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Case Reports

Surgical Repair of Postinfarction Left Ventricular Pseudoaneurysm

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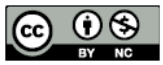

Abstract

Left ventricular pseudoaneurysm is a serious and rare disorder that usually develops after acute myocardial infarction. It can lead to potentially lethal mechanical complications, such as acute left ventricular free wall rupture. This report presents the case of a 64-year-old man with a left ventricular pseudoaneurysm and myocardial rupture that was managed by left ventricular restoration with aneurysmectomy and coronary artery bypass with 2 grafts.

Keywords: Aneurysm, false; myocardial infarction; coronary artery bypass

Case Report

Presentation and Physical Examination

A 64-year-old man was admitted to the emergency department for progressive dyspnea on exertion. He had experienced myocardial infarction (MI) 1 month earlier, but because of the COVID-19 pandemic, he had refused hospitalization out of fear of infection. Transthoracic echocardiography revealed severe left ventricular (LV) dysfunction, global hypokinesia, and a large LV aneurysm containing a thrombus. The patient's ejection fraction was 22% (Fig. 1A). He was taken to the cardiac catheterization laboratory, where multivessel coronary artery disease was diagnosed (Fig. 1B). Cardiac magnetic resonance imaging, which was performed to evaluate LV function and characterize the myocardium, revealed an extensive inferolateral wall infarct with free wall rupture into a huge pseudoaneurysm sac that contained a large thrombus (Fig. 1C).

Medical History

The patient's medical history was unremarkable, except for a possible history of hypertension.

Technique

The patient underwent surgical correction of the LV pseudoaneurysm, which measured approximately 9×8×7 cm and adhered tightly to the pericardium and left visceral pleura (Fig. 2). After ventriculotomy to access the LV apex, an old thrombus and long-standing hematoma were extracted. A 5×3-cm defect was found that was closed with a bovine pericardial patch (Fig. 3). With 2 layers of 3-0 Prolene (Ethicon) continuous suture, a transition zone was established between the healthy myocardium and areas of fibrosis. The ventriculotomy site was repaired with 2

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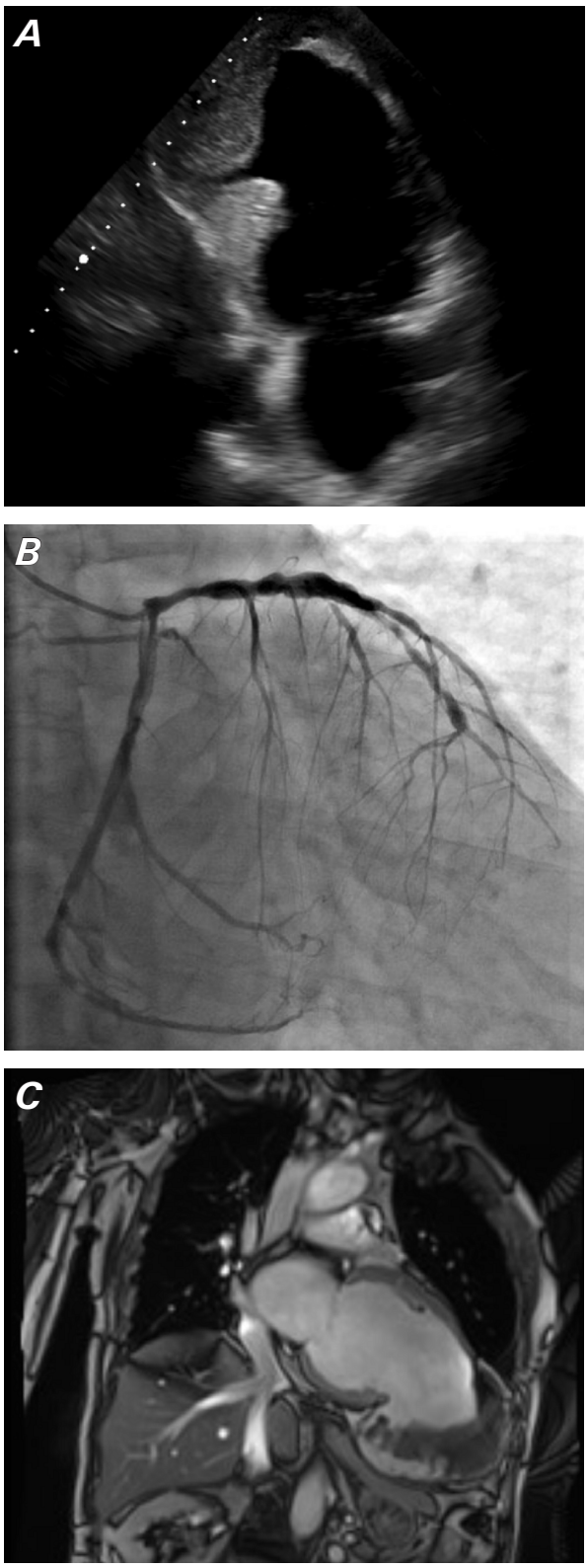

Fig. 1 A) Transthoracic echocardiogram shows a small, narrow neck defect connected to the ventricle. **B**) Coronary angiogram shows multivessel coronary artery disease. **C**) Cardiac magnetic resonance image shows inferolateral wall infarct with free wall rupture into a huge pseudoaneurysm sac that contains a large thrombus.

Key Points

- Left ventricular pseudoaneurysm is a serious and rare complication that develops after acute myocardial infarction.
- Surgical repair of left ventricular pseudoaneurysm involves reconstructing the left ventricle with the goal of restoring normal cardiac geometry.
- Concomitant coronary artery revascularization may be valuable in maintaining left ventricular function..

Abbreviations and Acronyms

LV	left ventricular
MI	myocardial infarction

mattress sutures supported with Teflon felt and sealed and reinforced with 3-0 Prolene sutures and surgical glue (Fig. 4). In the concomitant coronary artery bypass grafting procedure, the left internal thoracic artery was anastomosed to the left anterior descending coronary artery, and the great saphenous vein was anastomosed to the distal right coronary artery (Fig. 5).

The patient's postoperative course was uneventful. He was extubated 1 day after surgery and discharged 18 days after surgery without complications.

Latest Follow-Up

The patient is being followed up and has reported no problems for the past 30 months. Transthoracic echocardiography showed improvement in ejection fraction (from 21% to 25%).

Discussion

Left ventricular pseudoaneurysm is a rare disorder that typically develops after transmural MI.[1] The incidence of post-MI complications has statistically significantly decreased since the development and wide adoption of percutaneous coronary intervention and medications,[2] but it remains a potentially lethal mechanical complication when associated with acute LV free wall rupture. In pathologic terms, LV pseudoaneurysm is characterized by a small channel with a narrow neck connecting the ventricle to a larger aneurysmal sac; that sac contains blood and thrombus, and it is lined with fibrous pericardial tissue but no myocardial elements.[3] These pseudoaneurysms differ from true ventricular aneurysms in that they include no endocardium or myocardium and are more likely to expand and rupture.[4]

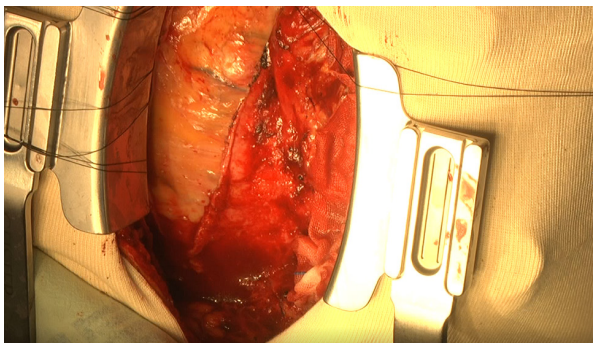

Fig. 2 The pseudoaneurysm is firmly adhered to the pericardium and the visceral pleura, and adhesiolysis is not possible. Therefore, cardiopulmonary bypass is initiated, after which the pseudoaneurysm site is accessed through left ventricular ventriculotomy with open left pleura. The supplemental video also shows portions of the cardiopulmonary bypass circuit.

Supplemental motion image available for Figure 2.

Diagnosis is complicated because the most frequently reported symptoms are heart failure, chest pain, and dyspnea, which are common in patients with coronary artery disease. Advances in noninvasive imaging have made it easier to distinguish pseudoaneurysm from other pathologies, leading to more timely management.[5] Transthoracic echocardiography is usually the preferred imaging modality because it is readily available and fast. Cardiac magnetic resonance imaging is an excellent diagnostic modality that identifies the contained cardiac rupture and provides clear anatomic images to guide surgical intervention.

Surgical techniques for correcting an LV pseudoaneurysm aim to reconstruct the left ventricle or reduce its volume, with the goal of restoring normal cardiac geometry and repairing the weakened LV wall. Historically, the surgical technique of intracavitary repair known as endoventricular circular plasty was the standard method of LV pseudoaneurysm repair, as described by Dor et al.[6]

Surgical technique should be adapted to each patient's anatomic characteristics, including cavity size and shape, scar dimension, and septal involvement. In the present case, the pseudoaneurysm had a sac measuring approximately 9×8×7 cm, with a 5×3-cm defect neck, and the transition area had been considerably widened. Thus, normal LV geometry was reproduced by using a bovine pericardial patch to restore the ventricle's elliptical shape. Cooley[7] repaired ventricular aneurysms with ventricular endoaneurysmorrhaphy, in which a tailored Dacron patch is used to make the length and width of the left ventricle conform to its normal volume. This technique emphasizes restoring function rather than excising diseased tissue.[7] In contrast, bovine pericardial patches are preferred because of their elasticity and ease of use and because they appear to allow less bleeding

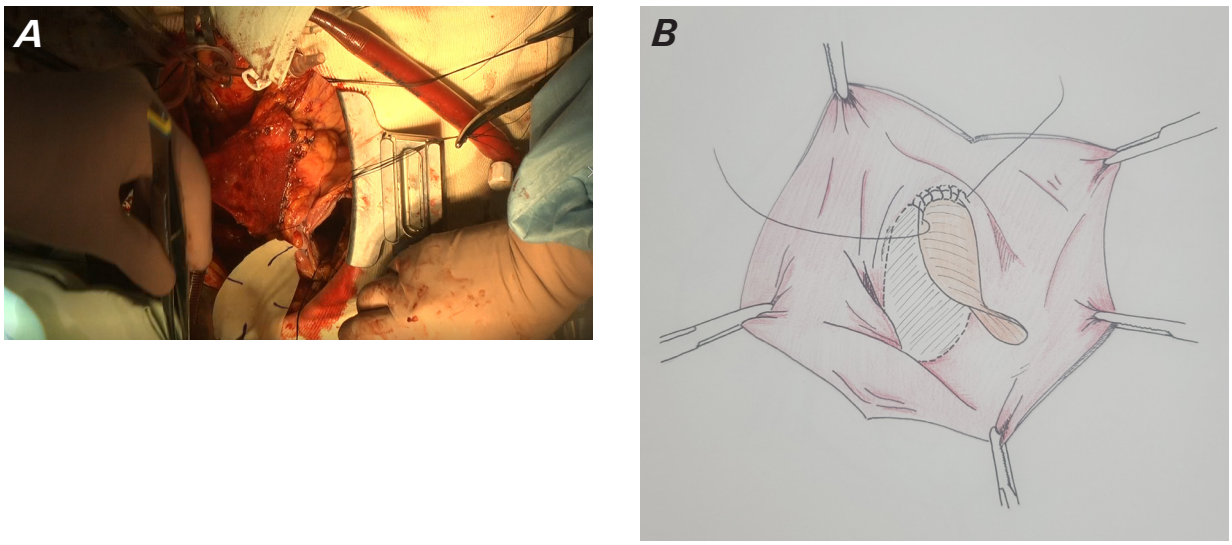

Fig. 3 A) The size of the pseudoaneurysm is approximately 9×8×7 cm. Ventriculotomy and patch closure with bovine pericardium are performed. The supplemental video also shows the process of extracting the thrombus and organized hematoma and repairing the aneurysmal defect. **B**) Illustration of the procedure. The aneurysmal defect is repaired with a bovine pericardial patch. The procedure was performed as deeply as possible until healthy endocardial tissue was secured.

Supplemental motion image available for Figure 3A.

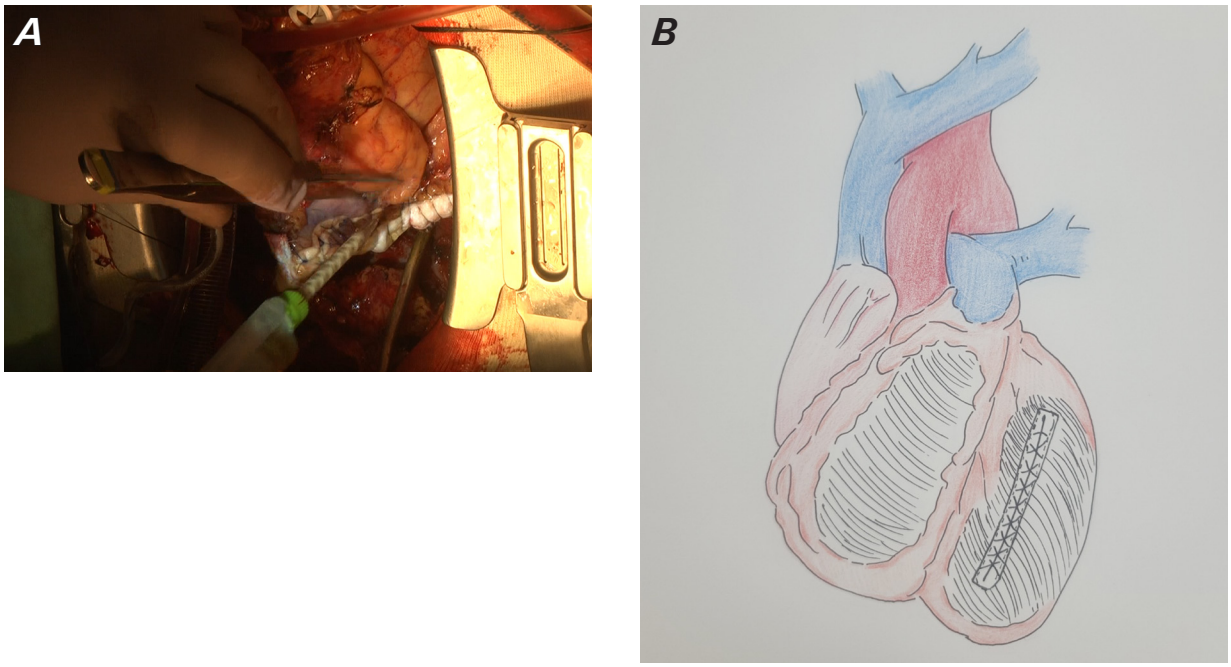

Fig. 4 A) The ventriculotomy is repaired with Teflon felt mattress suture and running suture reinforced by surgical glue. **B**) Illustration of the procedure. The left ventricle is repaired with Teflon felt strips.

Supplemental motion image available for Figure 4A.

at the suture site than a Dacron patch. The main goals of surgery are to return the left ventricle to a more normal volume and shape, restore wall integrity, exclude akinetic segments of the myocardium, and reduce the endocardial nidus for thrombus formation.[8]

In this patient, concomitant coronary revascularization was performed by anastomosing (1) the left internal thoracic artery to the left anterior descending coronary artery and (2) the great saphenous vein to the distal right coronary artery. Complete myocardial revascularization during left ventricle–restoring surgery may be valuable because it allows ventricles already at risk to better support the overall circulation, particularly in patients with low ejection fraction.

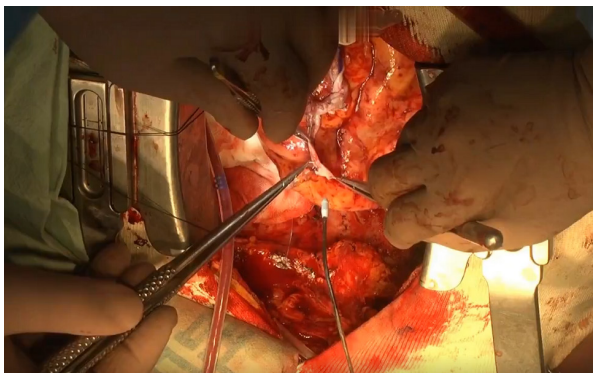

Fig. 5 Concomitant coronary artery revascularization is performed. The left internal thoracic artery is anastomosed to the left anterior descending coronary artery, and the great saphenous vein is anastomosed to the distal right coronary artery.

Supplemental motion image available for Figure 5.

This case of LV pseudoaneurysm after MI was discovered during the COVID-19 pandemic lockdown. Because patients with LV pseudoaneurysm have a high mortality rate, early diagnosis is important. When a diagnosis is made, as in this case, surgical ventricular restoration can improve ventricular function and functional status, producing a satisfactory outcome. In addition, concomitant coronary artery revascularization may improve outcomes by supporting LV function.

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