Case Report

Successful percutaneous closure of post myocardial infarction left ventricular ruptured pseudoaneurysm after failed surgical repair

Haliah Z. Alshehri (MD).*, Tariq S. Momenah (MD, FACC)†, Abdulaziz AlBaradai (MD, FRCS)‡, Ayman Sallam (MD)§, Mohammad A. Alassal (MD)¶, Samih Lawand (MD, FACC, FRCP)¶

* Adult Cardiology Department, Prince Salman Heart Center, King Fahad Medical City, Riyadh, Saudi Arabia
† Pediatric Cardiology Department, Prince Salman Heart Center, King Fahad Medical City, Riyadh, Saudi Arabia
‡ Cardiac Surgery Department, Prince Salman Heart Center, King Fahad Medical City, Riyadh, Saudi Arabia

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A B S T R A C T

Left ventricular pseudoaneurysms occur as a consequence of left ventricular free wall rupture contained by pericardium. This clinical situation is an uncommon but lethal complication of acute myocardial infarction. Surgery usually is the preferred therapeutic option but is associated with significant perioperative risk. We present a case of successful percutaneous closure of left ventricular ruptured pseudoaneurysm post myocardial infarction in a patient who failed two previous surgical repairs.

Learning objective: Recently there has been some published experience regarding percutaneous closure of left ventricle pseudoaneurysm as an alternative to surgical repair in patients at high operative risk. To the best of our knowledge this is the first reported case that demonstrates successful percutaneous closure of ruptured pseudoaneurysm after failed surgical repairs.

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Introduction

Rupture of left ventricular (LV) pseudoaneurysm may result in cardiac tamponade. Survival depends primarily upon rapid recognition and prompt management. Emergency surgical intervention is frequently the preferred therapeutic option. Percutaneous closure provides an alternative option for high-risk surgical candidates.

Case report

A 45-year-old previously healthy woman presented to our Emergency Department (ED) with chest pain of five days’ duration. On admission she was tachycardic with systolic arterial blood pressure of 60 mm Hg. A 12-lead electrocardiogram (ECG) revealed recent inferolateral myocardial infarction (MI). Transthoracic echocardiography (TTE) demonstrated massive pericardial effusion with signs of tamponade and LV posterolateral pseudoaneurysm (Fig. 1A). Fluid and inotropic agents were given immediately. After hemodynamic stabilization, coronary angiogram revealed normal left and right coronary arteries except for a very small inferior branch of the obtuse marginal vessel involved with severe disease (Fig. 1B). The left ventricular angiogram demonstrated infero-basal pseudoaneurysm (Fig. 1C). As soon as leaking pseudoaneurysm was diagnosed, the patient was transferred immediately to the operating room. After pericardiotomy, a large amount of dark blood and a clot were evacuated and the myocardial tear was identified and successfully repaired using Cortex strips with prolene 2-0 with Teflon pledgets. She tolerated the procedure without complication. On the tenth postoperative day the patient was found to be hypotensive and tachycardic. At this point, a bedside TTE showed reaccumulation of large pericardial effusion and it was evident that the patient had ruptured myocardium for the second time for which she underwent redo surgical repair. Intraoperatively another tear in the posterior LV wall was found after evacuation of bloody pericardial collection. The repair was done to the perforated area using Teflon strips and prolene 3-0 with Teflon pledgets. The recurrent myocardial rupture was attributed to evolution of the massive posterior infarction with recurrence of rupture which is in the same territory of the circumflex artery. The patient had uneventful post-operative recovery, TTE 4 weeks post second surgical repair revealed no significant pericardial effusion (Fig. 1D) and she was discharged home in stable condition after one week.

One month later she presented again to the ED with a tender pulsatile epigastric mass.

Clinical examination showed systolic arterial blood pressure of 95 mm Hg with no clinical signs of tamponade. A large clot
behind the posterior LV wall was demonstrated by TTE. Chest and abdomen contrast-enhanced computed tomography (CT) showed a large hematoma around the left ventricle with a size of approximately (13 cm × 9 cm × 9 cm) that had ruptured in the mediastinum extending to the upper abdomen as well as the abdominal wall and it was partially connected to the left ventricle via a small tear (Fig. 2). Because the patient was deemed high risk for redo surgical repair, we planned percutaneous closure. Urgent cardiac catheterization and LV angiogram were performed demonstrating basal posterior LV wall pseudoaneurysm with contrast flow through a narrow neck into the large blind sac (Fig. 3A and B). Successful closure of the defect was performed under
transesophageal echocardiography (TEE) and fluoroscopy guidance. A 14-mm Amplatzer muscular ventricular septal defect occluder (AGA Medical Corporation, Golden Valley, MN, USA) was deployed through an 8-F delivery sheath and advanced retrogradely from the right femoral artery into the LV and then into the pseudoaneurysm (Fig. 3C). Subsequent LV angiogram and TEE documented no obvious leak (Fig. 3D). The patient had an uneventful postprocedural course.

Contrast enhanced CT chest and abdomen was obtained three weeks later which demonstrated a well-seated device with no active contrast flow, additionally there was a remarkable reduction in the size of the pericardial hematoma, upper abdomen, and anterior abdominal wall hematoma (Fig. 4). At six months follow up, she was doing well with no symptoms and TTE revealed Amplatzer device in situ with no pericardial effusion.

**Discussion**

Rupture of LV free wall occurs more often than rupture of the interventricular septum or papillary muscle following acute MI [1]. Risk factors for myocardial rupture include hypertension, first infarction, anterior infarction, large transmural infarct, female sex, and older age [2]. It usually occurs within the first five days after MI in approximately 50% of cases and within two weeks in more than 90% of cases [3]. Rupture more frequently involves the left ventricle than the right ventricle, and rarely involves the atria. Complete rupture frequently leads to hemopericardium and death from cardiac tamponade. Incomplete or subacute rupture can occur when the ventricular perforation is contained by pericardium or hematoma which progress to formation of LV pseudoaneurysm. The commonest location is in the inferior or posterolateral wall after inferior MI. Clinical manifestations associated with pseudoaneurysm of LV include recurrent chest pain, dyspnea, transient hypotension, sudden cardiac death, tamponade, heart failure, and arrhythmia; systemic embolism, and murrums are present in about two-thirds of patients [4,5]. The diagnosis needs to be established early, since these aneurysms are prone to rupture. Angiography of the LV and coronary arteries is the most reliable method for diagnosis of a pseudoaneurysm which demonstrates a narrow neck leading to a saccular aneurysm with no surrounding coronary arteries [6]. TTE is commonly the preferred imaging modality when LV free wall rupture with or without associated pseudoaneurysm is suspected [7]. The most common finding is pericardial effusion and its absence excludes ventricular rupture. Pseudoaneurysms have a narrow neck, typically less than 40% of the maximal aneurysm diameter that causes an abrupt interruption in the ventricular wall contour. Additionally color flow imaging, pulsed Doppler and contrast agent may be useful in the assessment of flow characteristics at the presumed rupture site.
Our patient had TTE in the first hospital admission which demonstrated typical findings described above. In stable patients, cardiovascular magnetic resonance imaging and multidetector CT have also been shown to be effective and may help to delineate the anatomical location of LV wall rupture and aneurysmal change, thereby enabling planned surgical intervention [8,9].

Survival depends mainly on the early recognition and immediate therapy of myocardial rupture. Because patients frequently present with nonspecific symptoms, a high index of suspicion is needed to make the diagnosis. Medical therapy for hemodynamic stabilization includes fluids, inotropic support, vasopressors, pericardiocentesis, and intra-aortic balloon pump counterpulsation is required. Immediate surgery is indicated to relieve cardiac tamponade and prompt repair for pseudoaneurysm and ruptured myocardium [10,11].

Recently there has been some published experience regarding percutaneous closure of LV pseudoaneurysm as an alternative to surgical repair in patients at high operative risk [12,13]. This is a rare case because the pseudoaneurysm rupture did not lead to pericardial tamponade which could be explained by pericardial space obliteration as a consequence of her previous surgery. Instead, it ruptured in the mediastinum with extension to upper abdomen and abdominal wall. There was no clear etiology for recurrent myocardial rupture in our case; we thought it was most likely attributed to recent infarction. To our knowledge this is the first reported case demonstrating successful percutaneous closure of ruptured LV pseudoaneurysm after prior surgical repairs.

**Conclusion**

Rupture of the LV free wall associated with pseudoaneurysm remains one of the major causes of death after acute MI. The diagnosis requires primarily high index of suspicion since survival depends mainly upon early diagnosis and prompt management. Emergency surgery is usually the preferred therapeutic option. However, percutaneous closure is an alternative in patients at high operative risk.

**Disclosure**

None.

**Conflict of interest**

Authors declare no conflict of interest.

**References**


