

## CASE REPORT

# Left ventricular pseudoaneurysm. A diagnostic and surgical challenge

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Left ventricular pseudoaneurysm is a mechanical complication after an acute myocardial infarction. Early diagnosis is important because of high-risk for rupture. We present the case of a 65-year-old patient with recent acute myocardial infarction diagnosed with left ventricular aneurysm. Intraoperatively, a pseudoaneurysm was evident. The defect was successfully repaired using a Dacron patch with adequate results.

**Key words:** Acute Mechanical Complications, Myocardial Infarction; Aneurysm; Pseudoaneurysm; Left ventricle.

El pseudoaneurisma del ventrículo izquierdo es una complicación mecánica después de un infarto agudo de miocardio. El diagnóstico temprano es importante debido al alto riesgo de rotura. Presentamos el caso de un paciente de 65 años con un infarto agudo de miocardio reciente diagnosticado de aneurisma del ventrículo izquierdo. Intraoperatoriamente, se evidenció un pseudoaneurisma. El defecto se reparó con éxito utilizando un parche de Dacron con resultados adecuados.

**Palabras clave:** Infarto miocárdico, complicaciones mecánicas agudas; Aneurisma; Pseudoaneurisma; Ventrículo izquierdo.

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**A**mong acute myocardial infarction mechanical complications, ventricular septal defect, left ventricle free wall rupture, left ventricular aneurysm and pseudoaneurysm are described [1,2].

The true ventricular aneurysm is defined as a ventricular dilation which keeps all its layers from endocardium to epicardium, only thinning and being smaller than 5mm. The area is normally akinetic or dyskinetic.

Sometimes a free ventricular wall rupture can be contained by the pericardium leading to the formation of a ventricular pseudoaneurysm with pericardium and clot. It can be acute having a high risk of rupture, or chronic presentation normally an incidental finding in symptomatic patients [2,3].

Left ventricular aneurysms and pseudoaneurysm incidence is normally underestimated because most patients will die of left ventricular free wall rupture leading to tamponade and cardiac arrest before the diagnosis, and diagnosed after death. The reported incidence is between 2 and 4% [1,2].

Of note, to make the difference between aneurysm and pseudoaneurysm is of paramount importance because the lat-

ter needs urgent correction due to rupture high risk, whereas the true aneurysm can be treated as an elective procedure [3,4].

We present a case of a 65-year-old patient initially diagnosed as a true ventricular aneurysm, finding a pseudoaneurysm during surgical intervention.

## CLINICAL CASE

A 65-year-old male, previously diagnosed with high blood pressure, diabetes mellitus, active smoker and chronic ischemic heart disease, on medical treatment. He was diagnosed in 2017 as inferior ST elevation myocardial infarction treated by right coronary artery angioplasty and stent.

A transthoracic echocardiogram was done on September 2019, finding inferior akinesia, a 66x23mm cavity with thrombus (**Fig. 1**). Coronary angiography reported a 75% lesion in the left anterior descending artery, a 90% lesion in the distal circumflex and a 60% intra-stent stenosis in the right coronary artery. The case was accepted for surgical treatment.

After the aortic cross-clamping and cardioplegia infusion administered, we found a cystic cavity firmly adhered to the diaphragm. After dissection, a 7x5 cm cavity is found, without any myocardial or endocardial tissue (**Fig. 2**). Redundant tis-

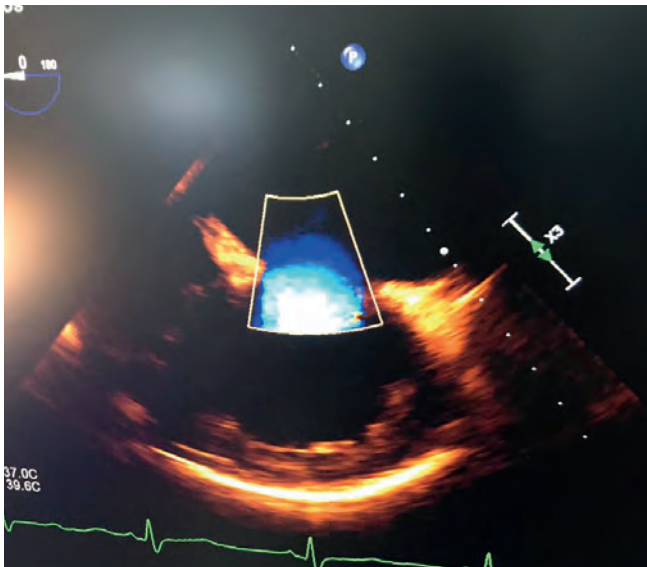


Figure 1. Transesophageal echocardiogram showing a cavity with thin walls from the left ventricular apex.

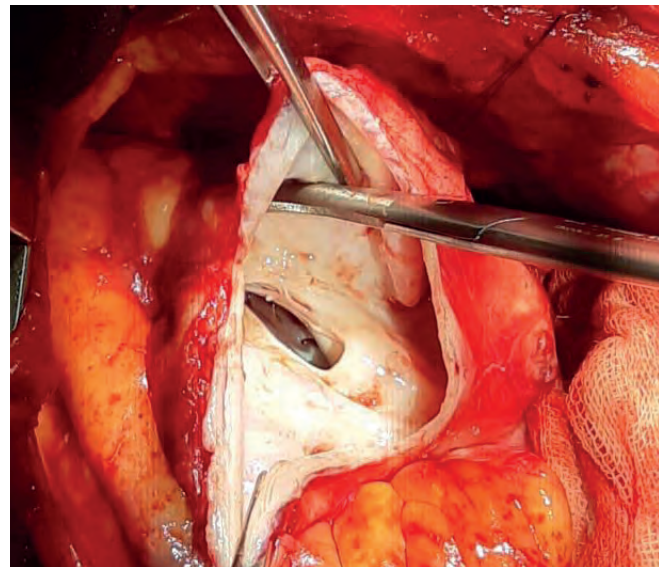


Figure 2. Cavity opened. No myocardial tissue in the wall. 15mm communication at left ventricular apex.

sue was resected identifying a 15 mm orifice at the left ventricle apex. The defect was closed using a Double Velour Dacron patch and a PTFE patch for reinforcing the ventricle closure. A coronary artery bypass grafting using internal thoracic artery to left anterior descending artery was done. (Fig 3) (Fig. 4). Total aortic cross-clamping time and cardiopulmonary bypass time were of 85 and 144 minutes, respectively.

Patient had a favorable postoperative recovery, spending three days in the intensive care unit and 7 days in-hospital stay, being discharged without any complications.

#### COMMENT

Left ventricular free wall rupture is a common complication after acute myocardial infarction, with a reported incidence between 2-4%, and a mortality rate above 40% requiring adequate diagnosis and early surgical treatment. After a small rupture with slow bleeding rate, intact epicardium or an adherent pericardium, a pseudoaneurysm will be formed. Although being a cavity with a thin wall and the constant growth, it has a high risk of rupture [1,4-6].

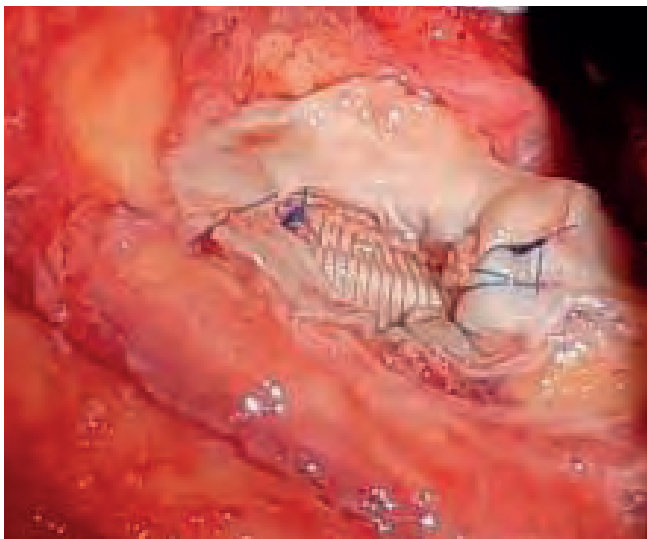


Figure 3. Double Velour Dacron Patch placed at the rupture zone.

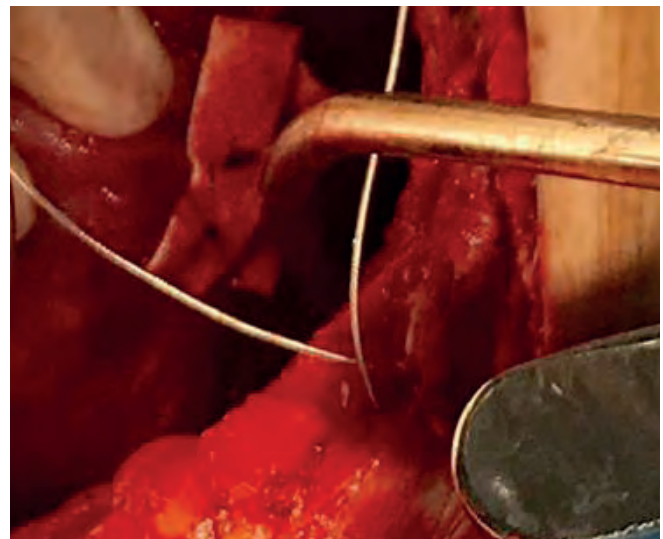


Figure 4. Ventricular closure reinforced with ePTFE patch.

It is not easy to differentiate a true aneurysm and a pseudoaneurysm as they present with similar clinical findings. Most of the time they are diagnosed as an incidental finding when an echocardiogram is done for some other reasons. The symptoms can be dyspnea, chest pain and pericardial rub. Up to 10% can be asymptomatic and present unspecific results in basic studies (chest X-ray, ECG) [1].

Although acute myocardial infarction is the main cause for ventricular pseudoaneurysm, it also can be found after infection, trauma, or after cardiac surgery [1,3].

The main complication of ventricular pseudoaneurysms is rupture due to a thin wall, but it also increases the risk of ventricular arrhythmias and congestive heart failure. Also, being an akinetic cavity there is high risk of thrombus formation and embolic events [1,5].

Most pseudoaneurysms are located on the lateral and inferior walls. The lower incidence of anterior pseudoaneurysms may be related to an early rupture. When diagnosed and treated on time, they have a low mortality rate and good results on the long term, with recovery of cardiac failure and functional class improvement [6,7].

There are many surgical techniques described for pseudoaneurysm repair. The most common is direct closure reinforced with PTFE patch and the use of pericardial or synthetic patches, without ventricular closure. The circular ventricular plasty repair and CABG, has demonstrated improvement in pump function and symptom free survival including patients with previous myocardial dysfunction [4,8].

Di Donato et al. experience at a single center in Monaco reported a 4.2% mortality rate, and after one-year follow-up reported a significant reduction in the long axis diastolic diameter (from 12.4 to 9.8 mm) without reduction of the diameter in short axis (8.5 vs 8.7 mm). On the other hand, one of the problems found on follow up was "spherization" of the left ventricle although it did not affect ventricular function [4].

On a series reported in Brazil by Shaefer et al. they did the Dor procedure for patients with left ventricular aneurysm and pseudoaneurysm, chronic ischemic heart disease and terminal heart failure before LVAD (HeartWare HVAD; Medtronic,

Minneapolis, MN, USA) implantation with improvement of LVAD function, and reducing rupture and thrombosis risk [9].

Even though many techniques have been described and many studies have been done comparing them, there is no common agreement on the best technique to treat patients with this pathology. The survival depends on early diagnosis, adequate pre-operative medical treatment, and early surgical repair. Recently "sutureless" techniques have been described as an option for treatment, making procedures simpler, without cardiopulmonary bypass or aortic cross-clamping, and without touching ischemic tissue [5,10].

The use of collagen sponges is indicated in patients with small ruptures and minimal bleeding that do not have other mechanical complications (acute mitral regurgitation, ventricular septal defect), but can make difficult to visualize the coronary arteries in patients that may need coronary artery bypass grafting in the future and also have a relative high re-rupture or pseudoaneurysm formation risk. It can be considered for patients with small defects requiring emergency surgery and high operative risk [10,11].

In conclusion, the left ventricle pseudoaneurysm is a condition difficult to diagnose and must be suspected in patients that clinically deteriorate days or weeks after an acute myocardial infarction. Early diagnosis and treatment are the key for good outcome.

Direct closure with synthetic fabric patch with or without a second suture line, is a technique with good short and long-term results with symptom free survival rate. Also, it improves the left ventricular function in patients with ischemic heart disease and left ventricular aneurysms or pseudoaneurysms.

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