# Multimodality Imaging in a Case of Chronic Massive Left Ventricular Pseudoaneurysm



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## INTRODUCTION

Left ventricular (LV) pseudoaneurysm is a rare complication of myocardial infarction with a high risk for mortality. The incidence has decreased in the era of early and aggressive revascularization. Surgical repair remains the cornerstone of treatment. We describe the case of a 72-year-old woman who presented for routine evaluation of atypical chest pain and was noted to have impressive findings of a chronic massive LV pseudoaneurysm with thrombus demonstrated through multimodality imaging. She was ultimately treated conservatively in view of her prohibitive surgical risk.

## CASE PRESENTATION

A 72-year-old woman was referred by her primary care physician for further evaluation of chronic atypical chest pain and dyspnea. She had a long-standing history of destructive rheumatoid arthritis on disease-modifying therapy with methotrexate 20 mg weekly and hydroxychloroquine 200 mg/d. Her other cardiac risk factors were significant for hypertension, dyslipidemia, and an extensive smoking history. She had no known ischemic heart disease.

The patient reported atypical chest pain several months before presentation and had markedly reduced exercise capacity. Her chest pain was described as brief, sharp, nonexertional, and transient, with episodes lasting up to 2 minutes at most. She denied any prolonged or severe episode of chest pain. She also reported dyspnea, although this was chronic and multifactorial because of her significant functional debilitation and heavy smoking history, with no acute change in symptomatology. Although she denied any clear heart failure symptoms such as peripheral edema and orthopnea, low cardiac output from impaired overall systolic function and coronary artery disease provided a strong suspicion in view of her cardiac risk profile. Her functional impairment was long-standing and had rendered her largely housebound.

Electrocardiography demonstrated sinus rhythm with a Q wave in lead III and T-wave inversions in leads III and aVF (Figure 1). Chest radiography revealed a normal cardiothoracic ratio with evidence of congestion on the posterior-anterior projection and a protuberant posterior LV contour on the lateral view (Figure 2).

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Transthoracic echocardiography was unexpectedly suspicious for a large inferolateral wall pseudoaneurysm with organized thrombus (Figure 3, Video 1). Her overall LV ejection fraction was difficult to estimate, but it was clear that she had a severely reduced ejection fraction in the setting of this large pseudoaneurysm.

Although transthoracic echocardiography was essentially diagnostic, further imaging was required for better anatomic delineation, surgical planning, and coronary artery status. She underwent retrospective helical cardiac computed tomography (CT), which confirmed a large pseudoaneurysm associated with rupture of the basal to mid-inferolateral/inferior segments measuring 83 × 83 × 72 mm, with a neck up to 36 × 56 mm (Figures 4 and 5, Videos 2 and 3). Delayed phase contrast demonstrated a significant filling defect consistent with organized thrombus. Severe right coronary artery disease was also demonstrated, with total occlusion at the mid segment and no significant stenosis in her other coronary arteries.

She was referred for consideration of surgical management of this large LV pseudoaneurysm. After heart team review and discussion with the patient and her family, she was deemed too high risk in view of her significant frailty and other medical comorbidities.

It was unclear what her prognosis would be at this stage given the chronicity of her pseudoaneurysm as well as the systemic embolization risk. The patient and family were keen to know her prognosis, and as such we performed limited noncontrast cardiac magnetic resonance imaging (MRI) to facilitate tomographic surveillance of possible pseudoaneurysm expansion for prognostication purposes. This further delineated massive pseudoaneurysm and organized thrombus (Figure 6, Video 4), with a severely dilated left ventricle and severely reduced ejection fraction. Accurate estimation of overall ejection fraction was not feasible by any modality, but it was clearly severely reduced (<30%) by visual estimation. Accordingly, conservative management was pursued, and she currently remains stable on optimal heart failure therapy.

## DISCUSSION

LV pseudoaneurysm occurs as a result of contained cardiac rupture limited by adherent pericardium.[1] The resultant aneurysm often has a thin, akinetic wall composed mainly of pericardium and fibrous tissue and hence poses a significant risk for rupture with high mortality.[1,2] This is in contrast to true aneurysms, which are formed from endocardium, myocardium, and pericardium and have less clinical and surgical urgency.[2] Differentiation between the two entities is of paramount importance because of the prognostic and management implications. The presumed risk for rupture is between 30% and 45% in the case of LV pseudoaneurysms.[1,3] Symptoms of LV pseudoaneurysm include congestive heart failure, chest pain, and embolism, but >10% are asymptomatic.[1,2] Pseudoaneurysms typically have a narrow neck with a ratio of the breadth in the wall to maximum diameter of <50%.[4] In contrast, a true aneurysm will have a broad neck.[4]

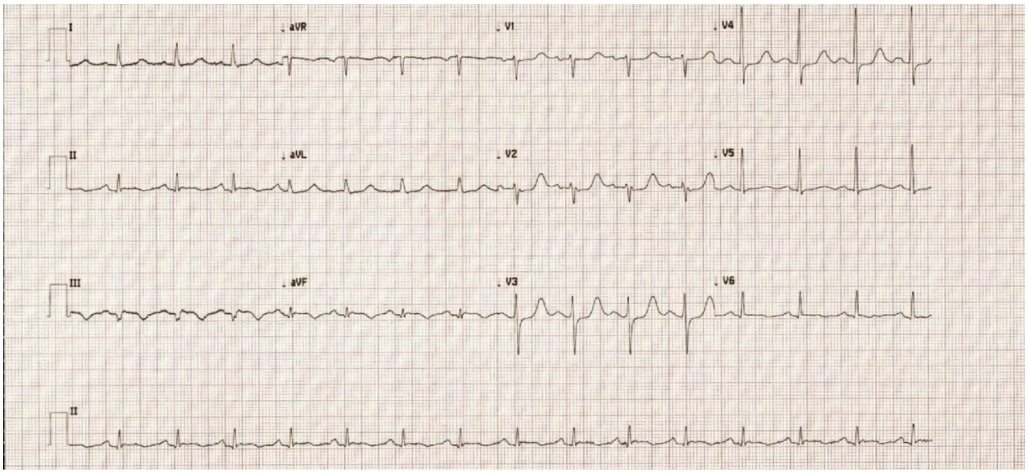


**Figure 1** Electrocardiogram demonstrating sinus rhythm with Q waves in lead III and T-wave inversions in leads III and aVF.

**Figure 2** Posterior-anterior and lateral views of chest radiograph with evidence of congestion and protuberant posterior LV contour (*arrow*).

Typically, the main etiology for this condition is transmural myocardial infarction, but other less common causes include postsurgical, trauma, and infection.[1,5] Early and aggressive revascularization has certainly reduced the incidence of this complication. The cause in our patient's case was presumably a remote silent myocardial infarction. Inferior myocardial infarction seems to account for twice as many cases as anterior infarctions, with subsequent pseudoaneurysmal formation on the inferoposterior surface of the left ventricle being more common.[1-3] One proposed explanation is that anterior rupture is more likely to lead to hemopericardium, shock, and death compared with posterior rupture, which is more likely to be contained by pericardium with inflammatory adhesions.[1,3] In contrast, true aneurysms generally tend to occur in the anterior and apical walls.[6]

Risk factors for the development of LV pseudoaneurysm include female sex, first occurrence of myocardial infarction, age > 60 years, and severe single-vessel coronary disease.[7] Rheumatoid arthritis and indeed chronic inflammation remain potent contributors to cardiovascular risk.[8] Through chronic inflammation, rheumatoid arthritis can cause endothelial and vascular dysfunction and resultant coronary artery disease. Chronic immunosuppressive therapy is well known to affect wound healing, but whether this might play a role in the extent and severity of our patient's pseudoaneurysm remains speculative. Indeed animal studies have suggested that corticosteroids may lead to myocardial scar thinning and possibly increased aneurysmal formation following myocardial infarction.[9]

LV angiography has traditionally been considered the best available test for the diagnosis of LV pseudoaneurysm, often because coronary angiography was necessary before surgery.[1] Transthoracic echocardiography remains important as a noninvasive means of diagnosis, and increasing use of multimodality imaging through cardiac CT and cardiac MRI often diminishes the need for upfront invasive angiography for diagnosis.[10] Although transthoracic echocardiography was essentially diagnostic in this case, further imaging with cardiac CT was required for improved anatomic delineation, surgical planning, and coronary artery status. However, once a decision of conservative treatment was taken, limited cardiac MRI was performed to facilitate tomographic surveillance of possible pseudoaneurysm expansion for prognostic purposes as per the patient's wishes. Lack of radiation was a clear advantage of cardiac MRI over cardiac CT for serial follow-up. In cases of smaller pseudoaneurysm, the sensitivity of