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Case report

New modalities of surgical treatment for postinfarction left ventricular free wall rupture: A case report and literature review



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ABSTRACT

Left ventricular free wall rupture (LVFWR) is the third leading and most feared complication of myocardial infarction. The course of rupture varies from a catastrophic blow-out type to a subacute oozing type. The widespread availability and use of echocardiography have increased the number of cases diagnosed before death and the number of surgical cases attempted. Despite this, experience with this entity is still quite small and LVFWR remains the second most common case of death after myocardial infarction with estimated mortality of about 20%. Survival of the critically ill patients depends on the early diagnosis, hemodynamic stabilization of the patient and prompt surgical repair. The aim of an emergent operation for LVFWR is to rescue the patients at risk of death by bleeding and cardiac tamponade. We present a case of oozing type postinfarction cardiac rupture that was treated by a sutureless technique using a fibrin tissue-adhesive collagen fleece TachoSil® (Takeda, Osaka, Japan) combined with bovine pericardial patch anchored by fibrin glue.

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Background

Left ventricular free wall rupture (LVFWR) is the third leading and most feared complication of myocardial infarction. It has an incidence of 1–4% following a heart attack. Patient characteristics of those with increased risk include age greater than 60 years, female sex, pre-existing hypertension; rupture usually follows the first episode of myocardial infarction and has a strong association with single-vessel disease [1]. Myocardial rupture generally occurs 1–7 days after myocardial infarction.

The course of rupture varies from a catastrophic blow-out type to a subacute oozing type [2]. The most common site of rupture is the anterior or lateral wall of the left ventricle, in a midventricular position along the axis from the base to the apex [3].

The widespread availability and use of echocardiography have increased the number of cases diagnosed before death and the number of surgical cases attempted.

Despite this, experience with this entity is still quite small and LVFWR remains the second most common case of death after myocardial infarction with estimated mortality of about 20% [3].

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Case presentation

A 58-year-old man, smoker with a history of chest pain with spontaneous termination 1 week ago, was seen at the local district hospital with a recurrence of central chest pain and history of collapse. Electrocardiogram results suggested ischemia of the infero-lateral wall. Because of concomitant hypotension continual vasopressors were administered. Cardiac catheterization and coronary angiography revealed closure of right posterolateral artery and hemodynamically not significant stenosis of left anterior descending artery and obtuse marginal branch. An echocardiography showed oozing type of LVFWR. After relieving pericardiocentesis was carried out, hemodynamics improved. Patient was transferred to our institution by helicopter.

On arrival, he was anxious, diaphoretic, and tachycardic. The doses of vasopressors increased in order to preserve perfusion blood pressure. The electrocardiogram demonstrated persistent ST-segment elevations in infero-lateral leads. Laboratory tests revealed elevated levels of hs-TnT (1426 ng/l). The echocardiography examination was reviewed with sign of incipient heart tamponade. Urgent life saving procedure was indicated.

After an urgent median sternotomy and pericardiotomy was performed, patient's hemodynamic indices improved immediately. In accordance with echocardiographic findings a large myocardial infarction of the infero-lateral wall of left ventricle with a tear in the middle was found (Fig. 1). The patient was connected to cardiopulmonary bypass (CPB) via ascending aorta and right atrium cannulation. A sheet of fibrin tissue-adhesive collagen fleece TachoSil® (Takeda, Osaka, Japan) was secured with compression applied by surgeon's fingers to the bleeding point and surrounding infarcted area. This procedure was repeated until hemostasis was established (Fig. 2). Finally a bovine pericardium was anchored to the heart surface by tissue glue. The patient was weaned from CPB without need of vasopressors or inotropic support.

Patient underwent echocardiographic examination before discharge with finding of inferior left ventricular aneurysm, moderate mitral regurgitation (2+) and left ventricular ejection fraction (LVEF) 40-45%. He was discharged on postoperative day 14 (with dual antiplatelet therapy).

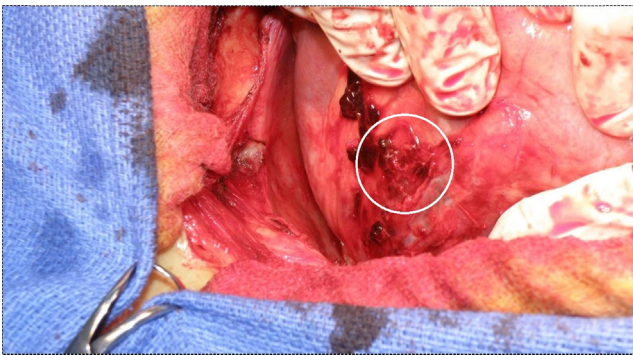


Fig. 1 – Operative view of ruptured left ventricle. The major source of bleeding was an oozing rupture localized in the infero-lateral wall of left ventricle (white circle).

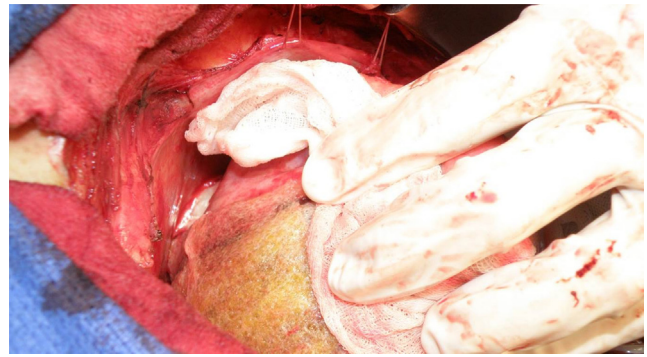


Fig. 2 – Intraoperative view after repair. TachoSil® sheets applied to the left ventricle.

Planned admission came true 1 month after surgery. Percutaneous coronary intervention with placement of 2 drug-eluted stents was successfully performed. Control transthoracic echocardiography (TTE) revealed progression of mitral regurgitation (3-4/4) and inferior pseudoaneurysm formation. Based on these findings a reoperation was indicated.

Dor procedure with CorMatrix ECM patch (CorMatrix, Roswell, GA, USA) and mitral valve replacement with mechanical prosthesis was performed. The procedure was technically very challenging. Shortly after successful weaning from CPB, fulminant deterioration of left ventricle function appeared. Implantation of peripheral V-A ECMO was required. After stabilization of patient, temporary support was explanted on postoperative day 8. After attainment of satisfactory clinical status of the patient, he was discharged home on postoperative day 25.

During continuous outpatient follow up TTE assessment objectifies LVEF 40% and accurate function of mitral prosthesis, the patient is in NYHA II functional class.

Discussion

There is absence of evidence-based suggestions regarding LVFWR. The optimal therapeutic strategy is thus still controversial. Nevertheless, survival of the critically ill patients depends on the early diagnosis, hemodynamic stabilization of the patient and prompt surgical repair. The aim of an emergent operation for LVFWR is to rescue the patients at risk of death by bleeding and cardiac tamponade [2].

Various types of surgical approaches for this condition have been advocated. The choice among them is made based on three main considerations: type of rupture, requirement of CPB, and suture close or sutureless repair [4]. In the conventional approach, infarctectomy is followed by replacement using a prosthetic patch or direct closure under CPB. Direct mattress suture buttressed with Teflon felt can be used as well. Recently there is a shift toward the sutureless technique because of its simplicity, effectiveness and avoidance of friable myocardial tissue. There is no obligatory use of CPB requiring systemic heparinization and aortic cross clamping as well. Invention of new tissue-adhesive materials also contributes to wider use of this modality.

Especially oozing type of LVFWR can be reliably treated using sutureless therapy. Based on results of Sakaguchi and colleagues the sutureless method seems to be simple and safe in most cases [2]. This strategy is not usually suitable for blowout ruptures as demonstrated by Yamaguchi and Kimura [4,5]. On the other hand, Lachapelle et al. reported 3 patients successfully treated using this method, without following re-rupture [5]. In the case of concomitant ventricular septal defect or papillary muscle rupture, the conventional approach is advocated [3].

Limitations of sutureless technique were described as well. Hemostatic sheets covering the LV surface could complicate a concomitant or subsequent coronary artery bypass grafting [4]. Another possible problems associated with a sutureless therapy include the risk of recurrent rupture, pseudoaneurysm formation, and ischemic mitral regurgitation [6].

To reduce these complications, surrounding healthy myocardium should also be covered by a large patch of TachoSil® (Takeda, Osaka, Japan) and pericardium, as suggested by Raffa et al. and other investigators [6,7]. Intraaortic balloon pump (IABP), which reduces after load and transmural wall tension at the repair site, is also recommended for postoperative management of LVFWR [1,5,6,8].

At our institution in cases of LVFWR we usually advocate prompt management of stricken patients, performing sutureless technique as soon as possible to preserve patient's life. At the patient reported herein, the inferolateral location of myocardial infarction was unfavorable. To obtain adequate visualization, the heart had to be mobilized, which was not hemodynamically tolerated. Thus the patient required CPB support. Anyway, the result was satisfactory, verified by postoperative echocardiographic examination.

Unfortunately, in the late postoperative period (1 month), control echocardiography revealed progression of mitral regurgitation and pseudoaneurysm formation with a need of re-operation. Because the concomitant revascularization was not performed, progression of mitral regurgitation was probably consequence of following ischemic cardiomyopathy. Despite this we still believe, that in these types of patients with huge acute mitral regurgitation this method can be life-saving despite the fact that subsequent procedures can follow. As far as another procedure is necessary, it can be performed in more stabilized patient's condition.

In conclusion, sutureless technique is promising in most cases, although there are some situations requiring a more invasive approach. Careful follow-up is essential because a ventricular aneurysm or pseudoaneurysm can be formed at the site of the sutureless repair. Despite evolving diagnostic and surgical techniques, myocardial infarction complicated by rupture of the left ventricular free wall is still associated with exceedingly high mortality.

Conflict of interest

Authors declare no actual or potential conflict of interests.

Funding body

There was no research needed, therefore no financial support required as well.

Ethical statement

There was no research performed – no ethical controversy.

Informed consent

Authors declare that an informed consent was signed by the patient.

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