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CASE REPORT
Cardiovascular imaging

Case report: large left ventricular aneurysm with contained rupture and haemopericardium

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Background Recent advancements in cardiology have significantly decreased the incidence of post-myocardial infarction mechanical complications. When these sequelae occur, they can have high morbidity and mortality and may require aggressive intervention.

Case summary We describe a case of contained rupture of a large left ventricular aneurysm (LVA) presenting with syncope in a 60-year-old male with late presentation myocardial infarction (MI) 6 weeks prior on home triple antithrombotic therapy (TAT). Urgent pericardiocentesis along with imaging techniques including ultrasound, computed tomography angiography (CTA), and cardiac magnetic resonance imaging (MRI) were used for initial diagnosis. Definitive treatment was achieved with excision and repair of the LVA with return to prior functional status 1 month after intervention.

Discussion Highlights of this report emphasize the importance of differential diagnosis consideration of LVA with contained rupture in patient populations with prior late presentation MI and TAT. High clinical suspicion and thorough diagnostic workup with appropriate imaging are important to guide appropriate treatment interventions.

Keywords Left ventricular aneurysm • Myocardial ischaemia • Pericardial effusion • Cardiac imaging • Case report

ESC Curriculum 2.1 Imaging modalities • 2.2 Echocardiography • 2.3 Cardiac magnetic resonance • 2.4 Cardiac computed tomography • 3.2 Acute coronary syndrome

Learning Points

- To recognize the utility of various imaging modalities including transthoracic echocardiogram (TTE), CTA and cardiac MRI in the diagnostic investigation of LVA.
- To appreciate LVA management options and indications for surgical intervention.
- To consider haemopericardium secondary to contained LVA rupture as a potential complication of TAT in patients with recent myocardial infarction and left ventricular thrombus.

Introduction

Left ventricular aneurysm (LVA) is a well-described complication of late presentation myocardial infarction (MI) as a result of ventricular wall ischaemia.[1,2] Left ventricular aneurysm complications can be severe and include arrythmias, congestive heart failure, and rupture resulting in tamponade.[1,3] Unfortunately, treatment guidelines are lacking, which impacts the variability of individualized patient care. The impact of triple antithrombotic therapy (TAT) on LVA complications including haemopericardium is additionally understudied. This report highlights a case of LVA with contained rupture and haemopericardium following a late presentation MI in a 60-year-old male on TAT.

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Timeline

6 weeks prior to presentation	The patient was admitted to an outlying hospital for late presentation anterior ST-segment elevation myocardial infarction (MI). The patient received two drug-eluting stents during left heart catheterization (LHC). This hospitalization was complicated by left ventricular (LV) thrombus for which triple antithrombotic therapy (TAT) was started.
Day 0	The patient presented to the emergency department for a syncopal episode with reported ventricular tachycardia. Transthoracic echocardiogram revealed a large left ventricular aneurysm (LVA) and pericardial effusion. The patient underwent urgent pericardiocentesis.
Day 2 and 3	Further cardiac imaging with computed tomography angiography (CTA) of the chest and cardiac magnetic resonance imaging (MRI) was completed for further LVA evaluation. Left heart catheterization was completed to rule out coronary artery disease.
Day 4	The patient undergoes successful surgical intervention with excision and repair of the LVA.
Day 8	Patient was discharged home in good condition with dual-antiplatelet therapy (DAPT) and guideline-directed medical therapy (GDMT).
Day 28	Patient was seen at outpatient follow-up appointment. Patient was doing well without signs or symptoms of heart failure or arrhythmias. He is cleared to return to work.

Case presentation

The patient was a 60-year-old male who presented to the emergency department (ED) for a syncopal episode in the setting of ventricular tachycardia while at his cardiologist's outpatient office. The patient has a past medical history of late presentation anterior ST-segment elevation MI 6 weeks prior to this event. During that time, he reported 1 week of anginal symptoms before his MI. He received two drug-eluting stents in the non-culprit right coronary artery and one in the culprit proximal left anterior descending artery. At time of his prior hospital discharge, echocardiogram demonstrated a left ventricular ejection fraction (LVEF) of 40–45% and an apical thrombus. He received antiplatelet therapy with aspirin 81 mg daily and ticagrelor 90 mg twice daily, as well as rivaroxaban 2.5 mg twice daily for the apical thrombus.

On admission following his syncopal event, the patient was haemodynamically stable in normal sinus rhythm on an amiodarone infusion. A physical exam was significant for a prominent and laterally displaced point of maximal impulse, the presence of hepatojugular reflux, and muffled heart sounds.

Laboratory findings were significant for a haemoglobin of 11.9 g/dL (normal range is 13.5–17.5 g/dL), an NT-pro BNP of 2549 pg/mL (normal value is <300 pg/mL), and a high sensitivity troponin T of 26 ng/L (normal value is <59 ng/L). Initial renal function, electrolytes, and liver function testing were within normal limits. Chest radiography showed an enlarged cardiac silhouette. Electrocardiogram revealed normal sinus rhythm with pathologic Q waves in inferior and anteroseptal leads along with low-voltage QRS complexes with an amplitude <5 mm in the limb leads and 10 mm in the chest leads (see Supplementary material online, *Figure S1*). An urgent TTE showed a large circumferential pericardial effusion, severe left ventricular (LV) systolic dysfunction with an LVEF of <15%, and a large apical LVA with pathologic thinning and diastolic deformity (*Figure 1* and Supplementary material online, *Video S1*).

The patient was initiated on intravenous amiodarone, and anticoagulation was held in the setting of the pericardial effusion with associated LVA. Urgent diagnostic and therapeutic pericardiocentesis was completed with the removal of 600 mL of sanguineous fluid. Incomplete effusion drainage was noted following the procedure suggesting loculated characteristics of the haemopericardium. Cardiothoracic surgery was consulted given the concern for contained LVA or pseudoaneurysm rupture as the underlying aetiology.

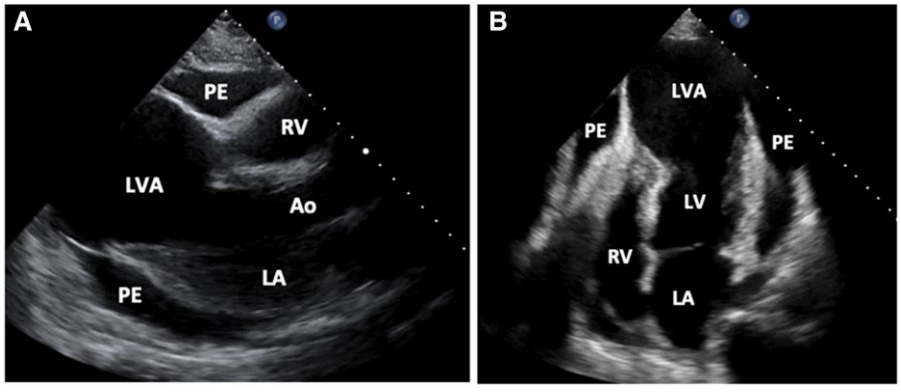

Figure 1 Admission parasternal long (*A*) and apical four-chamber (*B*) TTE images displaying the large LV aneurysm (LVA) and surrounding pericardial effusion (PE).

Subsequent computed tomography angiography (CTA) of the chest showed a moderate volume pericardial effusion and a large lobulated LVA measuring 74 mm × 84 mm × 79 mm without signs of active contrast extravasation into the pericardial space (*Figure 2*). Cardiac magnetic resonance imaging (cMRI) was suspicious for contained ruptured LVA; it showed striking dilation of the mid to distal LV wall with severe myocardial thinning and difficulty identifying myocardium at the apex (*Figure 3* and Supplementary material online, *Video S2*). Interval development of a large, mobile LV thrombus was also noted. Left heart catheterization revealed patency of all previously placed drug-eluting stents (see Supplementary material online, *Figure S2*).

During his hospitalization, the patient remained in the medical intensive care unit for bed rest and haemodynamic monitoring. Cardiothoracic surgery performed excision and repair of the LVA with placement of an LV endovascular patch (see Supplementary material online, *Figure S3*). Intraoperative findings include the presence of a small rent at the apex of the aneurysm, which was tightly adhered to the overlying pericardium. Pathology reports confirm partially granular myocardial tissue composition of the specimen.

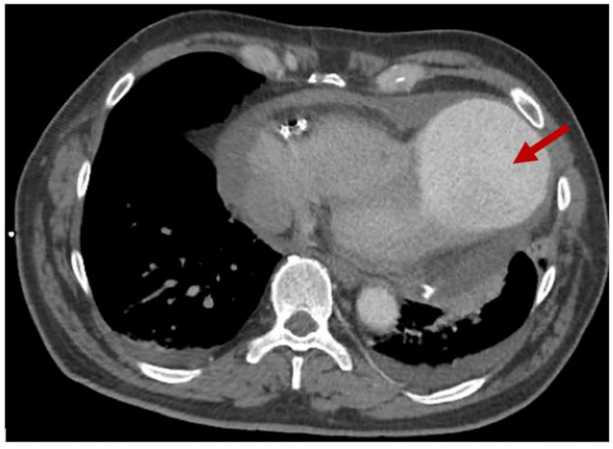

Figure 2 Computed tomography angiography of the chest in axial plane demonstrating a moderate volume pericardial effusion and a large lobulated LV aneurysm measuring 74 mm × 84 mm × 79 mm.

Post-operative TTE was notable for an improved LVEF of 61% with continued apical akinesis and small aneurysm with possible small associated thrombus (*Figure 4* and Supplementary material online, *Video S3*). CTA revealed post-surgical changes with resolution of the pericardial effusion without evidence of an LV thrombus (*Figure 5*). Guideline-directed medical therapy was initiated with metoprolol succinate 25 mg daily, losartan 25 mg daily, and spironolactone 25 mg daily; statin was initially held due to reported intolerance. Oral amiodarone 200 mg daily was continued for 1 month for arrhythmia management. Antithrombic therapy with aspirin 81 mg daily and clopidogrel 75 mg daily was started. Anticoagulation was held in the setting of completed left atrial appendage ligation and without signs of further thrombus.

The patient was clinically well without further symptomatic concerns of haemopericardium or heart failure 1 month post-operatively. The patient continued to participate well in his cardiac rehabilitation program and was cleared to return to work.

Discussion

This report details the presentation, diagnostic evaluation, and management of a large LVA with associated rupture and haemopericardium. LVAs are mechanical complications of MI characterized by dyskinetic ventricular outpouching composed of fibrotic myocardium. They have a recently reported incidence of 0.2% following acute MI, which has greatly declined secondary to the wide availability of percutaneous intervention (PCI).[1] The clinical presentation of aneurysms is variable from asymptomatic to sudden death. Providers should have a low threshold to suspect these diagnoses in patients with prior late presentation MI.

LVAs, unlike pseudoaneurysms, have a low propensity for rupture and therefore can be observed clinically to determine the need for intervention. Risk factors for LVA rupture include female sex, age >70 years, the first occurrence of MI, prior MI with anterior location or transmural infarction, or pericardial effusion >10 mm.[2] Complications of both LVA and pseudoaneurysms include thromboembolization, heart failure, ventricular arrhythmias, pericardial effusion with tamponade, and LV rupture.[4] These complications could be managed via surgical intervention. If surgery is not performed, conservative management options include guideline-directed medical therapy (GDMT) for associated heart failure and consideration for percutaneous repair.[3,5]

Diagnostic workup with differentiation between aneurysm and pseudoaneurysm is imperative in guiding appropriate treatment.[6] In the case outlined above, chest radiography, TTE, and CTA helped guide clinical

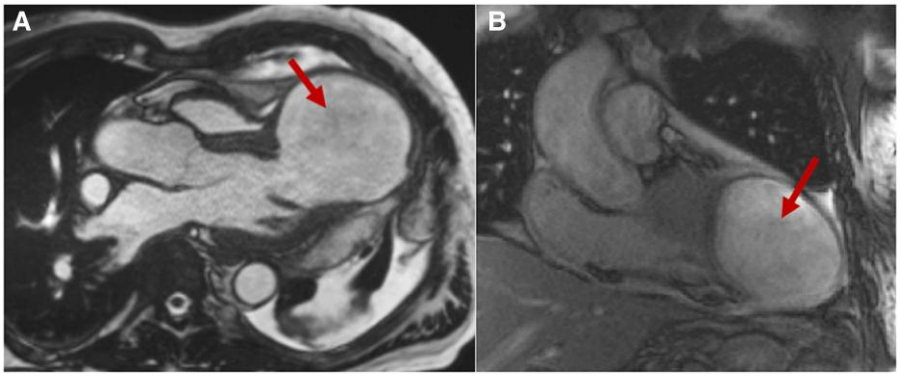

Figure 3 Cardiac magnetic resonance imaging three-chamber cine image in axial plane (*A*) and true FISP image in coronal plane (*B*) with large left ventricular aneurysm and concern for lack of myocardial tissue present at the apex.

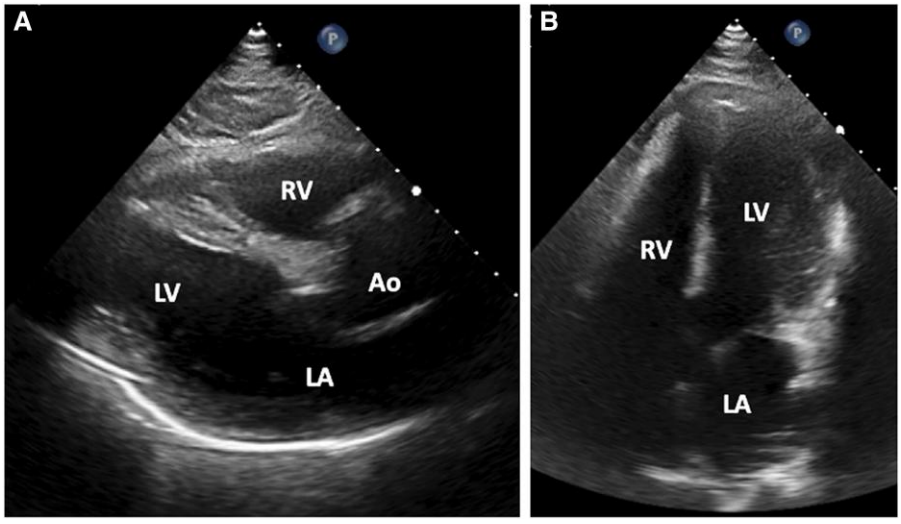

Figure 4 Post-operative parasternal long (*A*) and apical four-chamber (*B*) transthoracic echocardiogram images displaying resolution of large left ventricular aneurysm and pericardial effusion.

suspicion for contained mechanical rupture, however non-confirmatory in proving differentiation between the two pathologies. Cardiac magnetic resonance imaging successfully defined the presence of LV myocardium with a small apical rupture contained by overlying pericardium.

While LVAs are the most prevalent post-MI mechanical complication, reported incidences of contained aneurysm rupture presenting with haemopericardium are rare.[7,8,9,10] Thought should be given to the possible impact of TAT on the pathogenesis of this complication.

In this instance, TAT was initiated on discharge from an outlying hospital for treatment of an LV thrombus.[11] While large volumes of published data and current guidelines are available to establish increased bleeding risks with TAT in post-PCI populations with atrial fibrillation or venous thromboembolism, few data are available to discuss risks and benefits of TAT in the circumstance presented in this case.[11,12] It should be noted that available data do support individualized durations of TAT based on bleeding risk. Data also support the use of direct-acting oral anticoagulants over warfarin and the use of clopidogrel over alternate P2Y12 inhibitors due to decreased bleeding events.[13,14]

In summary, we report a case of a large LVA with contained rupture and haemopericardium in a 60-year-old male on TAT. LVAs can be evaluated with multimodal imaging to confirm clinical suspicions and guide management. Further evaluation of TAT use for LV thrombus should be further evaluated for safety and possible relationship to haemopericardium development.

Figure 5 Post-operative computed tomography angiography demonstrating expected post-surgical changes with repair of left ventricular aneurysm with notable resolution of the prior pericardial effusion and without left ventricular thrombus present.

Lead author biography

Dr Aimee Willett is a current resident physician completing her training in internal medicine at OhioHealth Riverside Methodist Hospital in Columbus, Ohio. She completed medical school at Edward Via College of Osteopathic Medicine in Blacksburg, Virginia. Following completion of residency, Dr Willett hopes to pursue further fellowship training in cardiology, contribute to medical education, and continue to pursue scholarly activity through research. Outside of medicine, Dr Willett enjoys spending time with family and friends and running and is an avid reader.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports*.

Consent: The authors confirm that written consent for submission and publication of this case report including images and associated

text has been obtained from the patient in accordance with COPE guidelines.

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