

Not Always Black and White – Left Ventricular Aneurysm Formation Following Myocardial Infarction

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Abstract Left ventricular (LV) aneurysms and pseudoaneurysms are two complications of myocardial infarction (MI) that can lead to death or significant morbidity. Despite the availability of advanced imaging techniques, the differential between true aneurysms and pseudoaneurysms is not always binary. Thinned myocardium, small myocardial discontinuities and the differentiation between intramural and cavity thrombus can pose particular difficulties particularly in the setting of transmural infarction.

Key words Aneurysm, Pseudoaneurysm, Acute myocardial infarction, diagnosis

Introduction

Left ventricular (LV) aneurysms and pseudoaneurysms are two complications of myocardial infarction (MI) that can lead to death or significant morbidity (1). In true LV aneurysm ventricular expansion includes all the cardiac layers, usually with a large segment involved. LV pseudoaneurysm is formed when cardiac rupture is contained by adherent pericardium or scar tissue, with no myocardial tissue (2). The clinical presentation can be nonspecific, including congestive heart failure, chest pain, dyspnea or arrhythmia leading to a delay in the diagnosis (3). Multimodality imaging is paramount to provide comprehensive assessment, allowing for appropriate therapeutic decision-making.

Case report

A 75-year-old woman presented with symptoms of numbness and weakness in her right hand. She was shown to have multiple cerebral, splenic and renal infarcts with echocardiography showing a dilated left ventricle with thinning of a "true" LV apical aneurysm with superimposed thrombus. She was commenced on intravenous heparin pending a coronary angiogram which later showed an occluded left anterior descending artery (LAD). Cardiac magnetic resonance (CMR) imaging suggested that the aneurysm in fact presented a contained apical myocardial rupture (Figs 1A + B). Unfortunately, the patient was considered to be high risk for surgical intervention and was transferred to our institute for consider-

ation of structural intervention (Parachute LV partitioning device).

A further high-resolution 3T CMR was performed to differentiate infarcted myocardium from the blood pool (Figs. C+D). The size of the suspected pseudoaneurysm precluded treatment with a Parachute device and high-risk surgical intervention was subsequently performed to prevent progressive heart failure and an uncontained rupture. Here, the aneurysm was freed from the pericardium, revealing no rupture, excised and repaired with bovine pericardium. She was discharged 20 days later without event and a pre-discharge CMR scan showing a good result from surgery (Figs. E+F).

Despite the availability of advanced imaging techniques, the differential between true aneurysms and pseudoaneurysms is not always binary. Thinned myocardium, small myocardial discontinuities and the differentiation between intramural and cavity thrombus can pose particular difficulties particularly in the setting of transmural infarction. In these cases, consideration an amalgamation of clinical and anatomical data is required to resolve discrepancies.

References

1. Lorusso R, Matteucci M, Lerakis S, et al. Postmyocardial Infarction Ventricular Aneurysm: JACC Focus Seminar. *J Am Coll Cardiol* 2024; 83(19):1-19.
2. Inayat F, Ghani AR, Riaz I, et al. Left Ventricular Pseudoaneurysm: An Overview of Diagnosis and Management. *J Investig Med High Impact Case Rep*. 2018; 6:2324709618792025.
3. Frances C, Romero A, Grady D. Left ventricular pseudoaneurysm. *J Am Coll Cardiol* 1998; 32:557-561.

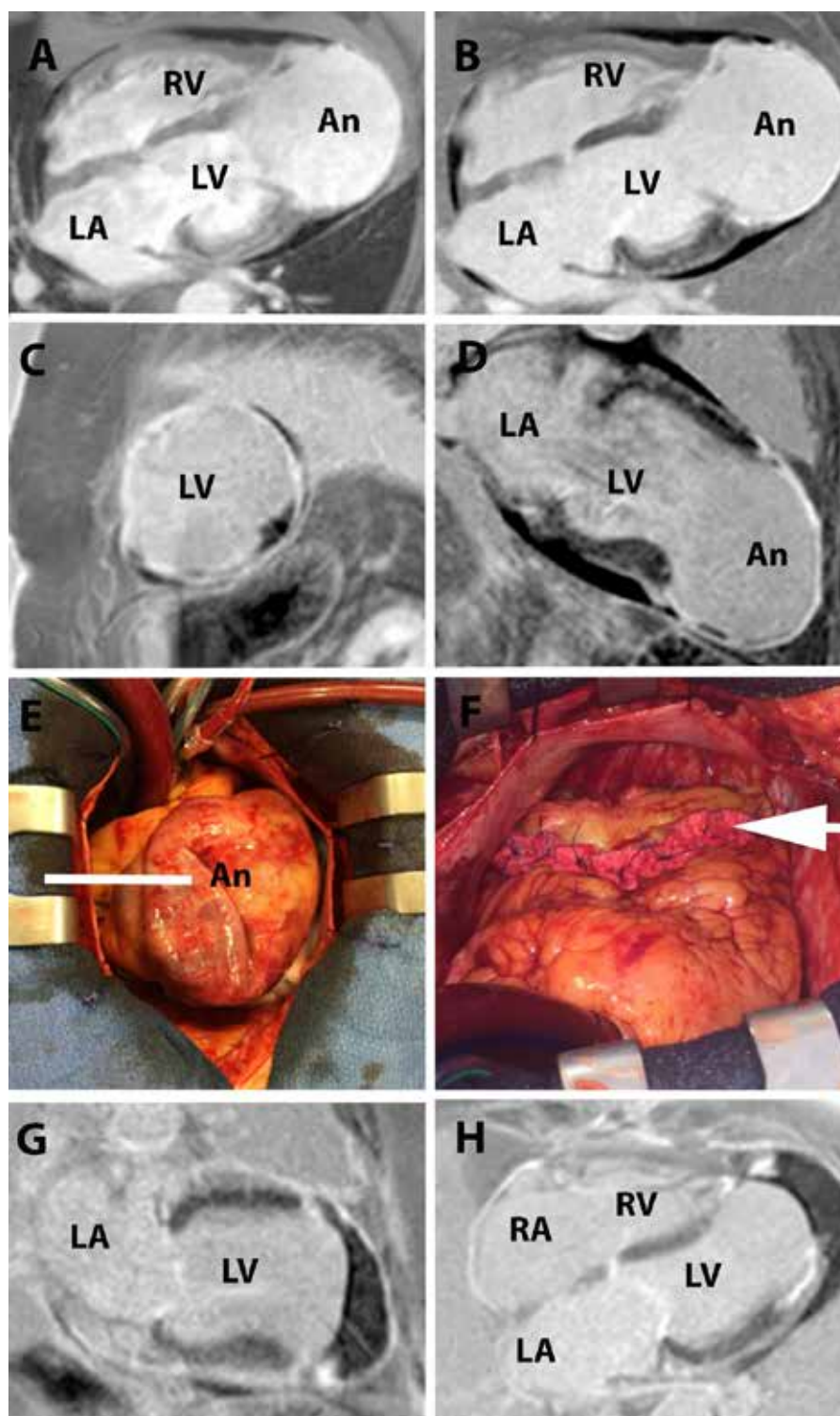


Figure 1. Cardiovascular magnetic resonance scan

A - 4-chamber phase-sensitive inversion recovery (PSIR) late gadolinium enhancement (LGE) with optimised inversion time (based on Look-Locker sequence) to null viable myocardium - demonstrating marked left ventricular (LV) apical dilatation. **B** - 4-chamber PSIR sequence with magnetisation transfer contrast preparation to enhance the contrast between the LV blood and thin apical scar, **C** - shows the short axis view showing microvascular obstruction in the interior wall (red arrow), with thrombus adherent to the inferolateral left ventricular wall (black arrow). **D** - 2-chamber PSIR reconstruction demonstrating the pericardial effusion in black. **C** and **D** suggested a large contained rupture of the left ventricle with the potential breach being located in the vicinity of the apical inferoseptum and apical anterior wall. The pseudoaneurysm measured 7.4 x 6.7 cm with an area of 40 cm². Areas of thrombus were also seen in the apical infero-lateral wall measuring 3 x 1 cm with multiple smaller areas seen in the apical septal segment, **E** and **F** shows the intraoperative appearance (**E**) of the aneurysm (open arrow) and subsequent repair (**F**) of the aneurysm with bovine pericardium (closed arrow), **G** and **H** show the post-operative CMR images in the 2-chamber (**G**) and 4-chamber (**H**) views. The apical aneurysm has been excised and replaced with a pericardial patch. A small haematoma is seen within the pericardial sack.

LA denotes left atrium, LV – left ventricle, RA – right atrium and RV – right ventricle.