A Case Series of Epicardial Lipomatosis Masquerading as Extracardiac Pathology on Echocardiography: Role of Multimodality Imaging in Clarifying Misdiagnosis

Farhan Bajwa, MD, FACC, Gerald Koenig, MD, FACC, Sarah Hegab, MD, Sachin Parikh, MD, FACC, FASE, and Karthik Ananthasubramaniam, MD, FACC, FASE, FASNC, FSCCT, FRCP, Rochester, New York; and Detroit, Michigan

INTRODUCTION

Transthoracic echocardiography (TTE) serves as a widely used, valuable and readily available noninvasive diagnostic modality for assessing cardiac anatomy and function in numerous clinical situations. Differentiating epicardial fat on TTE from pathology can be challenging in certain instances. Epicardial fat has been shown to mimic pericardial effusions on TTE, requiring further evaluation for clarification.1 Epicardial lipomatosis (EL) represents a prominent variation of extensive fat distribution around the heart. The most common variant of EL that clinicians and echo readers are used to seeing is lipomatous hypertrophy of interatrial septum, which can mimic atrial or atrial septal tumor and requires additional investigation. Dramatic EL has been described in the literature even presenting as cardiac tamponade requiring surgical resection.2 We describe a three-case series of EL mimicking extracardiac mass and possible thrombus as suspected on TTE requiring advanced cardiac imaging to further clarify the diagnosis.

CASE PRESENTATIONS

Case 1

A 51-year-old man with history of chronic systolic heart failure and paroxysmal atrial fibrillation presented with dyspnea on exertion. A 12-lead electrocardiogram illustrated low voltage in the precordial leads. Further evaluation with TTE was performed. The TTE images were suboptimal quality but revealed a large mobile mass measuring 2.8 × 4.1 cm initially thought to be in the right ventricular (RV) outflow tract (RVOT); but was actually in pericardial space; Figure 1A; see Videos 1 and 2). As the patient had a history of diastolic heart failure, severe obstructive sleep apnea (noncompliant with continuous positive airway pressure) and obesity (body mass index, 35 kg/m²), his right heart dysfunction and pulmonary hypertension were felt to be related to groups 2 and 3 pulmonary hypertension. In the setting of worsening RV dilatation with the above-mentioned comorbidities, there was concern for possible thrombus obstructing the RVOT. Gated chest computed tomography (CT) with contrast revealed no intracardiac mass but an extensive amount of epicardial fat with a globular collection of epicardial fat. CT scan confirmed the diagnosis of extensive epicardial lipomatosis.

Case 2: TTE apical four-chamber view showing a dense mass-like appearance along the right ventricle and apex suspected to be a hematoma/mass. Subsequent CT confirmed this to be extensive epicardial fat.

Case 3: TTE apical four-chamber view showing a dense mass-like appearance along the right ventricle and apex suspected to be a hematoma/mass. Subsequent CT confirmed this to be extensive epicardial fat.

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1. Illustration of Epicardial Lipomatosis (EL) mimicking extracardiac mass and possible thrombus as suspected on TTE requiring advanced cardiac imaging to further clarify the diagnosis.

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VIDEO HIGHLIGHTS

Video 1: Case 1: Modified angulated short-axis view by TTE at the great vessel level showing the aorta and main pulmonary artery along with right and left pulmonary artery bifurcation. A globular mobile mass is seen above the aorta, which was initially at the time of echo believed to be a tumor in the RVOT. This was subsequently shown by CT to be fat in the pericardial recess.

Video 2: Case 1: Short axis great vessel view was angulated compared to video 1 to bring the globular epicardial mass more into view. Initially at the time of echocardiogram it was believed to be a thrombus/mass in the RVOT. CT scan confirmed the diagnosis of epicardial lipomatosis.

Video 3: Case 2: TTE parasternal long-axis view revealed a suspected hematoma/mass visualized anteriorly along the right ventricle with pericardial effusion. CT helped to clarify the diagnosis of epicardial fat.

Video 4: Case 2: TTE apical long-axis view revealed a suspected hematoma/mass visualized in the apical region along with pericardial effusion. Subsequent CT scan confirmed extensive epicardial lipomatosis.

Video 5: Case 3: TTE apical four-chamber view showing a dense mass-like appearance along the right ventricle and apex suspected to be a hematoma/mass. Subsequent CT confirmed this to be extensive epicardial fat.

Video 6: Case 3: TTE parasternal long-axis view revealing an echo density visualized anterior to right ventricle, suspected to be hematoma/mass. CT scan confirmed this to be extensive epicardial fat.

View the video content online at www.cvcasejournal.com.
Case 2

A 90-year-old woman presented with history of intermittent and worsening shortness of breath and chest pain. For further evaluation, a TTE was performed that showed echo-density on the visceral surface of pericardium in the apical region; differential diagnosis included thrombus versus mass (tumor) and pericardial effusion (Figure 3A; see Videos 3 and 4). As this patient presented to an outside hospital with symptoms and TTE raised a concern for epicardial mass, thrombus versus malignancy, she underwent cardiac magnetic resonance imaging (CMR) for further tissue characterization; CMR with T1-weighted axial steady-state free precession image showed a diffuse bright epicardial fatty deposit around the heart (Figure 4A) with corresponding T2-weighted black blood turbo spin echo fat suppression sequence confirming this as fat due to uniform suppression of the fat signal (Figure 4B). She continued to have chest pain in subsequent days, prompting concern for pulmonary embolism, and subsequently underwent chest CT for pulmonary embolism evaluation. A chest CT with contrast revealed significant fat deposition concentrically throughout the epicardial space without any evidence of mass (Figure 3B). This diffuse echo density measured –83 HU on

Figure 1  TTE images revealed a large mobile mass initially thought to be in the RVOT (A). Gated chest CT with contrast revealed no intracardiac mass but an extensive amount of epicardial fat (B).

Figure 2  Sagittal (A) and coronal (B) view of gated chest CT with contrast revealing a localized collection of epicardial fat in front of the right ventricle and in close proximity to the RVOT.

Figure 3  TTE showed echo-density on the visceral surface of the pericardium in the apical region (A). A chest CT with contrast revealed significant fat deposition concentrically throughout the epicardial space without any evidence of mass (B).
the Hounsfield scale, confirming fat and representing a unique case of EL.

Case 3
A 53-year-old woman with chronic systolic heart failure (nonischemic cardiomyopathy) presented with progressive shortness of breath. A TTE was obtained for further assessment, which revealed suspected hematoma/mass visualized anteriorly along the right ventricle and in the apical region (Figure 5A; see Videos 5 and 6). A chest CT with contrast revealed significant epicardial fat deposition similar to case 2 but more prominent around the right atrioventricular groove with a $-85$ HU signal confirming fat and representing a case of EL (Figure 5B).

DISCUSSION

Typically, epicardial fat is found in the atrioventricular and interventricular grooves, and some clues can be useful to delineate epicardial fat from pathology on TTE. Epicardial fat is mostly anterior to the heart and relatively immobile and has a granular texture or reflection within. The exact etiology of EL is unclear but could be related to advanced age and obesity, which is noted in patients with lipomatous hypertrophy of atrial septum too. However, as illustrated above, it can be challenging to rule out pathology in certain cases with TTE appearance of EL. Chest CT without contrast is a valuable adjunctive tool, given its high spatial resolution and delineation of fat. Fat has low signal, and typically on CT it has Hounsfield units ranging from $>-190$ HU to $<-30$ HU and can be used in various scenarios to clarify normal variants from pathologic variants of cardiac and extracardiac fat deposition. Cardiac magnetic resonance imaging with its unique tissue characterization capability is able to differentiate tissue types. For example, fat appears bright on T1-weighted imaging, and then fat suppression prepulse sequences can be applied as shown in case 2 with fast spin echo; the fat signal suppression (“nulling”) can confirm that the epicardial mass is actually fat. Thus, this added information along with the typical distribution of epicardial fat on CT or CMR helps to clarify the diagnosis. We have presented three cases of extensive epicardial fat representing EL. In case 1, epicardial fat was associated with mild pericardial effusion, giving an impression of RVOT mass or thrombus on TTE. In cases 2 and 3, extensive epicardial fat gave an imprint of mass or tumor on TTE. In both cases, with the help of multimodality imaging, an
accurate diagnosis was established. A chest CT with contrast and CMR allowed characterization of the lesion and confirmed its precise location and fatty contents.

CONCLUSION

These three cases highlight the varying manifestations of extensive epicardial fat mimicking cardiac pathology. Cardiologists and echocardiographers should be aware of these variations in epicardial fat appearances, and in selected cases where doubt persists, complementary multimodality imaging with cardiac CT or CMR may help to clarify these scenarios better as illustrated in this paper, avoiding misdiagnosis and its consequences.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.case.2020.05.023.

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