

# Comprehensive Echocardiographic Evaluation of an Atypical Left Ventricular Mass with an Unusual Site of Attachment

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## INTRODUCTION

We report a large, atypical left ventricular mass attached to the basal inferolateral segment of the left ventricle in a 49-year-old Caucasian man. Because of the risk for embolization, the left ventricular mass was surgically resected. Histopathology of the mass demonstrated evidence of recent thrombus with karyorrhexis of polymorphonuclear leukocytes. The left ventricular mass described in our case is very unusual for several reasons. First, left ventricular thrombus usually occurs in regions of left ventricular akinesis, where relative stasis of blood creates a substrate for thrombus formation. Our patient's left ventricular systolic function was preserved. Therefore, there was no clear anatomic substrate for left ventricular thrombus formation. To our knowledge, this case is the first report of a large surgically resected left ventricular thrombus, with a very unusual site of attachment to the basal inferolateral segment of the left ventricle, in the context of preserved left ventricular systolic function. Second, the left ventricular mass may have represented a "sterile" vegetation following antibiotic therapy. However, the left ventricular mass was very unusual in location, even for mural endocarditis. To the best of our knowledge, mural endocarditis has not been previously reported to involve the basal inferolateral left ventricular segment. From an echocardiographic imaging perspective, this case highlights the importance of careful assessment from multiple imaging windows and planes, using both transthoracic and transesophageal imaging, to accurately delineate the location of an intracardiac mass.

## CASE PRESENTATION

A 49-year-old Caucasian man presented to a regional hospital with nausea, vomiting, and fever. He had a relevant history of type 2 diabetes mellitus complicated by peripheral neuropathy and gastroparesis. He was discharged home with oral amoxicillin and ciprofloxacin. Following discharge, the patient remained unwell, and soon returned to the hospital with ongoing vomiting and confusion, associated with decreased conscious state. Blood cultures were transiently positive for *Streptococcus dysgalactiae* before broad-spectrum intravenous antibiotic therapy was commenced. Magnetic resonance imaging of the brain demon-

strated multiple small acute infarcts throughout the supratentorial and infratentorial brain. Transthoracic echocardiography (TTE) demonstrated a large mass in the left ventricle. On transthoracic imaging, the site of attachment of the left ventricular mass was not clear. It was felt that the mass was attached to the basal inferior segment of the left ventricle (Figure 1A). However, on other views, the mass appeared to be associated with the papillary muscle complex (Figure 1B, Video 1 available at [www.cvcasejournal.com](http://www.cvcasejournal.com)). Further echocardiographic imaging occurred with transesophageal echocardiography (TEE). TEE, in particular the transgastric views, provided clear imaging, demonstrating the left ventricular mass arising from the basal inferolateral segment of the left ventricle (Figure 2A, Video 2 available at [www.cvcasejournal.com](http://www.cvcasejournal.com)). The left ventricular mass measured  $3.3 \times 1.4$  cm (Figure 2B). Three-dimensional imaging and multiplanar reconstruction demonstrated that the left ventricular mass was prolapsing into the left ventricular outflow tract during systole (Figures 3 and 4, Video 3 available at [www.cvcasejournal.com](http://www.cvcasejournal.com)). On echocardiographic assessment, the cardiac valves were not involved. There was also no evidence of aortic root abscess.

Because of the large size of the left ventricular mass and the likelihood of further embolization, the patient underwent open heart surgery 7 days after his second presentation to hospital. At the time of surgery, the left ventricular mass was found to be attached to the basal inferolateral segment of the left ventricle. Macroscopically, it had an appearance that was suggestive of a vegetation. Histopathology of the resected left ventricular mass demonstrated evidence of recent thrombus with karyorrhexis of polymorphonuclear leukocytes (Figure 5).

## DISCUSSION

We report the case of a 49-year-old Caucasian man with a large atypical left ventricular mass attached to the basal inferolateral segment of the left ventricle. The differential diagnosis of an intracardiac mass includes vegetation, thrombus, and tumor. The left ventricular mass described in our case is very unusual for several reasons. First, left ventricular thrombus usually occurs in regions of left ventricular akinesis, where relative stasis of blood creates a substrate for thrombus formation. Following anterior myocardial infarctions, left ventricular thrombus commonly forms in the left ventricular apex.<sup>1</sup> Our patient's left ventricular systolic function was preserved. Therefore, there was no clear anatomic substrate for left ventricular thrombus formation. To our knowledge, this case is the first report of a large surgically resected left ventricular mass, with a very unusual site of attachment to the basal inferolateral segment of the left ventricle, in the context of preserved left ventricular systolic function. Second, the left ventricular mass may have represented a "sterile" vegetation following antibiotic therapy. However, the left ventricular mass was very unusual in location, even for mural endocarditis. To the best of our knowledge,

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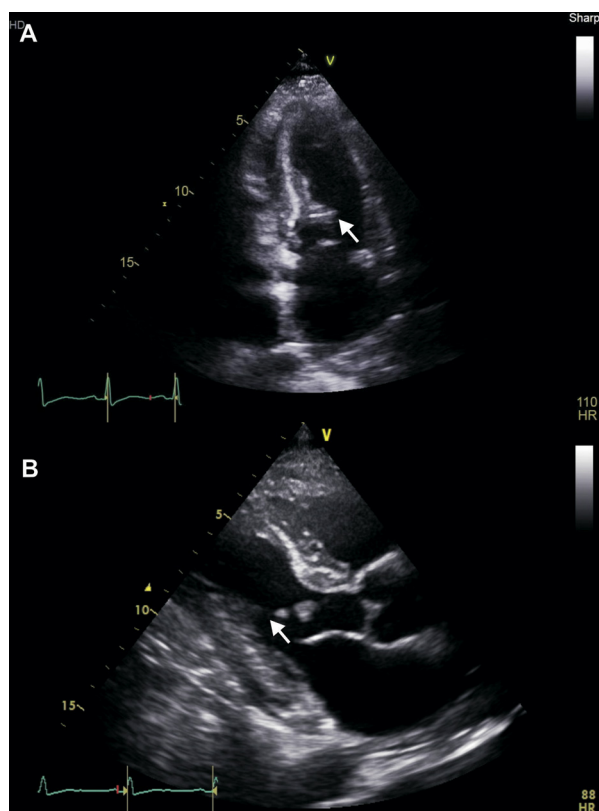
Keywords: Intracardiac mass, Mural endocarditis, Left ventricular thrombus, Transthoracic echocardiography, Transesophageal echocardiography

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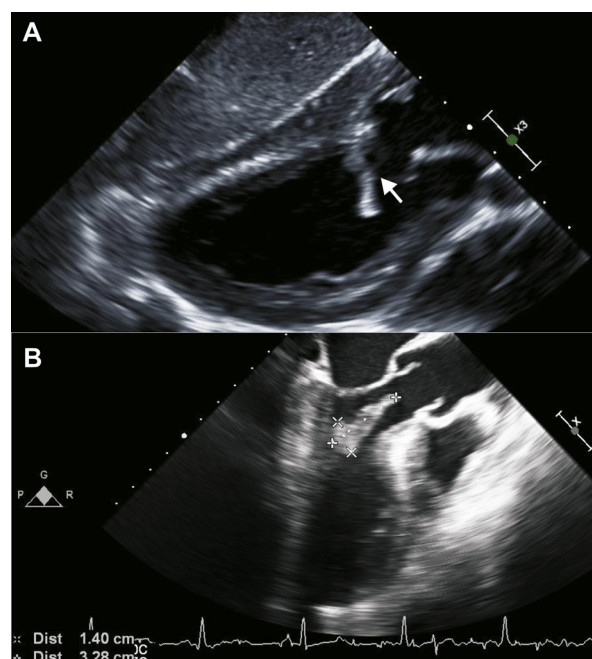
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**Figure 1** Initial transthoracic echocardiographic imaging suggested that the left ventricular mass (*white arrow*) was either attached to the basal inferior wall (**A**, apical two-chamber view) or was associated with the papillary muscle complex (**B**, parasternal long-axis view).

mural endocarditis has not been previously reported to involve the basal inferolateral left ventricular segment. Although a myocardial abscess may have also been a differential diagnosis, the histopathologic results make this less likely in this clinical case. Mural endocarditis refers to infective endocarditis involving nonvalvular endocardial surface of the cardiac chambers.<sup>2</sup> It represents a rare presentation of infective endocarditis.<sup>2</sup> The exact incidence of mural endocarditis is not clear. Mural vegetations have been reported to occur in left ventricular aneurysms,<sup>3</sup> the right ventricular moderator band,<sup>4</sup> and the right atrium.<sup>5</sup> Several lines of evidence support the notion that the patient may have had an atypical presentation of partially treated mural endocarditis. First, the patient was found to have transient streptococcal bacteremia. Additionally, immunosuppressed hosts such as intravenous drug users are also more likely to develop mural endocarditis.<sup>2</sup> Even though our patient did not have a history of intravenous drug use, it could be hypothesized that his long-standing type 2 diabetes mellitus caused him to be immunosuppressed, making him more susceptible to developing mural endocarditis.

Adel *et al.*<sup>6</sup> described a series of three cases of mural endocarditis due to *Staphylococcus aureus* bacteremia. TEE was used in each case to delineate the size and location of the vegetations. In the first case, a mural vegetation was found on the anterolateral papillary muscle, measuring  $2.5 \times 1.5$  cm; in the second case, TTE initially demonstrated a small mobile mass in the left ventricular outflow tract, but, subsequent TEE demonstrated a  $1.9 \times 1.2$  cm mass attached

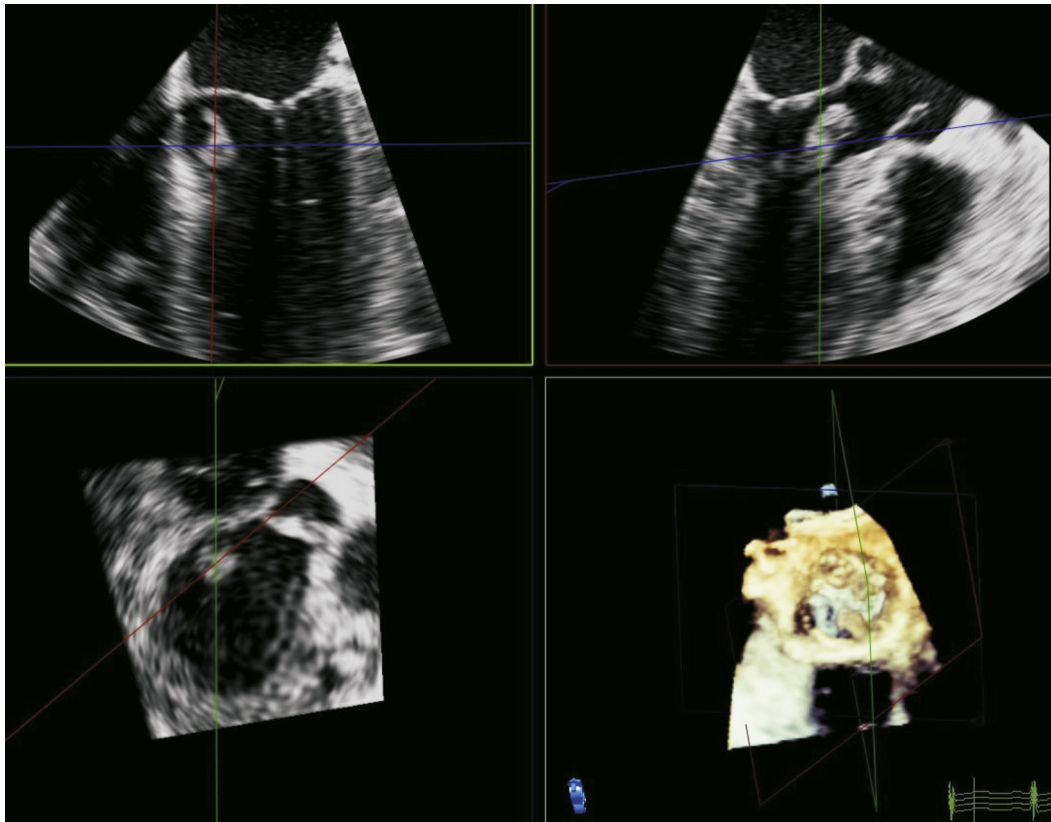


**Figure 2** Transesophageal echocardiographic imaging provided accurate delineation of the location of the left ventricular mass (*white arrow*), demonstrating that the mass was attached to the basal inferolateral segment of the left ventricle (**A**, trans-gastric imaging window). The mass measured  $3.3 \times 1.4$  cm (**B**, midesophageal long-axis view).



**Figure 3** Three-dimensional transesophageal echocardiographic imaging (intraoperative study), demonstrating the left ventricular mass (*white arrow*) prolapsing into the left ventricular outflow tract during systole.

to the basal anterolateral wall; in the third case, TTE initially demonstrated a small mass in the left ventricular outflow tract; on subsequent TEE, a  $1.5 \times 0.2$  cm mass was seen to be attached to the basal anterolateral wall.<sup>6</sup> Koshy *et al.*<sup>4</sup> described a  $2.0 \times 1.5$  cm vegetation over the right ventricular moderator band, diagnosed on TTE



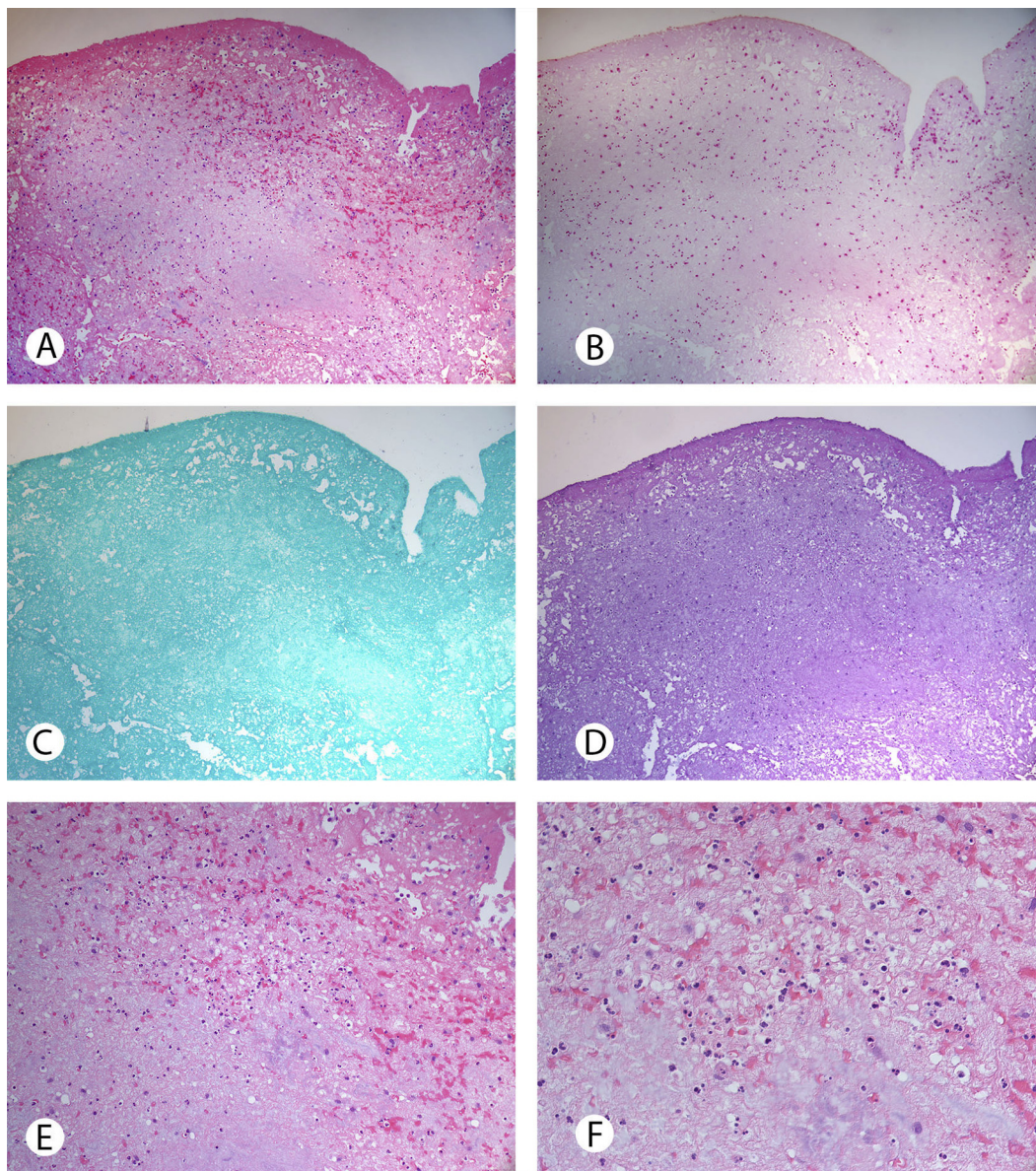
**Figure 4** Multiplanar reconstruction of three-dimensional transesophageal echocardiographic data, demonstrating the location of the left ventricular mass and its relationship to the left ventricular outflow tract.

and TEE. Lo *et al.*<sup>3</sup> described a 3.0-cm vegetation associated with left ventricular apical aneurysm. The site of attachment of the left ventricular vegetation in our case is unusual and has not been reported previously. Predisposing factors for mural endocarditis include congenital heart defects and left ventricular wall abnormalities such as aneurysms and thrombi.<sup>2</sup>

From an echocardiographic imaging perspective, this case highlights the importance of careful assessment from multiple imaging windows and planes, using both transthoracic and transesophageal imaging, to accurately delineate the location of an intracardiac mass. On transthoracic imaging, the left ventricular mass appeared to arise from the basal inferior wall. Some views also suggested that it was associated with the papillary muscle complex. Detailed transesophageal echocardiographic examination with multiple windows, including examination from the transgastric imaging window and multiplanar reconstruction of three-dimensional data, demonstrated that the left ventricular mass was attached to the basal inferolateral segment. The potential for underevaluating or even missing the intracardiac lesion when TTE is the only echocardiographic modality used in clinical assessment is highlighted by a previously reported case of a 44-year-old woman who died of staphylococcal mural abscess, proved at autopsy, despite two unremarkable transthoracic echocardiographic studies.<sup>7</sup> Contrast perfusion echocardiography with intravenous contrast microbubbles may be useful for the echocardiographic diagnosis of left ventricular thrombus, differentiating an avascular tumor from a thrombus.<sup>8</sup> However, in this clinical case, the size and mobility of the left ventricular mass, together with

a clinical history of embolic events, would make justification for empirical therapy with anticoagulation alone, without surgical intervention, more difficult. Further characterization of the left ventricular mass with another cardiac imaging modality did not occur, as the clinical and echocardiographic factors in this case justified surgical resection of the left ventricular mass without additional cardiac imaging. However, it must be emphasized that cardiac magnetic resonance imaging, with its superior tissue contrast, and the ability to discriminate different tissue characteristics, is powerful in differentiating a cardiac thrombus from a cardiac tumor and in the characterization of cardiac tumors.<sup>9</sup> The role of cardiac magnetic resonance imaging, particularly with the use of multiparametric tissue characterization pre- and post-gadolinium and perfusion imaging in the evaluation of patients with an intracardiac mass, cannot be understated.<sup>9,10</sup> Malignant cardiac tumors tend to be heterogeneous on T1- and T2-weighted imaging and display delayed enhancement with postgadolinium imaging.<sup>9</sup> Accurate delineation of the location of an intracardiac mass is important, especially for the purpose of operative planning. Although TTE is the first-line imaging modality of choice when investigating for suspected infective endocarditis, TEE has superior imaging quality and diagnostic accuracy.<sup>11,12</sup> Although the diagnostic accuracy of TEE for mural endocarditis is unknown, the diagnostic accuracy of TEE for valvular endocarditis exceeds 90%.<sup>11,12</sup> We suggest that in clinical scenarios in which an intracardiac mass is encountered, and the accurate location of the mass is not clear on TTE, TEE should be carried out, using multiple imaging windows and three-dimensional data acquisition with multiplanar reconstruction.





**Figure 5** Left ventricular mass histopathology. **(A)** Microscopic examination demonstrating fibrin-rich thrombus with scant polymorphonuclear leukocytes. Stains for microorganisms (including Gram stain for bacteria **[B]**, Grocott methenamine silver **[C]**, and periodic acid Schiff stain **[D]** for fungi) were negative. Close-up views of the thrombus **(E,F)** demonstrating breakdown karyorrhexis of the polymorphonuclear leukocytes consistent with a 48- to 72-hour-old area near the surface of the thrombus.

#### SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.case.2016.11.002>.

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