CASE REPORT

LEFT VENTRICULAR TRUE ANEURYSM: CARDIAC CT ANGIOGRAPHY DIAGNOSIS AND DIFFERENTIATION FROM PSEUDOANEURYSM

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Abstract

Left ventricular true aneurysms (LVTA) are uncommon, but clinically significant sequelae of myocardial infarction (MI), most frequently arising weeks to months after transmural infarction due to progressive ventricular remodeling and scar formation. Accurate differentiation from left ventricular pseudoaneurysm (LVPA) is critical, as LVPA represents a contained myocardial rupture with a substantially higher risk of fatal rupture, often necessitating urgent surgical repair. LVTA, in contrast, is generally more stable and can be managed conservatively in selected cases.
We report a case of a 68-years-old male with a history of anterior ST-elevation MI who presented with progressive exertional dyspnea. Cardiac CT angiography (CTA) was performed for further evaluation, and it demonstrated a large anterolateral LV outpouching with a broad neck (orifice-to-cavity diameter ratio of ~0.9), preserved myocardial continuity, traceable coronary arteries along the aneurysmal wall, and traceable mural calcifications - features consistent with chronic LVTA. No pericardial effusion, mural thrombus, or signs of rupture were present.
This case underscores the diagnostic value of CTA in characterizing LV outpouchings, particularly when echocardiography or MRI is unavailable or inconclusive. CTA offers high spatial resolution, multiplanar assessment, and precise measurement of the aneurysm's neck and cavity, enabling confident differentiation between LVTA and LVPA, guiding clinical decision-making and preventing unnecessary urgent surgery.

Key Words: *Cardiac CT angiography; left ventricular aneurysm; myocardial infarction; pseudoaneurysm; true aneurysm.*

Introduction

True LV aneurysms are defined as dyskinetic outpouchings of the ventricular wall containing endocardium, epicardium and fibrous myocardial tissue (1,2). They develop in fewer than 5% of the patients following ST-elevation myocardial infarction (STEMI), typically within 5 days to 3 months (1,3). Pathophysiology involves infarct expansion and remodeling, resulting in thinning and bulging of scarred myocardium during systole (4).

In contrast, LVPA is a contained myocardial rupture, with the sac wall composed predominantly of pericardium and fibrous adhesions (1,5). LVPA carries a high risk of rupture and sudden death, often requiring urgent surgery (5,6).
Morphologically, LVTA usually presents with a broad neck (orifice: cavity ratio ~0.9–1.0) and preserved myocardial continuity, whereas LVPA exhibits a narrow neck (ratio 0.25–0.5) and lacks myocardium in the sac wall (1,5,7). Cardiac CT angiography offers high spatial resolution and multiplanar assessment, enabling accurate measurement of the neck and cavity dimensions, wall calcification, thrombus, and coronary artery course (1,5,8). Cardiac magnetic resonance imaging (MRI) further enhances diagnostic accuracy by providing superior myocardial tissue characterization, enabling differentiation between fibrotic scar and viable myocardium, and confirming the integrity of myocardial layers in suspected aneurysms (3,9).

Case Presentation

A 68-years-old male with a history of anterior STEMI 10 weeks earlier, treated with primary PCI to the proximal left anterior descending artery, presented with progressive exertional dyspnea. Examination revealed a laterally displaced apical impulse and no audible murmurs. ECG showed persistent ST-segment elevation and deep Q waves in leads V2–V5.
CTA Protocol: A retrospectively ECG-gated CTA was performed on a 128-slice scanner following intravenous iodinated contrast injection. Multiplanar reconstructions were obtained.

CTA Findings, Figure 1a–c:

- A large, broad-necked aneurysmal dilatation of the anterolateral LV wall measuring 49 × 41mm in maximal dimensions.
- The neck measured 43mm, giving an orifice-to-cavity diameter ratio of ~0.9, consistent with a true aneurysm morphology (1,5).
- The aneurysm wall was thinned but continuous with adjacent myocardium, with traceable coronary arteries along its course.
- Traceable specks of mural calcifications along the sac wall indicated chronicity.
- No pericardial effusion, hemopericardium, or active contrast extravasation was present.
- No mural thrombus was detected.

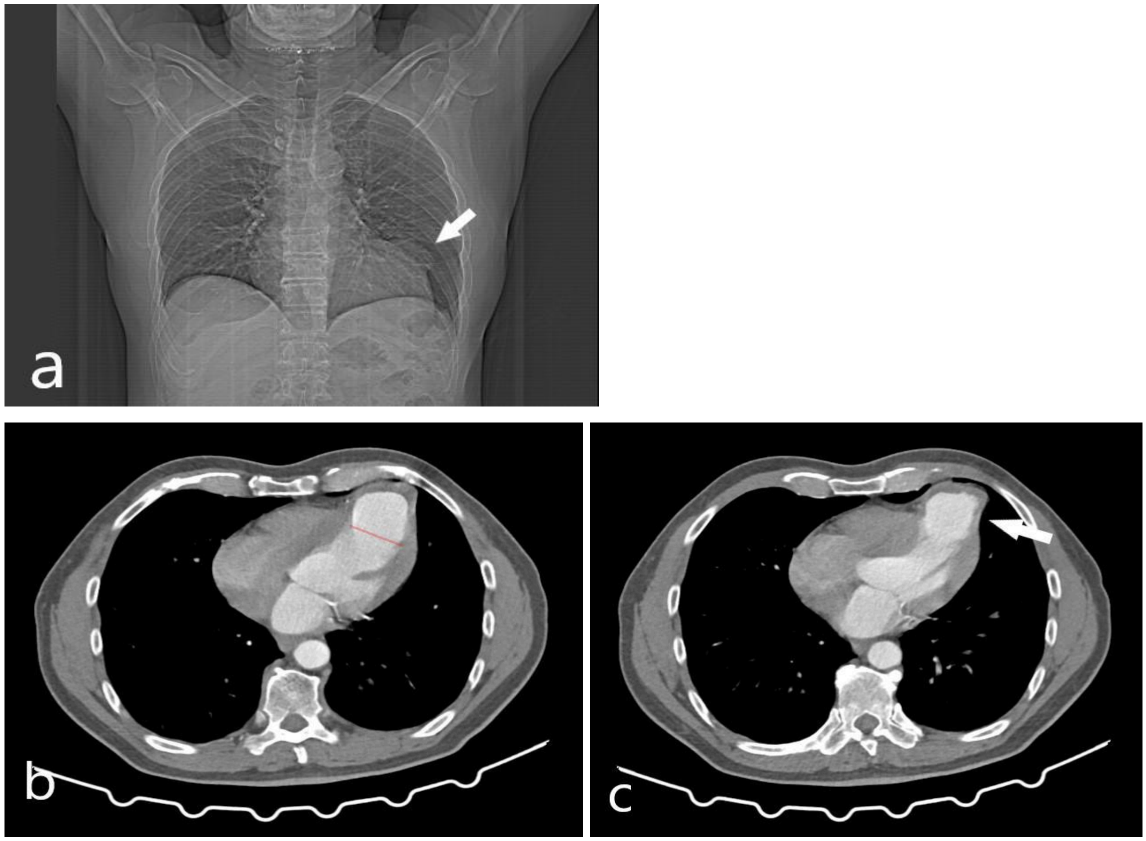

Figure 1. (a) Chest radiograph demonstrating a focal anterolateral outpouching along the left ventricular contour, consistent with aneurysmal dilatation. (b) and (c) Axial cardiac CT angiography images showing a broad-necked aneurysm of the anterolateral left ventricular wall, with preserved myocardial continuity and tiny specks of mural calcifications.

Given the absence of complications or rupture risk indicators, conservative management with optimized heart failure therapy was continued.

Discussion

CTA is increasingly recognized as a key tool in the evaluation of LV outpouchings, particularly when echocardiography is inconclusive or when detailed anatomical assessment is required (1,5,8).

Differentiating LVTA from LVPA on CTA, *Table 1*:

• Neck size: Broad neck (ratio ~0.9–1.0) in LVTA; narrow neck (0.25–0.5) in LVPA (1,5,7).

• Wall composition: LVTA shows myocardial continuity and may have mural calcification; LVPA walls lack myocardium and are pericardial in nature (1,5).

• Coronary arteries: In LVTA, coronary vessels can be traced along the aneurysm wall; LVPA walls are avascular (1,5).

• Additional features: Presence of chronic mural thrombus or calcification suggests LVTA, whereas pericardial effusion/hemopericardium favors LVPA (2,5).

Table 1. Imaging Features of Left Ventricular True Aneurysm (LVTA) vs. Left Ventricular Pseudoaneurysm (LVPA).

Feature	LV True Aneurysm (LVTA)	LV Pseudoaneurysm (LVPA)
Neck size (orifice: cavity ratio)	Broad (~0.9–1.0)	Narrow (0.25–0.5)
Wall composition	Myocardium + endocardium + epicardium (continuous wall)	Pericardium and fibrous tissue only; no myocardium
Wall thickness	Thinned but intact	Thin, often discontinuous
Coronary artery course	Coronary vessels traceable along aneurysm wall	No coronary vessels in sac wall
Calcification	Common in chronic cases	Rare
Thrombus	May be present chronically	May be present
Pericardial effusion / hemopericardium	Rare	Often present
Rupture risk	Low	High

Comparison to Other Imaging Modalities:
While CTA provides high spatial resolution, multiplanar capabilities, and precise anatomical measurements, other imaging modalities play important roles:

- Transthoracic echocardiography (TTE): Widely available, rapid and non-invasive; useful for initial screening but limited by acoustic windows and operator dependency.
- Transesophageal echocardiography (TEE): Superior resolution for posterior structures; invasive and less suitable for unstable patients.
- Cardiac MRI (CMR): Gold standard for myocardial tissue characterization; allows detection of fibrosis, infarct size and integrity of myocardial layers; limited availability, longer acquisition time, and contraindicated in certain patients (e.g., with incompatible devices).
- CTA: Especially valuable when MRI is unavailable or contraindicated, or when precise measurement of the aneurysmal neck and detection of calcification are needed.

Clinical Decision-Making and Follow-Up:
In stable LVTA without high-risk features, conservative management is often appropriate. This includes optimized heart failure therapy, anticoagulation when indicated, and periodic imaging surveillance (e.g., echocardiography or CTA every 6–12 months, or sooner if symptoms change). Surgery is reserved for refractory heart failure, systemic embolization or malignant arrhythmias

(3,8). In contrast, suspected LVPA generally warrants urgent surgical repair given its high rupture risk.
In this case, CTA demonstrated all hallmarks of a chronic LVTA: broad neck, preserved myocardial continuity, specks of mural calcification and absence of pericardial effusion. These findings aligned with previously reported CT differentiation criteria (1,5,8). The patient's stable clinical status and absence of rupture indicators supported a conservative management strategy with regular follow-up.

Conclusion

This case highlights the pivotal diagnostic value of cardiac CT angiography (CTA) in differentiating left ventricular true aneurysm (LVTA) from pseudoaneurysm (LVPA), particularly when other imaging modalities are unavailable or inconclusive. CTA provides high-resolution, multiplanar visualization, enabling precise measurement of the aneurysmal neck, evaluation of myocardial continuity, assessment of wall composition and identification of ancillary findings such as mural calcification or thrombus. Recognizing these morphological hallmarks allows for confident diagnosis, facilitates appropriate risk stratification, and supports tailored patient's management. In selected stable cases, accurate differentiation can prevent unnecessary urgent surgical intervention, while ensuring timely follow-up and intervention if clinical status changes.

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