

Mitral Valve Blood Cyst Diagnosed with the Use of Multimodality Imaging



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INTRODUCTION

Blood cysts of the heart are rare in adults. They are relatively common in newborns, but in the majority of cases they disappear spontaneously before the age of 6 months.¹ They are usually found in the heart valves, but rare cases have been described attached in the cardiac chambers. Most often blood cysts are asymptomatic and are discovered incidentally on echocardiography performed for other reasons. Occasionally, they may cause valve dysfunction, and rarely embolization has been reported.^{2,3}

We report a case of a large blood cyst attached in the anterior mitral valve leaflet, which was incidentally discovered on a patient who underwent a transthoracic echocardiogram for newly diagnosed atrial fibrillation. Our case underlines the importance of multimodality imaging in the diagnosis of this rare abnormality of the mitral valve.

CASE PRESENTATION

A 62-year-old overweight female with history of hypertension, diet-controlled hyperlipidemia, and suspected obstructive sleep apnea due to reported snoring was referred to cardiology for evaluation of palpitations and dizziness. She reported a 2-month history of bouts of “heart racing” usually when lying in bed at night. On examination, she was afebrile, with blood pressure 124/70 mm Hg and heart rate 100 bpm. She had no evidence of jugular venous distention and no peripheral edema; her lungs were clear and no murmur was appreciated on cardiac auscultation. An electrocardiogram showed atrial fibrillation with a rate of 95 bpm.

A transthoracic echocardiogram showed severely depressed left ventricular systolic function and preserved right ventricular function and raised concern for a mass attached in the mitral valve, which appeared cystic and without associated valve destruction (Figure 1, Videos 1-6). She was then referred for cardiac magnetic resonance imaging (MRI), which confirmed severely reduced left ventricular systolic function without evidence of late gadolinium enhancement to suggest fibrosis or infarction. The cardiac MRI showed a 2 cm mass attached in the anterior leaflet of the mitral valve that was homoge-

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VIDEO HIGHLIGHTS

Video 1: Long-axis parasternal window on transthoracic echocardiogram demonstrates a mass attached to the anterior leaflet of the mitral valve. The mass has a round, cystic appearance with hyperechogenic walls and hypoechogenic content. Left ventricular systolic dysfunction is also noted.

Video 2: Long-axis parasternal window on transthoracic echocardiogram with color Doppler. The video demonstrates the cystic-appearing mass attached in the anterior leaflet of the mitral valve. Color Doppler shows no color inside the mass and rules out left ventricular outflow tract obstruction.

Video 3: Long-axis parasternal window on transthoracic echocardiogram with Color Doppler. The cystic appearing mass is demonstrated again without evidence of valve destruction and presence of mild mitral regurgitation.

Video 4: Short-axis parasternal window on transthoracic echocardiogram at the level of the mitral valve again demonstrates the mass with the echolucent core attached to the anterior leaflet of the mitral valve.

Video 5: Apical three-chamber window on transthoracic echocardiogram demonstrates the blood cyst attached to the anterior leaflet of the mitral valve without evidence of left ventricular outflow tract obstruction.

Video 6: Apical four-chamber window on transthoracic echocardiogram with color flow focusing on the mitral valve blood cyst attached on the anterior mitral valve leaflet. Left ventricular systolic dysfunction is also noted.

Video 7: Midesophageal four-chamber view on transesophageal echocardiogram shows a large cystic lesion with thin walls attached to the anterior leaflet of the mitral valve. Severe left ventricular systolic dysfunction is also noted.

Video 8: Midesophageal view at 75° with a zoom at the mitral valve showing the blood cyst attached to the anterior leaflet with the characteristic echolucent core.

Video 9: Midesophageal long-axis view with color Doppler, showing the mitral valve blood cyst, mild mitral regurgitation, and no evidence of left ventricular outflow tract obstruction.

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neously enhanced on postcontrast cine imaging, becoming isointense to blood pool (Figure 2). Of note, the mass was observed to be stealthy on all other pulse sequences (Figure 3), including the more standard pre- and postcontrast T1-weighted technique. It is likely that the contents of the cyst are in fairly direct communication (via channels) with the blood pool such that signal intensity within the cyst matches that of

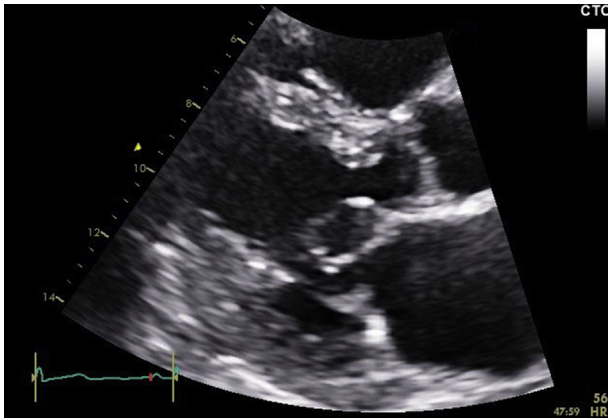


Figure 1 Long-axis parasternal view on transthoracic echocardiogram with zoom at the mitral valve, demonstrating a mass attached on the anterior leaflet of the mitral valve. The mass has a cystic appearance with an echolucent core.

the blood pool, except on precontrast cine imaging, where perhaps the slight difference is due to the sluggish flow within the cyst. Transesophageal echocardiogram confirmed the presence of a round, cystic mass with hyperechogenic walls and hypoechoic content

attached to the anterior leaflet of the mitral valve (Videos 7-9). There was mild mitral regurgitation without stenosis and no evidence of left ventricular outflow tract obstruction. After the diagnosis of a blood cyst of the mitral valve was confirmed with the use of multimodality cardiac imaging, the patient was referred for cardiothoracic evaluation. In the absence of mitral valve dysfunction, left ventricular outflow tract obstruction, or embolization, the decision was made to manage the patient conservatively with imaging follow-up.

DISCUSSION

The first intracardiac blood cyst appreciated on the mitral valve was reported in 1844.⁴ In 1983, Hauser *et al.*⁵ presented the first echocardiographic description of a cardiac blood cyst. A blood cyst is usually a congenital abnormality that typically resolves before adulthood. Blood cysts are predominantly seen in infants under the age of 6 months as confirmed in autopsy studies.¹ They typically regress spontaneously; however, they have been described in adults up to 80 years old.⁶ Blood cysts may also be acquired as the result of cardiothoracic surgery, blunt trauma, or inflammatory process.²

Within the heart, they are predominantly seen on the valves (with the anterior leaflet of the mitral valve being the most commonly affected structure), with few cases attached to the atria or the ventricles.² Intracardiac blood cysts have been related to a variety of different

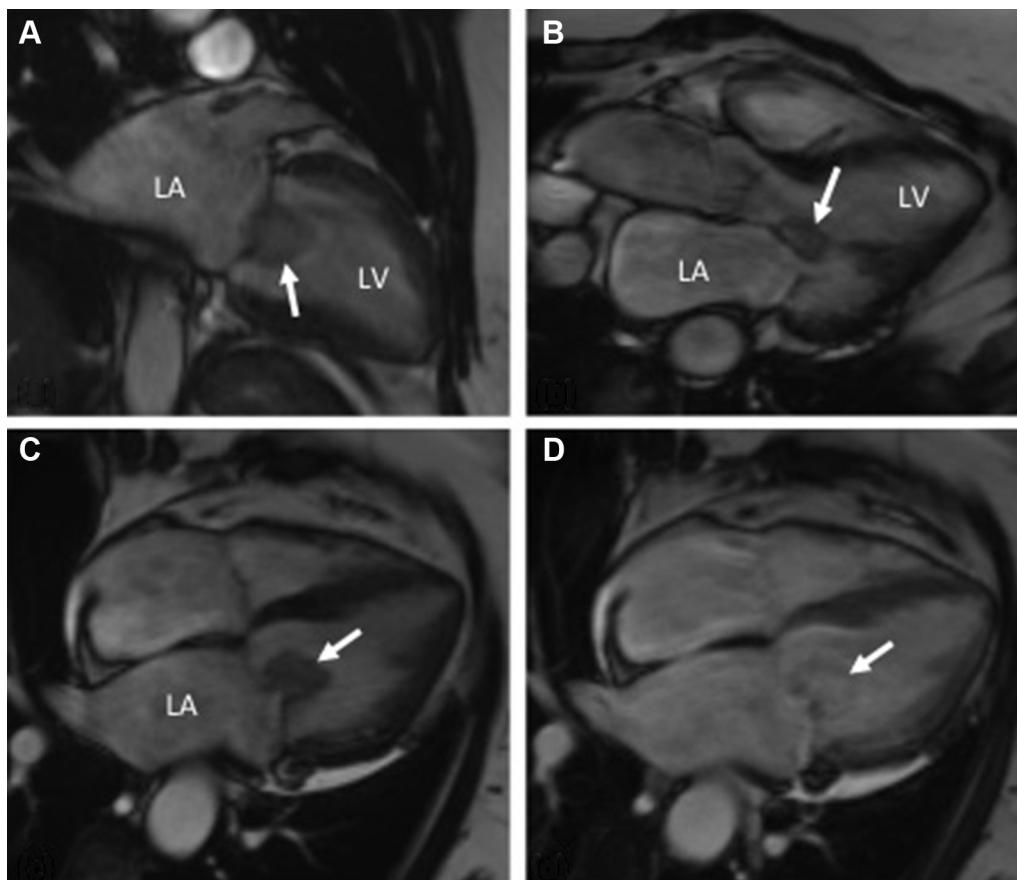


Figure 2 Two-chamber (A), three-chamber (B), and four-chamber (C, D) systolic phase MRI images acquired using cine steady-state free precession acquisition demonstrate a 2 cm mass attached to the anterior leaflet of the mitral valve. Image D was obtained 8 minutes after intravenous contrast administration and reveals diffuse homogenous enhancement of the mass that is now isotense with the blood pool and barely perceptible. LA, left atrium; LV, left ventricle.

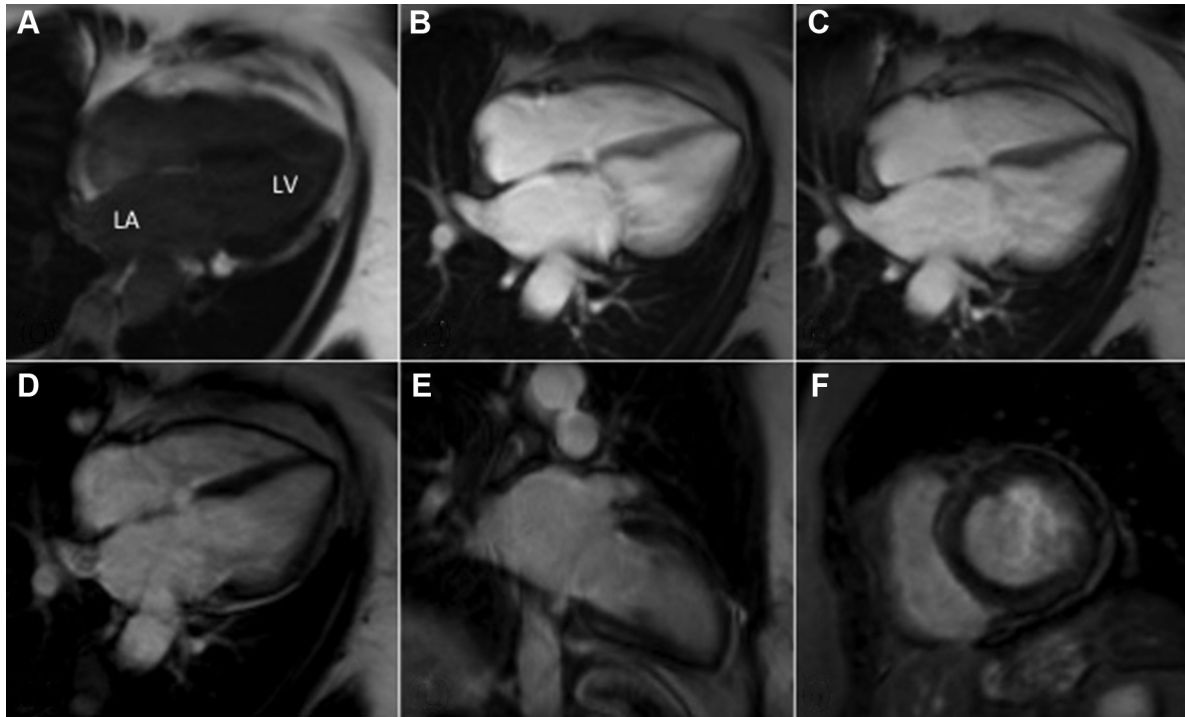


Figure 3 The 2 cm mitral valve mass seen in [Figure 2](#) is stealthy on T1-weighted four-chamber **(A)** precontrast and **(B)** 1 minute and **(C)** 5 minutes postcontrast inversion-recovery imaging (TI = 400 msec). It is not clearly visible at 10-15 minutes postcontrast on **(D)** four-chamber, **(E)** two-chamber, and **(F)** basal short-axis late gadolinium enhancement imaging (TI = 300 msec). LA, left atrium; LV, left ventricle.

symptoms including dyspnea, chest pain,^{7,8} syncope,⁹ and rarely neurologic deficits due to embolism.¹⁰ Most commonly, blood cysts are asymptomatic in adults and often discovered incidentally during routine echocardiographic evaluation. They can cause mitral valve regurgitation due to incomplete coaptation of the leaflets¹¹ and left ventricular outflow tract obstruction when a large cyst of the anterior mitral leaflet prolapses in the left ventricular outflow tract.⁹

Echocardiography is considered the imaging modality of choice for the diagnosis of the intracardiac blood cysts. Cardiac blood cysts have

typical ultrasound features, including an echolucent core and a thin wall with clean boundaries.¹² Furthermore, contrast echocardiography can accurately demonstrate the attachment and absence of blood perfusion of the mass.¹³ Echocardiography can also demonstrate effects of the blood cyst on heart function, for example, the presence of mitral regurgitation, mitral valve stenosis, or outflow tract obstruction. It also helps differentiate a blood cyst from solid tumors such as fibroelastoma and myxoma, as well as vegetations ([Table 1](#)). Cardiac magnetic resonance can be used adjunctively in the diagnosis of the

Table 1 Differential diagnosis of cardiac masses based on echocardiographic characteristics

Cardiac mass	Echo findings
Blood cyst	Attached to valve leaflet (most commonly mitral valve). Thin-walled cystic lesion. Echolucent core. May be multilobed. Usually doesn't opacify with use of echo contrast, but if channels are present, contrast may show up in the cyst. May cause valve regurgitation and left ventricular outflow tract obstruction.
Fibroelastoma	Most often found in valves (most commonly aortic valve, may occur in any endothelial structure). Attached to valve by a stalk. "Shimmering" edge. No associated regurgitation or valve destruction.
Myxoma	Most commonly located in the left atrium, followed by the right atrium and usually attached to the atrial septum by a stalk.
Lambli's excrescence	Linear echodensities most commonly seen in the aortic valve at the closure margin of the valve. Considered degenerative process and frequency increases with age. No associated regurgitation or valve destruction.
Vegetation	Mobile mass with independent motion from the structure it is attached to. Usually located in a valve but can also be seen in support structures or prosthetic devices. Typically causes valve destruction and is usually seen in the path of the regurgitant jet. Positive blood cultures support the diagnosis.

blood cyst as the characteristic findings and, most specifically, the absence of gadolinium uptake during delayed phase imaging can differentiate a cyst from other solid masses of the heart. In T1-weighted sequences the mass may appear hypointense or isointense, while it is hyperintense in T2-weighted sequences. Although it usually shows no contrast enhancement after contrast infusion, it may enhance in some cases, depending on the presence and size of the channels by which contrast can enter and exit the cyst. In our case the mass does enhance, probably due to large channels that permit rapid passage of blood (and contrast) between the blood pool and the cyst.^{8,14}

There is no consensus on the management of blood cysts. In the absence of symptoms, significant mitral valve regurgitation, or left ventricular outflow tract obstruction, they are typically managed by observation and echocardiographic follow-up to monitor cyst size, presence of obstruction, and valve dysfunction.¹⁵ As stated previously, surgical intervention may be indicated in the event of large size, embolic events, significant mitral valve regurgitation, or left ventricular outflow tract obstruction.¹⁶

CONCLUSION

Intracardiac blood cysts are rarely seen in adults and most commonly involve the mitral valve. Although sometimes they may cause symptoms, they are usually discovered incidentally during cardiac imaging performed for other reasons. Echocardiography, especially with the use of contrast, is very useful in the diagnosis, differential diagnosis, and functional effects of the cysts in the heart. Because this is a rare finding, management should be individualized based on presence of symptoms and complications associated with the intracardiac cyst.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.case.2021.01.004>.

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