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Surgical Ventricular Restoration With the Dor Procedure for Anterior Left Ventricular Aneurysm and Suspected Rupture: A Case Report

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Abstract

Surgical ventricular restoration (SVR) using the Dor procedure has become uncommon in the era of early myocardial revascularization and optimized medical therapy. However, in carefully selected patients with advanced left ventricular (LV) remodeling or suspected ventricular rupture, SVR remains a critical surgical option. We report the case of a 55-year-old who presented with chest pain and progressive dyspnea one month after an untreated myocardial infarction. Imaging revealed a large anterior LV aneurysm with features suggestive of a contained rupture. Despite revascularization of the left anterior descending (LAD) artery, the patient developed hypotension requiring inotropic support and underwent urgent SVR using the Dor procedure. Intraoperative findings confirmed extensive dyskinetic myocardium, a large laminated thrombus, and a sealed rupture of the apical wall. The thrombus was evacuated and the dyskinetic segment excluded using a tailored Dacron patch. The postoperative course was uneventful. At the latest follow-up, 22 months after surgery, the patient remained clinically stable, with a left ventricular ejection fraction above 30% and no arrhythmic events; however, apical dyskinesia with aneurysmal dilation had reappeared, indicating that remodeling may continue after SVR. This report highlights that the Dor procedure remains a valuable and potentially life-saving intervention in selected patients with post-infarction LV aneurysms complicated by suspected rupture, particularly when timely diagnosis and surgical intervention are achieved.

Categories: Cardiac/Thoracic/Vascular Surgery
Keywords: dor procedure, endoventricular patch plasty, left ventricular aneurysm, myocardial infarction, surgical ventricular restoration, ventricular rupture

Introduction

Surgical ventricular restoration (SVR) is a reconstructive technique for ischemic cardiomyopathy designed to exclude non-contractile myocardial segments, restore near-normal left ventricular (LV) geometry, and improve systolic function. Originally described by Dor in the late 1980s, the procedure uses endoventricular patch plasty to reduce chamber volume, restore ventricular shape, and decrease wall stress [1].

Advances in early reperfusion strategies, particularly percutaneous coronary intervention (PCI), along with improvements in pharmacological management, have significantly reduced the incidence of post-infarction LV aneurysm formation. Furthermore, the Surgical Treatment for Ischemic Heart Failure (STICH) trial demonstrated no benefit from adding SVR to coronary artery bypass grafting (CABG) in patients with a left ventricular ejection fraction of 35% or less and predominant anterior akinesia or dyskinesia, leading to a substantial decline in its use [2]. Nevertheless, SVR remains relevant in carefully selected patients, particularly those with discrete ventricular aneurysms, preserved basal myocardial function, or mechanical complications such as suspected ventricular rupture. In these circumstances, surgical intervention may be the definitive treatment [3-5].

In this setting, three post-infarction entities should be distinguished. A true aneurysm has a wide neck and a thinned, scarred wall that remains continuous with the myocardium. A pseudoaneurysm represents a contained free-wall rupture, with a wall composed of pericardium and thrombus rather than myocardium, and typically has a narrow neck. A contained (subacute) rupture is a tear that is temporarily sealed by thrombus or pericardial adhesions but may progress to free rupture [6,7]. We report a rare case of SVR using the Dor procedure in a patient with an anterior LV aneurysm and suspected contained rupture, with follow-up extending to 22 months.

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Case Presentation

A 55-year-old male presented to the emergency department on December 6, 2024, with chest pain and

progressive dyspnea on exertion (New York Heart Association (NYHA) class II-III). He reported a severe episode of chest discomfort associated with vomiting approximately one month earlier, for which he had not sought medical attention. His medical history was significant for heavy tobacco use (>50 pack-years) and untreated dyslipidemia.

On admission, the patient was hemodynamically stable, with a blood pressure of 115/80 mmHg, a heart rate of 86 bpm, and an oxygen saturation of 94%. Electrocardiography revealed pathological Q waves and persistent ST-segment elevation in leads V2-V6, along with Q waves in leads II, III, and aVF, consistent with an extensive anterolateral and inferoapical myocardial infarction. Given the one-month history and established Q waves, the persistent ST-segment elevation was interpreted as suggestive of a late-presenting myocardial infarction with possible ventricular aneurysm formation rather than acute myocardial injury alone. High-sensitivity troponin T levels increased from 56 to 193 pg/mL. Laboratory investigations revealed a white blood cell count of 11,000/µL, a hemoglobin level of 12.6 g/dL, and a D-dimer level of >10 µg/mL.

Transthoracic echocardiography revealed severe LV systolic dysfunction, with apical segment dyskinesia, severe hypokinesia of the mid-ventricular segments, and an estimated ejection fraction of 20-25% (Figure *1B*). The apical wall appeared indistinct, raising the possibility of an apical thrombus, intramural hematoma, or ventricular wall rupture. Right ventricular function was preserved. Mild-to-moderate mitral regurgitation and a posterior pericardial effusion measuring up to 8 mm were also noted.

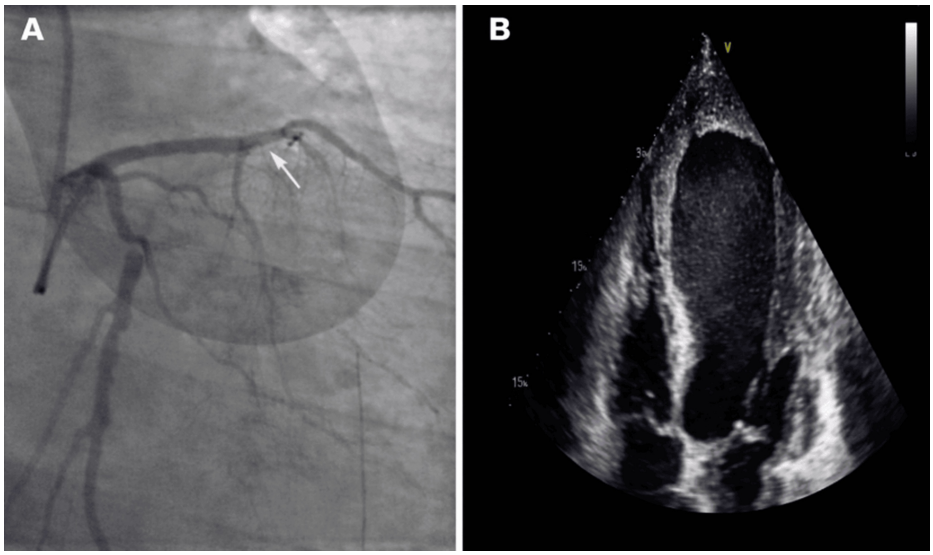


FIGURE 1: Preoperative coronary angiography and echocardiography

A. Diagnostic coronary angiography demonstrating total occlusion of the left anterior descending (LAD) artery distal to the first diagonal branch, with absence of distal runoff. B. Transthoracic echocardiography, apical four-chamber view, showing a dilated left ventricle with apical dyskinesia

Coronary angiography on the day of admission demonstrated total occlusion of the left anterior descending (LAD) artery distal to the first diagonal branch, with no antegrade flow (TIMI 0), and significant stenosis of the left circumflex artery at the level of the second obtuse marginal branch; the dominant right coronary artery had no significant stenosis (Figure *1A*). With the indication of a late-presenting anterior ST-elevation myocardial infarction, PCI of the LAD was performed under unfractionated heparin (7,000 IU), with aspirin and clopidogrel. After sequential balloon predilation, two drug-eluting stents (4.0 × 28 mm and 4.0 × 35 mm) were implanted, with partial restoration of flow (TIMI 2). The circumflex lesion was scheduled for staged treatment.

Despite revascularization, the patient developed hypotension requiring inotropic support. Given the severity of LV dysfunction and concern for a mechanical complication, contrast echocardiography was performed and suggested discontinuity of the apical wall. ECG-gated contrast-enhanced CT on December 11, 2024 revealed LV dilation, linear intramyocardial contrast pooling consistent with a contained ventricular rupture, and a linear pericardial collection containing hemorrhagic elements. The apparent thickening of the LV wall on CT probably corresponded to the large laminated thrombus later found at surgery. The patient was transferred to the cardiothoracic surgery unit for urgent surgical management.

Surgical technique

The patient underwent surgery on December 17, 2024, under general anesthesia with continuous intraoperative transesophageal echocardiographic (TEE) monitoring. An intra-aortic balloon pump (IABP)

was placed preoperatively through the left femoral artery for hemodynamic support. Through a median sternotomy, cardiopulmonary bypass (CPB) was established via right axillary arterial and right femoral venous cannulation. The procedure was performed on the arrested heart, after aortic cross-clamping, with Custodiol (histidine-tryptophan-ketoglutarate) cardioplegia.

Step 1: Aneurysm Identification

The aneurysmal anterior LV segment was identified following adhesiolysis of the pericardial adhesions over the anterior wall. Intraoperative TEE and direct palpation were used to delineate diseased myocardium from viable tissue.

Step 2: Aneurysm Entry

An incision was made approximately 1.5-2.0 cm lateral to the LAD artery toward the LV free wall, entering through a relatively stable margin of the aneurysmal segment.

Step 3: Cavity Inspection and Thrombus Evacuation

Upon opening the aneurysm, a large laminated thrombus was identified and completely evacuated (Figures 2A, 2B), and a sealed rupture of the apical aneurysmal wall was found. Visual inspection and palpation were used to identify the transition between scar tissue and viable myocardium.

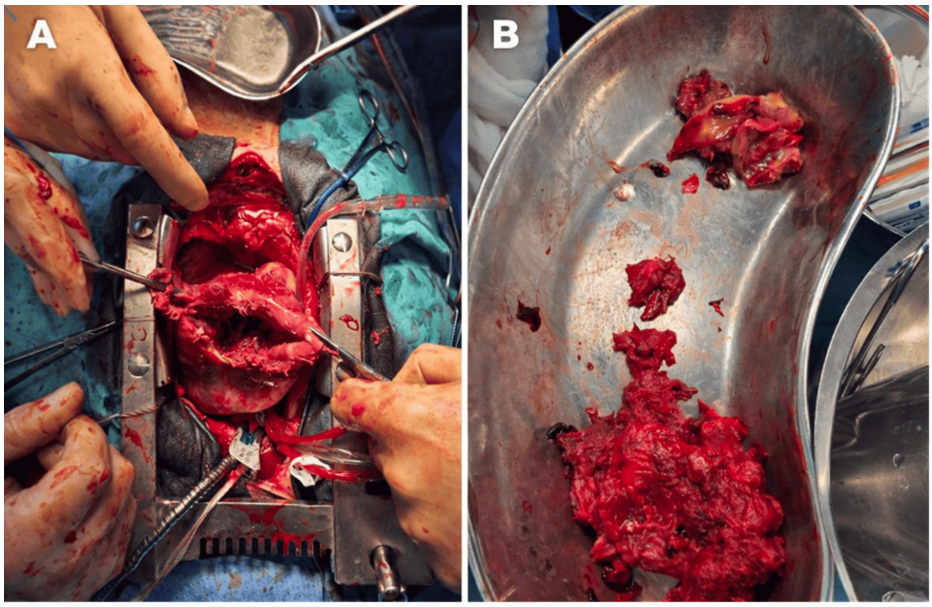


FIGURE 2: Surgical and gross pathology of left ventricular aneurysmal thrombus

A. Intraoperative view of the opened left ventricular aneurysmal cavity revealing extensive laminated thrombus adherent to the endocardial surface. B. Gross specimen of the organized laminated thrombus evacuated from the aneurysmal left ventricular cavity, demonstrating its multilayered structure

Step 4: Ventricular Sizing and Purse-String Suturing

A balloon catheter was inserted into the LV cavity to assist with sizing and maintenance of physiologic ventricular geometry. A Fontan-style purse-string suture using 2-0 polypropylene was placed circumferentially around the aneurysm neck. A second concentric suture was added when the opening exceeded 3 cm.

Step 5: Patch Preparation and Placement

A Dacron patch was tailored to the residual opening and positioned (Figure 3A).

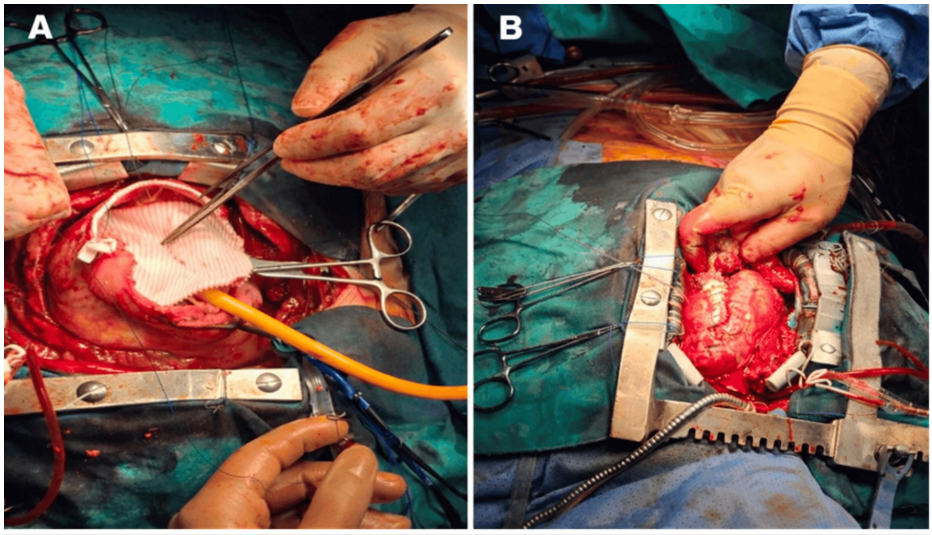


FIGURE 3: Surgical ventricular restoration with Dacron patch reconstruction

A. Intraoperative image demonstrating the tailored Dacron patch positioned within the left ventricular cavity following complete thrombus evacuation and ventricular volume sizing. B. Final stage of surgical ventricular restoration showing secure fixation of the Dacron patch using polypropylene sutures with reinforcement by PTFE felt strips, followed by closure of the left ventricular wall

Step 6: Patch Fixation and Reinforcement

The patch was secured to the endocardial surface using a continuous 2-0 polypropylene suture, and the ventricular wall was then closed over the patch with polypropylene sutures reinforced with PTFE felt strips (Figure *3B*). No concomitant coronary artery bypass grafting was performed.

CPB time was 155 minutes and aortic cross-clamp time was 100 minutes. The patient was weaned from CPB with inotropic and IABP support and transferred to the intensive care unit in stable condition.

Postoperative course and follow-up

No postoperative complications were recorded. The patient was extubated within hours, and on postoperative day two, inotropic support was weaned, the IABP and chest drains were removed, and he was transferred to the ward. Early postoperative echocardiography demonstrated improved LV geometry with exclusion of the dyskinetic segment.

Staged PCI of the circumflex artery was performed on December 23, 2024, with implantation of one drug-eluting stent (4.0 × 20 mm). The patient was discharged on December 31, 2024, on aspirin 100 mg and clopidogrel 75 mg (dual antiplatelet therapy for 12 months), atorvastatin 20 mg, metoprolol, ramipril 1.25 mg, furosemide 40 mg, spironolactone 25 mg, and omeprazole 20 mg. Oral anticoagulation was not prescribed because the thrombus had been completely evacuated with exclusion of the aneurysm and the patient required dual antiplatelet therapy after recent stenting. He successfully quit smoking following surgery.

Five weeks after surgery (January 22, 2025), a dual-chamber implantable cardioverter-defibrillator (ICD) was implanted electively for secondary prevention, given severe left ventricular dysfunction and an episode of ventricular fibrillation during surgery. Medical therapy was then adjusted: atorvastatin was replaced by atorvastatin/ezetimibe 40/10 mg and metoprolol by nebivolol 10 mg, empagliflozin 10 mg was added, and the patient was followed in the heart failure clinic.

At the 14-month follow-up (February 2026), the patient was evaluated for brief episodes of chest pain, without evidence of myocardial injury. Echocardiography showed an LV ejection fraction above 30%, aneurysmal dilation and dyskinesia of the apex, akinesia and thinning of the anterior wall, and moderate mitral regurgitation, without pericardial effusion. CT angiography excluded pulmonary embolism and acute aortic syndrome and showed no pericardial collection, and ICD interrogation showed no arrhythmic events. At the latest follow-up in October 2026, 22 months after surgery, the patient remained clinically stable, with unchanged echocardiographic findings

Compared with the preoperative study (LVEF 20-25%, mild-to-moderate mitral regurgitation, 8-mm

posterior pericardial effusion), LVEF improved to above 30%, mitral regurgitation was moderate, and the effusion had resolved.

Discussion

Although SVR, particularly the Dor procedure, is no longer routinely performed in the contemporary PCI era, it remains a therapeutic option in carefully selected patients with severe ischemic LV remodeling complicated by aneurysm formation or suspected rupture. The present case illustrates the use of SVR in a hemodynamically vulnerable patient with extensive anterior wall dysfunction. The primary goal of SVR is to restore ventricular geometry, reduce wall stress, and exclude non-functional myocardium. In our patient, imaging findings were highly suggestive of a contained ventricular rupture, a condition associated with substantial mortality if left untreated, and a sealed rupture of the apical wall was found at surgery. Prompt diagnosis and urgent surgical intervention allowed aneurysm exclusion and restoration of ventricular architecture.

Left ventricular free wall rupture (LVFWR) is an uncommon but frequently fatal complication of acute myocardial infarction, with a reported incidence of roughly 0.2-7.6% depending on the population studied, and it accounts for a disproportionate share of in-hospital mortality after infarction [6]. Most ruptures present acutely with sudden hemodynamic collapse from tamponade, but roughly one-third follow a subacute, “contained” course, in which localized, repetitive bleeding is sealed by pericardial adhesions or thrombus rather than causing immediate free rupture. This subacute pattern, consistent with the imaging and operative findings in our patient, is the scenario in which surgery can convert an otherwise near-uniformly fatal event into a survivable one, because it affords a diagnostic and therapeutic window that acute “blowout” rupture does not.

Reliable premortem diagnosis of contained rupture is difficult, because clinical and echocardiographic findings can be subtle or absent, particularly when pericardial adhesions prevent the free pericardial effusion that classically raises suspicion. Combined clinical, hemodynamic, and echocardiographic criteria, including pericardial echo-densities suggestive of clot without overt tamponade, have been proposed to improve the sensitivity of bedside diagnosis [7]. In our patient, the admission echocardiogram showed an indistinct apical wall and contrast echocardiography suggested wall discontinuity, but it was ECG-gated contrast-enhanced CT that identified intramyocardial contrast pooling and a hemorrhagic pericardial collection with confidence.

The differential diagnosis included a true aneurysm with thrombus mimicking intramyocardial contrast, a pseudoaneurysm, and an intramyocardial dissecting hematoma. The scar wall of the aneurysm and the sealed rupture site found at surgery favored a true aneurysm complicated by contained rupture. This underscores a broader point: when post-infarction LV dysfunction is more severe than expected from the angiographic and echocardiographic picture alone, a low threshold for cross-sectional imaging (CT or cardiac MRI) is warranted to exclude a contained rupture before it declares itself catastrophically.

Direct suture repair and patch-and-glue techniques are established alternatives for acute or subacute LVFWR, particularly when the defect is small and localized. However, in the presence of a discrete anterior aneurysm with extensive dyskinetic myocardium, as opposed to an isolated point of rupture, the Dor endoventricular patch technique offers the additional benefit of restoring physiologic LV geometry and volume, rather than simply excluding the defect. This distinction mattered in our case: the rupture lay within a dyskinetic apical aneurysm filled with a large thrombus, and a localized patch-and-glue repair alone would neither have removed the thrombus nor addressed the degree of ventricular remodeling contributing to the patient’s persistent hemodynamic compromise despite revascularization. The choice was therefore based on the operative anatomy rather than on evidence that the Dor procedure is superior for rupture.

The STICH trial showed no benefit from adding SVR to CABG in patients with an LV ejection fraction of 35% or less and anterior akinesia or dyskinesia [2]. However, subsequent analyses and accumulated clinical experience have suggested potential benefit in highly selected patients, particularly those with discrete ventricular aneurysms and preserved basal myocardial contractility. The STICHES extension study reported improved long-term survival with surgical revascularization compared with medical therapy alone in ischemic cardiomyopathy [8]. Importantly, neither STICH nor STICHES was designed to evaluate SVR as an emergency intervention for suspected mechanical rupture; our case therefore falls outside the population those trials addressed, and the decision to proceed with SVR was driven by the mechanical complication rather than by remodeling alone.

Historical surgical series of post-infarction LVFWR report in-hospital survival rates of roughly 40-80%, with better outcomes associated with prompt diagnosis, hemodynamic stability at the time of surgery, and absence of preoperative cardiac arrest [6]. Our patient survived to discharge and remained alive and clinically stable at 22 months. However, the reappearance of apical dyskinesia with aneurysmal dilation on follow-up echocardiography indicates that LV remodeling may continue after SVR. It may represent residual non-excluded scar, paradoxical motion of the patch region, or LV redilation, which cannot be distinguished without volumetric imaging.

Technical success in SVR relies on accurate preoperative imaging, complete thrombus evacuation, identification of viable myocardium, and careful patch sizing. In the present case, multimodal imaging and perioperative IABP support facilitated the operation. The choice of a tailored Dacron patch, sized over an intracavitary balloon and secured with a reinforced Fontan-style purse-string closure, reflects the standard technique for restoring near-physiologic LV volume while avoiding undersizing (which risks diastolic restriction) or oversizing (which fails to reduce wall stress adequately). The patient's course also reflects several concurrent treatments, including LAD and staged circumflex revascularization, ICD implantation, and guideline-directed medical therapy with a sodium-glucose cotransporter 2 inhibitor, whose individual effects cannot be separated from those of surgery.

Limitations

This report describes a single case, and the generalizability of the outcome is limited. Although a sealed rupture was identified intraoperatively, the diagnosis of contained rupture was not confirmed by pathological examination, since the priority intraoperatively was rapid hemodynamic stabilization and definitive repair. Aneurysm dimensions and LV volumes were not measured, and quantitative postoperative echocardiographic data are limited. Follow-up is limited to 22 months, and the reappearance of apical dyskinesia means that the durability of the repair remains uncertain.

Although SVR is performed less frequently today, long-term series from Dor and other experienced centers have reported favorable results when the procedure is applied in appropriately selected patients [3,9]. This case report reinforces the ongoing relevance of surgical solutions in the management of complex ischemic heart disease, and highlights that a high index of suspicion for mechanical complications, supported by liberal use of cross-sectional imaging, remains essential when a patient's hemodynamic course does not match the apparent severity of the revascularized coronary disease.

Conclusions

This case report illustrates that SVR using the Dor procedure remains a valuable intervention for selected patients with ischemic left ventricular aneurysms, particularly when complicated by suspected rupture. In the presence of localized non-contractile myocardium and hemodynamic compromise, timely surgical intervention can exclude the rupture site and restore ventricular geometry. Because LV remodeling may recur, these patients require long-term imaging follow-up.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Nikoleta Stanitsa, Georgios Seretakis, Emmanouil Tempelis, Ilias Samiotis, Ilias Gissis, Panagiotis Dedeilias, John Kokotsakis

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Supervision: Nikoleta Stanitsa, Panagiotis Dedeilias, John Kokotsakis

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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