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Case Reports

Delayed Giant Pseudoaneurysm With Left-to-Right Shunt Following Postinfarct Ventricular Septal Perforation Repair

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Abstract

Left ventricular pseudoaneurysm with a left-to-right shunt is extremely rare, requiring surgery if symptomatic; however, surgery has a high risk. Here, the case of a 77-year-old man with heart failure symptoms is reported, in which he develops a giant left ventricular pseudoaneurysm 16 months after ventricular septal perforation repair as a result of acute myocardial infarction, with mild shunt blood flow from the pseudoaneurysm to the right ventricle. Intraoperative findings showed a free wall rupture along the area where the patch was secured during the initial surgery. The patient was discharged on postoperative day 13, and postoperative examination revealed no abnormalities.

Case Report

The extended sandwich patch technique is commonly performed for ventricular septal perforation (VSP) after acute myocardial infarction (AMI); however, little is known about the technique's chronic complications. Here, a case of chronic left ventricular pseudoaneurysm (LVPA) complicated by a left-to-right (L-R) shunt and its causes are reported and discussed.

Presentation and Physical Examination

A 77-year-old man was transferred to the hospital after visiting his physician 1 week after experiencing sudden respiratory distress. Upon admission, the patient presented with mild shortness of breath and bilateral leg edema but stable vital signs.

Medical History

Sixteen months earlier, the patient had presented to the hospital after having experienced persistent chest pain for 9 days. Emergency coronary angiography revealed 100% stenosis of the proximal right coronary artery, and echocardiography revealed VSP. Emergent VSP repair was performed using the posterior right ventricular (RV) approach. Intraoperative findings revealed a large VSP from the apex to the base of the heart (5 cm × 2 cm). A bovine pericardial patch was secured by transmurally bringing the needles (3-0 polypropylene) from the LV cavity to the LV wall beyond the right coronary artery posterior descending branch and from the LV cavity to the RV cavity through

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the ventricular septum. Transmural sutures were reinforced using pledgets, and sutures were introduced into the RV cavity and passed through a second patch. The RV incision line was closed using 2 felt strips. Coronary revascularization of the right coronary artery was not performed. Postoperative echocardiographic imaging revealed no residual shunts or other mechanical complications. The patient was discharged and followed up at a local clinic.

Differential Diagnosis

The differential diagnosis included recurrent VSP, new MI, and congestive heart failure secondary to low cardiac function.

Technique

Transthoracic echocardiographic imaging showed an ejection fraction of 28%, no recurrent VSP, and a giant LVPA. A mild L-R shunt from the aneurysm to the RV was also observed, with a pulmonary to systemic flow ratio of 1.4:1 (Fig. 1A and Fig. 1B). Enhanced computed tomography and cardiac magnetic resonance imaging scans confirmed a giant LVPA originating near the apex of the left ventricle (Fig. 2A and Fig. 2B). Drug therapy for heart failure symptoms associated with LVPA or L-R shunts was initiated. The patient was discharged from the hospital after his symptoms improved, but they reappeared after 2 months. It was therefore decided to perform surgery after fully explaining the associated high risk to the patient.

Key Points

- Although surgery is the recommended approach for symptomatic LVPA, the disease course is relatively gradual; therefore, surgical risk should be considered in determining a treatment plan.
- Although speculative, during VSP repair, it is suggested that special attention be given to needle penetration from the LV cavity into the LV wall, as it can potentially result in free wall rupture.
- The presence of an L-R shunt should be carefully explored when treating LVPA.

Abbreviations and Acronyms

AMI	acute myocardial infarction
L-R	left-to-right
LVPA	left ventricular pseudoaneurysm
RV	right ventricular
VSP	ventricular septal perforation

Surgery was performed via median sternotomy. Cardiopulmonary bypass was established between the right femoral artery and femoral vein before the sternotomy. An LV vent was inserted through the right upper pulmonary vein, and cardiac arrest was achieved using anterograde cardioplegia. Upon clamping the ascending aorta and opening the LVPA, a 70 mm × 30 mm defect was observed in the posterior LV wall (Fig. 3A). This defect was possibly a result of the tearing of the transmural suture from the LV cavity to the LV wall during the previous VSP repair. The trimmed defect was closed

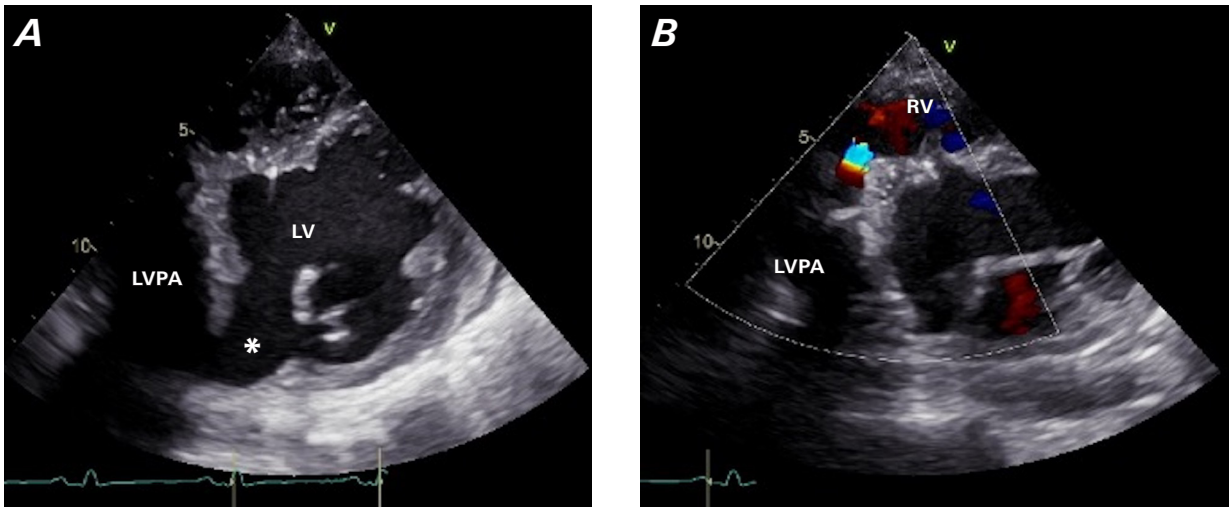


Fig. 1 A) A transthoracic echocardiogram shows blood flow from the LV to the giant LVPA (asterisk); **B)** a transthoracic echocardiogram shows a shunt flow from the LVPA to the RV.

LV, left ventricle; LVPA; left ventricular pseudoaneurysm; RV, right ventricle.

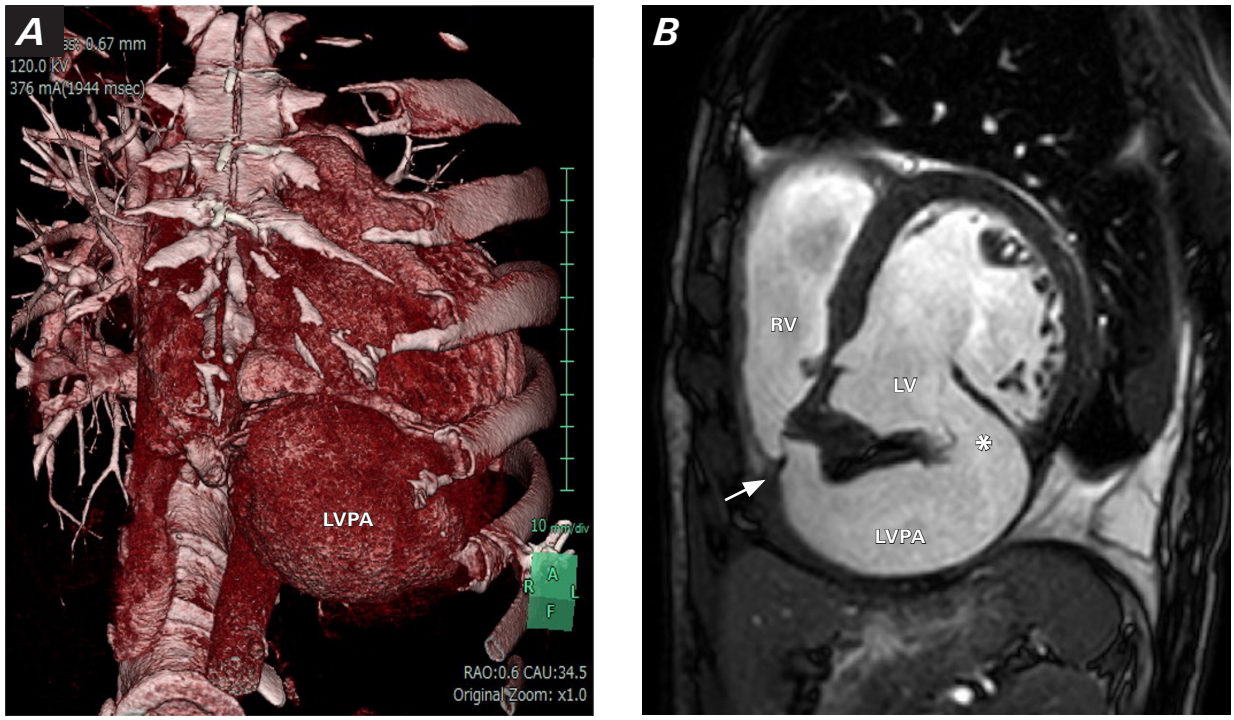


Fig. 2 A) Three-dimensional volume rendering computed tomogram m shows a giant LVPA; **B)** magnetic resonance image, sagittal section, shows the orifice to the LVPA (asterisk) and a shunt hole to the RV (arrow).

LV, left ventricle; LVPA, left ventricular pseudoaneurysm; RV, right ventricle.

using 2-0 polypropylene mattress sutures with patches made of artificial vessels (J Graft; Japan Lifeline). An L-R shunt near the previous RV incision line was also closed with 4-0 polypropylene (Fig. 3B). The surgical schema is shown in Fig. 3C.

The patient was transferred to the intensive care unit and extubated on postoperative day 1. He was moved to the general ward on postoperative day 5 and discharged on postoperative day 13, with resolution of preoperative symptoms.

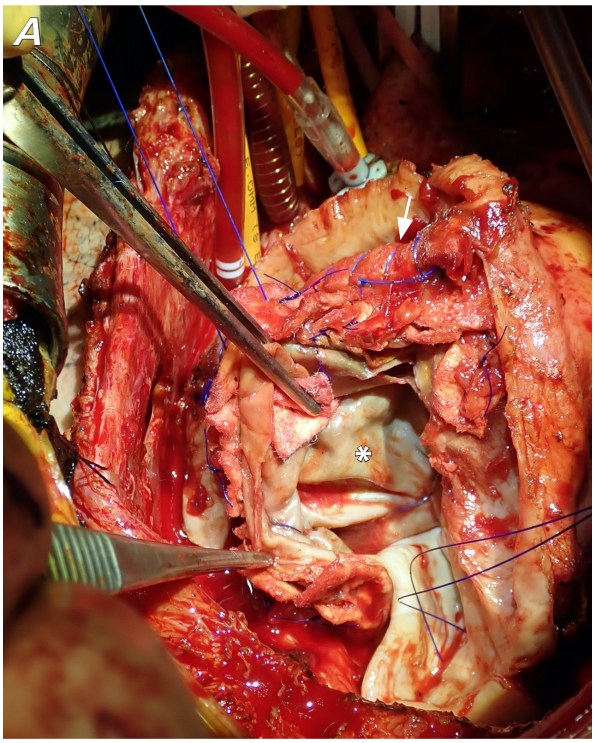
Latest Follow-Up

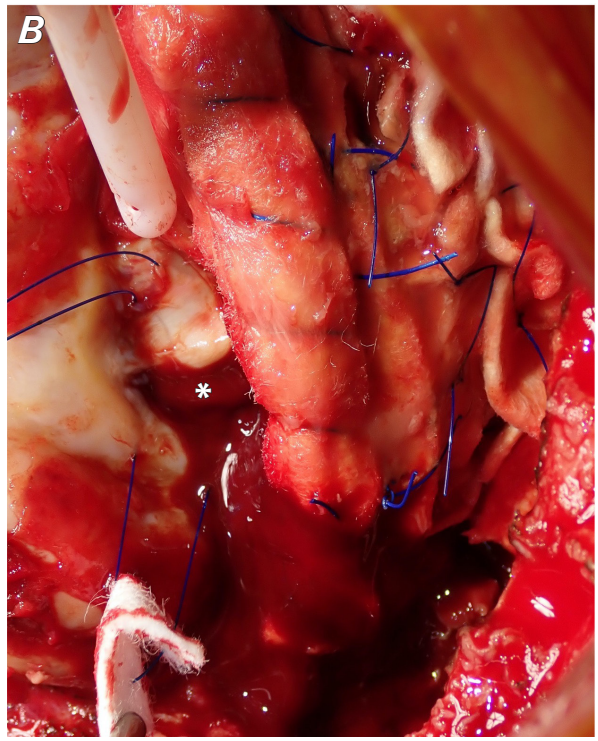
Postoperative cardiac magnetic resonance imaging performed 2 months after surgery showed successful LVPA repair without leakage through the patch and a completely thrombosed aneurysmal sac (Fig. 4).

Discussion

Left ventricular pseudoaneurysm is a rare complication after AMI and is defined as a rupture of the free wall of the left ventricle composed of pericardial adhesions, epicardium, or both.[1] Most frequently, the condition arises after AMI, but it can also be a complication of cardiac surgery, trauma, or infection.[2] Postinfarction LVPA can be acute (<2 weeks after AMI), subacute, or chronic (>3 months after AMI), and the natural history of the chronic LVPA remains clear.[2,3] In the present case, the onset of the disease was sudden, and free wall rupture may have occurred at that time. The patient ultimately underwent surgery 2 months after onset, during which time his vital signs remained stable. As this case suggests, LVPA often has a relatively stable course, and the timing of surgery is debatable. Prêtre et al[3] reported that surgery is preferable in patients with symptomatic LVPA, especially when the LVPA is discovered in the first 3 months after AMI and when it expands or is large (>3 cm). In this case, initially, conservative treatment was planned because of the high risk of surgery; however, considering the persistent symptoms and the size of the aneurysm, the decision was made to proceed with surgery.

In the present case, the LVPA orifice was observed transmurally along the penetrating needle from the LV cavity to the free wall. The VSP was large and likely involved





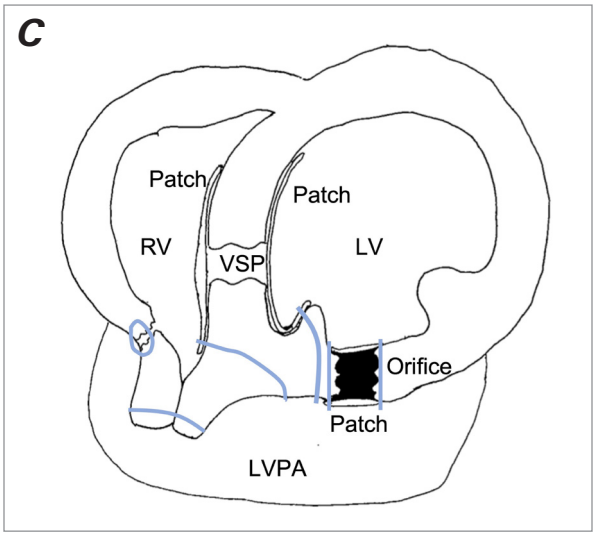


Fig. 3 A) Intraoperative findings show the orifice of the LVPA (70 mm × 30 mm) along the needle for patch fixation from the previous left ventricular cavity to the left ventricular wall (asterisk indicates the bovine pericardial patch applied to the VSP; arrow indicates the suture line of the left ventricular wall at the previous surgery); **B)** the asterisk in the photograph indicates the left-to-right shunt hole; **C)** the blue lines in the schema show the sutures of the previous surgery.

LV, left ventricle; LVPA, left ventricular pseudoaneurysm; RV, right ventricle; VSP, ventricular septal perforation.

substantial extensive MI. The fragile post-AMI tissue may have contributed to the development of LVPA. The possibility of complications from VSP repair must also be considered because the area is thought to be dominated by the left coronary artery without stenosis. Although pledgets were used to reduce stress on the LV walls, the tear is still believed to have occurred in this area. Reevaluating the fundamental principles of needle penetration from the LV cavity to the LV wall, ensuring a perpendicular approach to the myocardium, and avoiding excessive tension in the ligation may therefore be necessary to prevent such situations. This case is also unique because of the presence of an L-R shunt from the LVPA to the RV. Bryniarski et al[4] reported on a patient with LVPA with an L-R shunt 6 weeks after inferior MI. In the present case, the shunt hole was small and difficult to identify without preoperative echocardiographic imaging. In the future, when operating on patients with LVPA, surgeons must be mindful of the presence of a shunt.

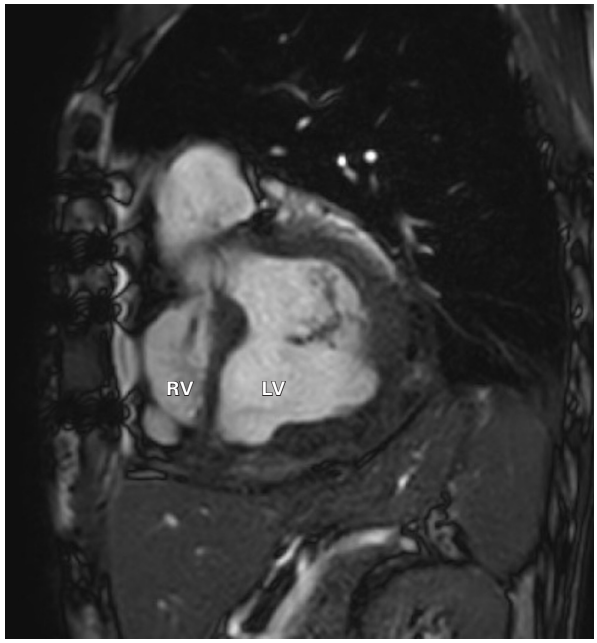


Fig. 4 Cardiac magnetic resonance image shows successful left ventricular pseudoaneurysm repair without leakage through the patch.

LV, left ventricle; RV, right ventricle.

Surgery is preferred for symptomatic LVPA, and patients should be carefully monitored for complications associated with L-R shunts. Further investigation of surgical management in patients with L-R shunts is warranted.

Article Information

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