

Case Reports

# Successful Suture-Free Repair of Left Ventricular Rupture Using the EVARREST Patch

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## Abstract

Left ventricular free wall rupture is a lethal complication of myocardial infarction. Although emergent surgical repair is the treatment of choice, the method of repair remains highly individualized. This report presents a case of spontaneous coronary artery dissection in a patient with Turner syndrome that led to left ventricular free wall rupture and was successfully repaired on cardiopulmonary bypass using a suture-free technique with the EVARREST Fibrin Sealant Patch.

**Keywords:** Myocardial infarction; heart rupture; sutureless surgical procedures; fibrin tissue adhesive

## Case Report

### Presentation

A 38-year-old woman with Turner syndrome presented with abdominal pain, nausea, vomiting, and tachycardia, with an elevated lactate level and leukocytosis. She had initial resolution of symptoms with conservative management for gastrointestinal discomfort, but on hospital day 1 she reported worsening heartburn and was subsequently found to be unresponsive. Chest computed tomography scans showed hemopericardium with impending left ventricular rupture (Fig. 1A). Echocardiography showed marked hypokinesis of the left ventricular apex and concerns in the lateral and inferior walls for acute myocardial infarction (AMI). Emergent angiography demonstrated a right dominant system with evidence of spontaneous coronary artery dissection in the left anterior descending artery, distal circumflex artery (Fig. 1B), and posterior descending artery (Fig. 1C) as well as a contained left ventricular free wall rupture.

### Technique

The patient was taken emergently to the operating room, where she underwent sternotomy and evacuation of hemopericardium and was stabilized on cardiopulmonary bypass. With the heart empty, a 3 × 3-cm<sup>2</sup> area of left ventricular free wall rupture was observed in the lateral distal circumflex artery territory, with a small myocardial defect (Fig. 1D). The area of left ventricular free wall rupture was repaired using a suture-free technique with an EVARREST Fibrin Sealant Patch (Omxix Biopharmaceuticals Ltd/Ethicon, Inc), over which a bovine pericardial patch was applied using TISSEEL fibrin sealant (Baxter Healthcare Corp). No further postrepair bleeding could be observed. An intra-aortic balloon pump was placed for afterload reduction, and the patient was weaned from cardiopulmonary bypass.

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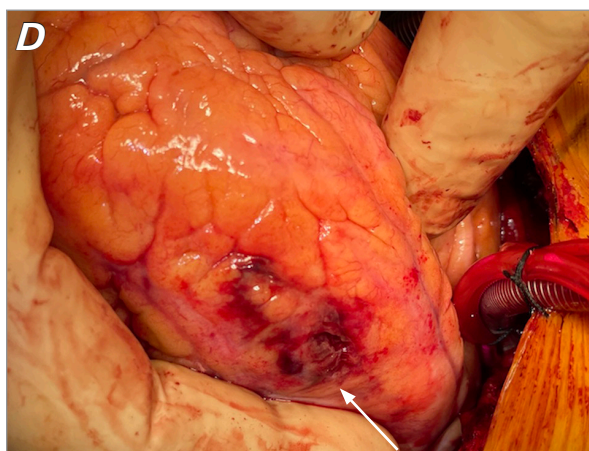
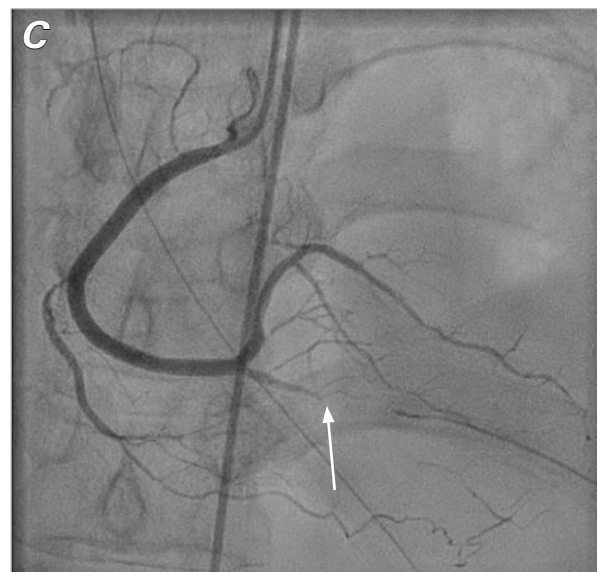
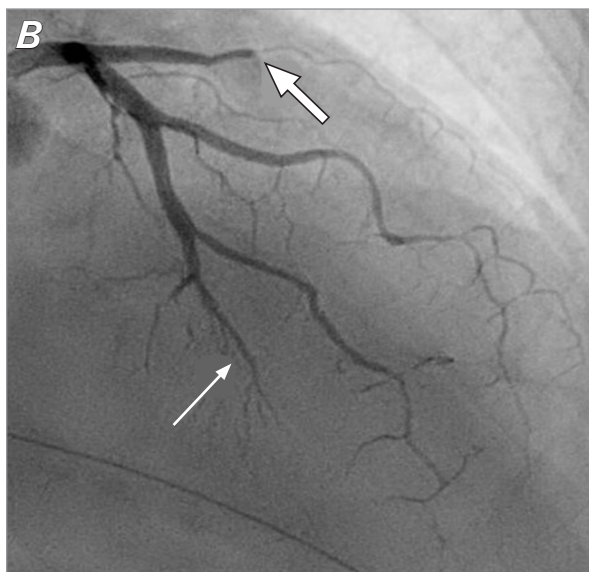


### Key Points

- Presentation of AMI complicated by left ventricular free wall rupture is variable.
- The use of suture-free techniques for the repair of left ventricular free wall rupture has increased in the modern era, with comparable efficacy and durability of repair to sutured techniques.
- Data on the hemostatic advantages of the EVARREST patch have recently been described and may support its use in the complicated repair of left ventricular free wall ruptures that would benefit from a hemostatic suture-free approach.

### Abbreviations and Acronyms

AMI                      acute myocardial infarction



**Fig. 1** **A)** A preoperative computed tomography scan demonstrates hemopericardium (thin arrow) and left ventricular pseudoaneurysm with impending rupture (thick arrow); **(B)** coronary angiography demonstrates subtotal occlusion of the left anterior descending artery distal to the second diagonal branch (thin arrow) and complete occlusion of the distal circumflex artery (thick arrow); **(C)** coronary angiography demonstrates occlusion of the posterior descending artery (arrow); and **(D)** an intraoperative photograph demonstrates left ventricular rupture (arrow).

### Outcome and Latest Follow-Up

The patient was extubated in the intensive care unit on postoperative day 1, and repeat chest computed to-

mography scans on postoperative day 3 demonstrated intact patch repair of the left ventricular free wall and the resolution of hemopericardium (Fig. 2). The balloon pump was removed on postoperative day 5. The

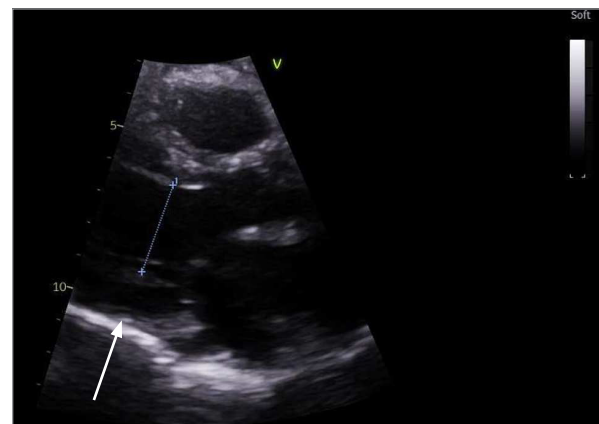
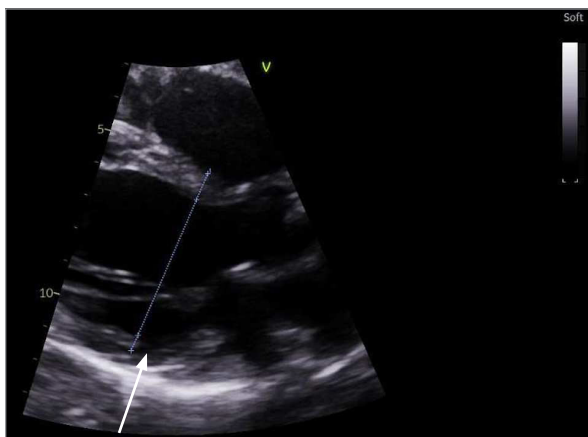
patient's high-sensitivity troponin I, cardiac form, levels remained stable but elevated until postoperative day 7. She was discharged home on postoperative day 12, with discharge echocardiography demonstrating a preserved left ventricular ejection fraction of 57% despite dyskinesia of the left ventricular anterolateral free wall with slight outpouching. At 12-month follow-up, the patient was doing well at home, having returned to all prior activities, and transthoracic echocardiography showed a left ventricular ejection fraction of 65% (Fig. 3).

## Discussion

Left ventricular free wall rupture is a rare complication of AMI that develops in up to 2% of patients and has a mortality rate ranging from 40% to 80%.<sup>1</sup> Surgical repair is the treatment of choice, and treatment options



**Fig. 2** A postoperative computed tomography scan demonstrates healing of the left ventricular free wall after suture-free repair (arrow).



**Fig. 3** Follow-up transthoracic echocardiographic images of left ventricular free wall (arrow) in (A) diastole and (B) systole, with normal wall motion and ejection fraction.

include direct repair with felt reinforced suture, patch repair, and suture-free repair.<sup>1</sup> Direct repair remains challenging in the setting of fragile, infarcted myocardial tissue. To mitigate the issue of suturing on poor-quality tissue, the use of suture-free repair has increased. In this case, spontaneous coronary artery dissection led to AMI and left ventricular free wall rupture in a patient with Turner syndrome that was initially misdiagnosed and managed as a gastrointestinal issue and later treated successfully using an operative suture-free technique.

Left ventricular free wall rupture following AMI is increasingly rare in the modern era of prompt revascularization, and it complicates less than 0.1% of cases.<sup>2</sup> Unusual presentations of AMI, however, may lead to delays in diagnosis and treatment, increasing the likelihood of mechanical complications. Such was the case for this patient, a woman in her 30s, who presented with primarily gastrointestinal discomfort and for whom AMI as a result of spontaneous coronary artery dissection was low on the initial differential diagnosis. The clinical presentation of left ventricular free wall rupture can be variable, ranging from hemodynamic instability and pericardial effusion to cardiogenic shock and cardiac arrest.<sup>3</sup> The optimal surgical approach remains controversial, and the mortality rate of left ventricular free wall rupture remains high, despite advancements in treatment and techniques.

Treating left ventricular free wall rupture initially included only suture-based techniques involving either direct repair or suture placement of a pericardial patch. Success with this technique, however, is made challenging by the need to tie sutures through friable or necrotic tissue. More recently, suture-free techniques have been

employed for left ventricular free wall rupture, most commonly by applying a collagen sponge to the defect.<sup>4</sup> More than half of repairs are still performed using a direct suture technique, despite similar survival rates for suture vs suture-free surgical techniques.<sup>1</sup> The choice of repair is likely to remain highly individualized, based on both the rupture type and the quality of tissue seen at the time of repair. For this patient, an EVARREST patch was used to cover the defect; EVARREST is a hemostat comprising a matrix of nonwoven polyglactin coated with human fibrinogen and thrombin that has been shown in trials to be a more effective hemostatic agent than the TachoSil Fibrin Sealant Patch (Takeda Pharma A/S, Corza Medical), a more commonly employed fibrin-coated collagen sponge.<sup>5</sup> This case is the first report of EVARREST patch repair for left ventricular free wall rupture. The patient's immediate postoperative course is encouraging, as is the improved, normal left ventricular ejection fraction of 65% at 1-year follow-up.

Left ventricular free wall rupture is a rare complication of AMI for which surgical management is variable. A suture-free technique using the EVARREST Fibrin Sealant Patch was effective in treating left ventricular free wall rupture in this patient, and 1-year follow-up revealed a return to normal ventricular function. Though experience in a greater number of patients is required, this technique may be more widely employed in the future owing to its simplicity and durability in repair of left ventricular free wall rupture.

## Article Information

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