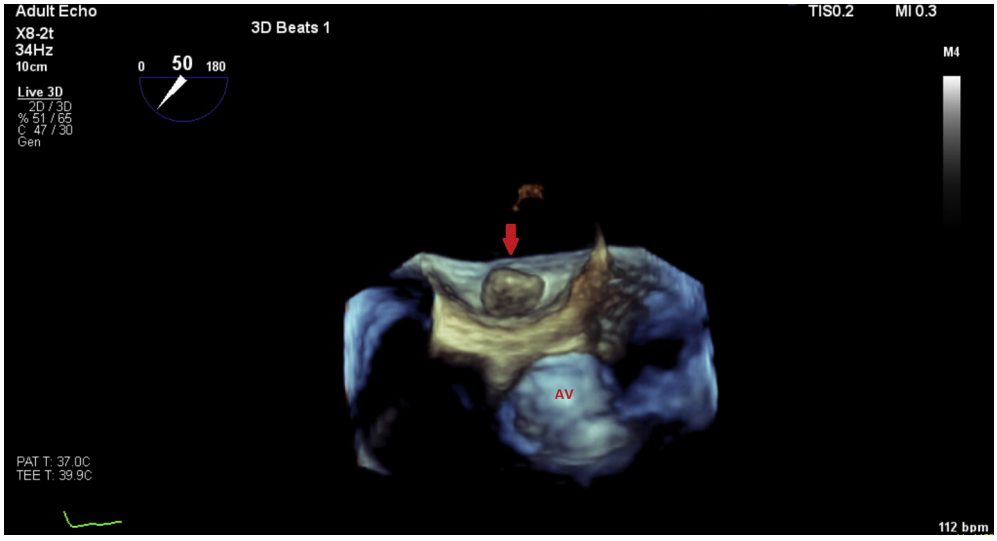

Figure 13 Patient 2: transesophageal echocardiogram, midesophageal short-axis view at the aortic valve (AV) level. Three-dimensional rendering showing the mass and the anatomic orientation in relation to the aortic valve. *Red arrow* points to the left atrial mass.

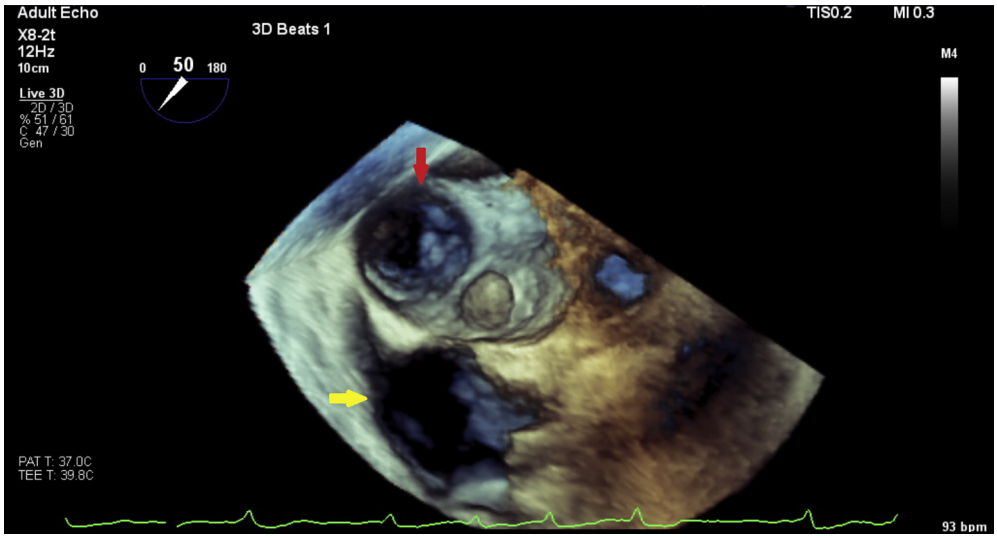

Figure 14 Patient 2: transesophageal echocardiogram, midesophageal three-dimensional rendering showing the anatomic orientation of the left atrial mass in relation to the interatrial septum, mitral valve, and tricuspid valve. *Red arrow* points to the mitral valve. *Yellow arrow* points to the tricuspid valve.

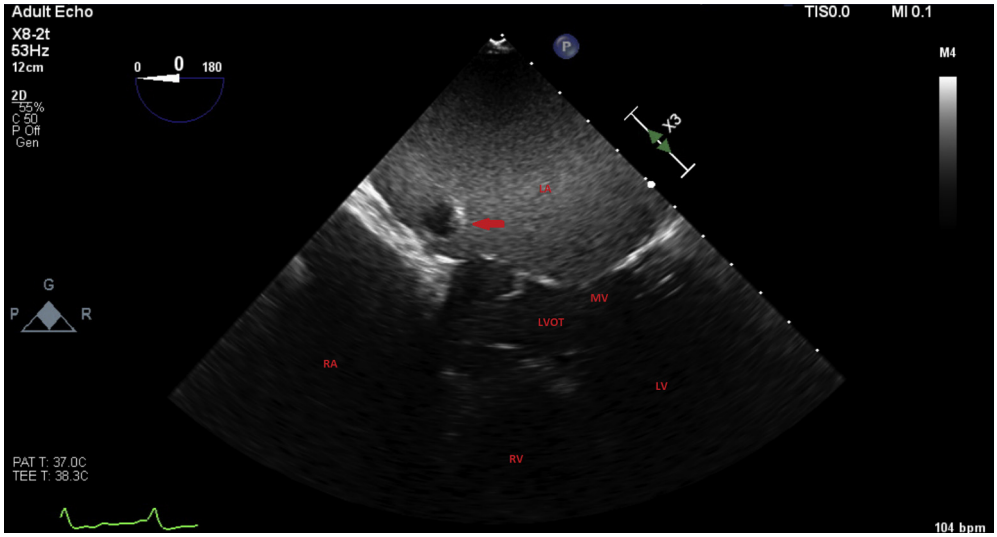

Figure 15 Patient 2: transesophageal echocardiogram, midesophageal four-chamber view. Low–mechanical index imaging following the injection of perflutren lipid microsphere (Definity) ultrasound enhancing agent. *Red arrow* points to the left atrial mass, exhibiting peripheral enhancement and central clearing suggestive of a vascular tumor with necrotic core. *LA*, Left atrium; *LV*, left ventricle; *LVOT*, left ventricular outflow tract; *MV*, mitral valve; *RA*, right atrium; *RV*, right ventricle.

contradicts that notion. The fundamental concept of contrast echocardiography is the ability to differentiate vascular structures via contrast uptake and thus enhancement. Although thrombi should demonstrate complete lack of contrast enhancement as avascular structures, this assumption might be flawed. Angiographic neovascularization at areas of left atrial thrombi has been long described in association with mitral valve disease. In a retrospective study of 507 patients, coronary angiography demonstrated neovascularity of the left atrium in 30 of 76 patients with left atrial thrombi.[46] This phenomenon was also described in another retrospective analysis as well as several case reports.[34,47-50] Whether this neovascularization is specific to patients with severe mitral valve disease is unknown but has not been reported in patients without. This potentially explains the peripheral contrast enhancement observed in our second patient.

Accurate differentiation between left atrial thrombi and myxomas in patients with procoagulant predisposition might not be entirely possible without tissue biopsy. An initial approach of systemic anticoagulation and repeat imaging might be considered in this cohort of patients to avoid unnecessary surgery, but the safety of such approach is not yet established.

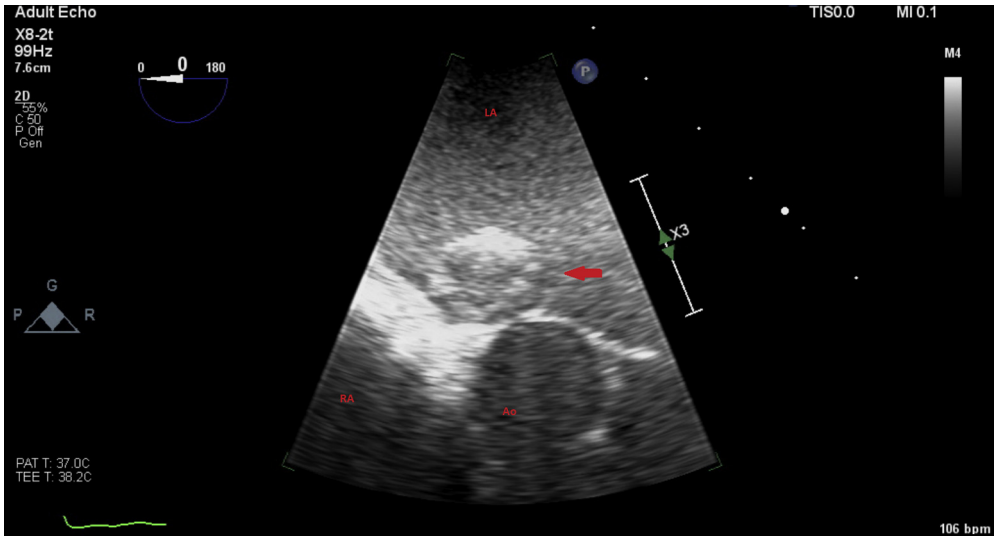

Figure 16 Patient 2: transesophageal echocardiogram, midesophageal four-chamber view zoomed on the left atrial mass. Low–mechanical index imaging following the injection of perflutren lipid microsphere (Definity) ultrasound enhancing agent. *Red arrow* points to the left atrial mass, exhibiting peripheral enhancement and central clearing suggestive of a vascular tumor with necrotic core. *Ao*, Aorta; *LA*, left atrium; *RA*, right atrium.

CONCLUSION

Pathology remains the gold standard for diagnosing cardiac masses. Although noninvasive imaging modalities such as echocardiography, contrast echocardiography, and cardiac magnetic resonance have excellent accuracy, misdiagnoses still occur, especially in patients with procoagulant conditions. An initial approach of systemic anticoagulation and repeat imaging might be warranted to avoid unnecessary surgery.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2020.03.009.

REFERENCES

1. Ohgo T, Yamamoto K, Furuno T. Complete detachment of cardiac myxoma causing aortic saddle embolization and cerebral infarction. Int J Cardiol 2008;127:e48-9.
2. Dinesh Kumar US, Wali M, Shetty SP, Sujay KR. Left atrial myxoma—a tumor in transit. Ann Card Anaesth 2019;22:432-4.
3. Reynen K. Cardiac myxomas. N Engl J Med 1995;333:1610-7.
4. Goswami KC, Shrivastava S, Bahl VK, Saxena A, Manchanda SC, Wasir HS. Cardiac myxomas: clinical and echocardiographic profile. Int J Cardiol 1998;63:251-9.
5. Carney JA, Gordon H, Carpenter PC, Shenoy BV, Go VL. The complex of myxomas, spotty pigmentation, and endocrine overactivity. Medicine (Baltimore) 1985;64:270-83.
6. Ragland MM, Tak T. The role of echocardiography in diagnosing space occupying lesions of the heart. Clin Med Res 2006;4:22-32.
7. Vincelj J, Sutlic Z, Biocina B, Niki N, Lajtman Z. Diagnostic accuracy of trans esophageal echocardiography for detection of atrial mass. Acta Med Croatica 2001;55:47-51.
8. Nomeir AM, Watts LE, Seagle R, Joynen CR, Corman C, Prichard RW. Intracardiac myxomas: twenty-year echocardiographic experience with review of the literature. J Am Soc Echocardiogr 1989;2:139-50.
9. Bhan A, Mehrotra R, Choudhary SK, Sharma R, Prabhakar D, Airan B, et al. Surgical experience with intracardiac myxomas: long-term follow-up. Ann Thorac Surg 1998;66:810-3.
10. Meng Q, Lai H, Lima J, Tong W, Qian Y, Lai S. Echocardiographic and pathologic characteristics of primary cardiac tumors: a study of 149 cases. Int J Cardiol 2002;84:69-75.
11. Shyu KG, Chen JJ, Cheng JJ, Hwang JJ, Kuan P, Lien WP. Comparison of transthoracic and transesophageal echocardiography in the diagnosis of intracardiac tumors in adults. J Clin Ultrasound 1994;22:381-9.
12. Alam M. Pitfalls in the echocardiographic diagnosis of intracardiac and extracardiac masses. Echocardiography 1993;10:181-91.
13. Menegus MA, Greenberg MA, Spindola-Franco H, Fayemi A. Magnetic resonance imaging of suspected atrial tumors. Am Heart J 1992;123:1260-8.
14. Robinson NM, Desai J, Monaghan MJ. Atrial and pulmonary mass: intracardiac thrombus mimicking myxoma on multiplane transesophageal echocardiography. J Am Soc Echocardiogr 1997;10:93-6.
15. Scheffel H, Baumueller S, Stolzmann P, Leschka S, Plass A, Alkadhi H, et al. Atrial myxomas and thrombi: comparison of imaging features on CT. AJR Am J Roentgenol 2009;192:639-45.
16. Mousavi N, Cheezum MK, Aghayev A, Padera R, Vita T, Steigner M, et al. Assessment of cardiac masses by cardiac magnetic resonance imaging: histological correlation and clinical outcomes. J Am Heart Assoc 2019;8:e007829.
17. Hoffmann U, Globits S, Schima W, Loewe C, Puig S, Oberhuber G, et al. Usefulness of magnetic resonance imaging of cardiac and paracardiac masses. Am J Cardiol 2003;92:890-5.
18. Fussen S, De Boeck BW, Zellweger MJ, Bremerich J, Goetschalckx K, Zuber M, et al. Cardiovascular magnetic resonance imaging for diagnosis and clinical management of suspected cardiac masses and tumours. Eur Heart J 2011;32:1551-60.
19. Kirkpatrick JN, Wong T, Bednarz JE, Spencer KT, Sugeng L, Ward RP, et al. Differential diagnosis of cardiac masses using contrast echocardiographic perfusion imaging. J Am Coll Cardiol 2004;43:1412-9.
20. Mansencal N, Revault-d'Allonnes L, Pelage JP, Farcot JC, Lacombe P, Dubourg O. Usefulness of contrast echocardiography for assessment of intracardiac masses. Arch Cardiovasc Dis 2009;102:177-83.

21. Uenishi EK, Caldas MA, Tsutsui J, Abduch MC, Sbano JC, Kalil Filho R, et al. Evaluation of cardiac masses by real-time perfusion imaging echocardiography. Cardiovasc Ultrasound 2015;13:23.
22. Jang KH, Shin DH, Lee C, Jang JK, Cheong S, Yoo SY. Left atrial mass with stalk: thrombus or myxoma? J Cardiovasc Ultrasound 2010;18:154-6.
23. Lu HT, Nordin R, Othman N, Choy CN, Kam JY, Leo BC, et al. Biatrial thrombi resembling myxoma regressed after prolonged anticoagulation in a patient with mitral stenosis: a case report. J Med Case Rep 2016;10:221.
24. Strecker T, Rümmele P, Seitz T, Nooh E. A huge left atrial mass "not a myxoma". Cardiol J 2017;24:450-1.
25. Khan N, Whitton A, Hoffman R, Qualtieri J, Dunlap S. Left atrial thrombus mimicking atrial myxoma on imaging studies in a patient with cardiac transplant. J Cardiol Cases 2014;10:153-4.
26. Khalid U, Hirudayaraj P, Lakkis N, Tabbaa R. Left atrial thrombus mimicking a myxoma in a patient with systemic lupus erythematosus. Hellenic J Cardiol 2014;55:167-70.
27. Tümüklü MM, Naseri E, Ceyhan K, Elalmiş A. Left atrial ball-shaped thrombus mimicking myxoma detected by transthoracic echocardiography. Anadolu Kardiyol Derg 2007;7:355.
28. Dhawan S, Tak T. Left atrial mass: thrombus mimicking myxoma. Echocardiography 2004;21:621-3.
29. Morelli S, Testa G, Voci P. Large left atrial thrombus mimicking atrial myxoma: successful treatment with anticoagulant therapy. Eur Heart J 1996;17:1290.
30. Adauy JV, Gabrielli L, Córdova S, Saavedra R, McNab P. Big thrombus "sitting" in an atrial septal aneurysm. Echocardiography 2017;34:1396-8.
31. Shimamoto K, Kawagoe T, Dai K, Inoue I. Thrombus in the left atrial septal pouch mimicking myxoma. J Clin Ultrasound 2014;42:185-8.
32. Hosseinsabet A, Shirzad M, Anvari MS. Left atrial appendage thrombosis simulating myxoma. J Tehran Heart Cent 2014;9:194-5.
33. Peters F, Khandheria BK, Patel AR, Essop MR. Mitral stenosis and pedunculated left atrial thrombus: an unusual presentation. Eur Heart J Cardiovasc Imaging 2013;14:117.
34. Kodali S, Yamrozik J, Biederman RW. Left atrial thrombus masquerading as a myxoma in a patient with mitral stenosis. Echocardiography 2010;27:E98-101.
35. Chen MA, Ahlgrim AA, Allen CT. Location, location, location: a left atrial mass. J Am Soc Echocardiogr 2009;22:541.
36. Sonoda M, Higashi K, Shimokawahara H, Tanaka H, Kashima K, Nakamura K. Multiple atrial ball thrombi with stalk mimicking myxoma without valve disease: a case report. J Cardiol 2007;49:287-93.
37. Hesse B, Murphy RT, Myles J, Huang J, Sabik EM. Images in cardiovascular medicine. A left atrial appendage thrombus mimicking atrial myxoma. Circulation 2006;113:e456-7.
38. Kuśmierczyk-Droszcz B, Michalak E, Wołczyk J, Parulski A, Hoffman P. Thrombus or myxoma?. Kardiol Pol 2005;63:337-9.
39. Dunst KM, Antretter H, Huemer GM, Poelzl G, Laufer G. Left atrial thrombus mistaken as a tumor after heart transplantation. Thorac Cardiovasc Surg 2003;51:347-50.
40. Lisowska A, Skibińska E, Galar B, Tomaszuk-Kazberuk A. Left atrial tumour in a patient with dilated cardiomyopathy: myxoma or thrombus? A case report. Kardiol Pol 2003;58:221-3.
41. Madanat WY, Prokaeva TB, Kotel'nikova GP, Alekberova ZS. Endocarditis with left atrial thrombus formation in Behçet's disease mimicking myxoma. J Rheumatol 1993;20:1982-4.
42. Kmetzo JJ, Peters RW, Plotnick GD, Carliner NH, Baumgartner WA, Fisher ML. Left atrial mass. Thrombus mimicking myxoma. Chest 1985;88:906-7.
43. Zur-Binenboim C, Ammar R, Grenadier E, Veisler A, Freud M, Palant A. Detection of round floating left atrial thrombus simulating left atrial myxoma by two-dimensional echocardiography. Am Heart J 1985;110:492-3.
44. Algom M, Schlesinger Z, Stryjer D. Echocardiography in left atrial ball thrombus simulating myxoma. Harefuah 1981;100:31-2.
45. Corea L, Alicandri C, Todisco T. Calcified mitral valve stenosis and calcification of the atrial wall with massive thrombosis of the left atrium simulating myxoma. Report of a case and review of the literature. Cardiol Prat 1976;27:63-8.
46. Colman T, de Ubago J, Figueroa A, Pomar JL, Gallo I, Mortera C, et al. Coronary arteriography and atrial thrombosis in mitral valve disease. Am J Cardiol 1981;47:973-7.
47. Russo G, Tamburino C, Ali' A, Monaco O, Calvi V, Drago A, et al. Diagnosis of left atrial thrombi in mitral valve disease by coronary arteriography. Cathet Cardiovasc Diagn 1990;21:82-5.
48. Lazar AA, Aszalos A, Ober C, Encica S, Scridon T, Iancu AC. A case of mobile giant left atrial thrombus which vascularized with coronary arteries in severe mitral valve stenosis. Cardiovasc Revasc Med 2011;12:235-6.
49. Al-Bezem R, Kwan T, Clark LT. Regression of large atrial thrombi and coronary neovascularizations with conventional anticoagulation in mitral stenosis—a case report. Angiology 1999;50:859-63.
50. Fu M, Hung JS, Lee CB, Cherng WJ, Chiang CW, Lin FC, et al. Coronary neovascularization as a specific sign for left atrial appendage thrombus in mitral stenosis. Am J Cardiol 1991;67:1158-60.