

# Use of a patch technique to repair post myocardial infarction ventricular septal defect

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**Abstract** Repair of post myocardial infarction ventricular septal defect is complex due to impaired bi-ventricular function, heart failure, cardiogenic shock, poor anatomic delineation of septal defect and poor quality myocardial tissue. We describe a technique that places a patch with pledgets on the right ventricular aspect of the defect. Appropriate resection of anterior wall of left ventricle is done. A large bovine pericardial patch is used to reinforce the ventriculotomy with sutures taken from inside the left ventricle from the relatively healthy area of the endocardium, marking the junction of infarcted and non-infarcted areas. The current technique may also facilitate the remodelling of the left ventricle.

**Keywords** Myocardial infarction · Ventricular septal defect · Cardiac failure

## Introduction

The incidence of post myocardial infarction (MI) ventricular septal defect (VSD) in the reperfusion era is less than 1 % [1, 2]. While a number of surgical techniques are available [3, 4], the post operative morbidity and mortality continues to be high with a significant risk of recurrence of VSD. We have described our approach to the surgical repair of post MI VSDs.

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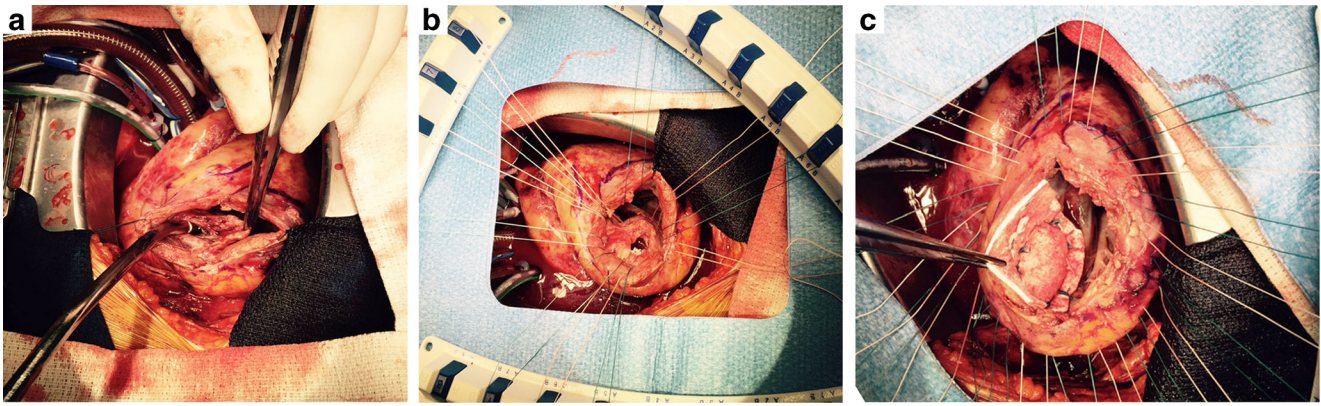
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## Case report

A 52-year-old female presented with antero-lateral ST elevation myocardial infarction (STEMI) which was treated with percutaneous coronary angioplasty to left anterior descending (LAD) artery. Initially, the patient was discharged home 6 days after the admission. She represented 12 days later after the infarct with worsening heart failure and was found to have antero-apical VSD with LV ejection fraction (LVEF) 20 %. An intra aortic balloon pump (IABP) was inserted and patient was commenced on levosimendan infusion. The patient underwent an operative repair of VSD as described below. The patient was weaned off IABP and inotropic support on day 2. Intensive care unit stay was 7 days. Post operative echo demonstrated no evidence of recurrent VSD. Her LVEF was 10 %. An implantable cardioverter-defibrillator (ICD) was implanted post operatively. She was discharged home on day 31 with ongoing management of heart failure. At 7 months of follow-up, the patient had controlled heart failure and her LVEF was 20–25 % with no significant mitral or tricuspid regurgitation.

## Surgical technique

We generally tend to repair these patients on an emergent basis. A delayed repair is considered in patients who are clinically stable. However, even conservative management of these patients requires close clinical supervision. Patients are supported in the peri-operative period with inotropes and IABP. Surgical repair requires median sternotomy, harvesting of conduits, institution of cardiopulmonary bypass with bicaval cannulation and myocardial protection with antegrade and retrograde cardioplegia. Distal coronary anastomoses if indicated are performed at this stage. The LAD artery runs into the infarcted area and is usually not grafted. A linear ventriculotomy in the infarcted area parallel to the course of



**Fig. 1** **a** Exposure of antero-apical VSD via anterior ventriculotomy. Cardiomy sucker has been placed across the defect. **b** Placement of full thickness 2–0 Ethibond pledgeted sutures with full thickness bites taken from the RV aspect. **c** A large felt patch has been used to repair the defect.

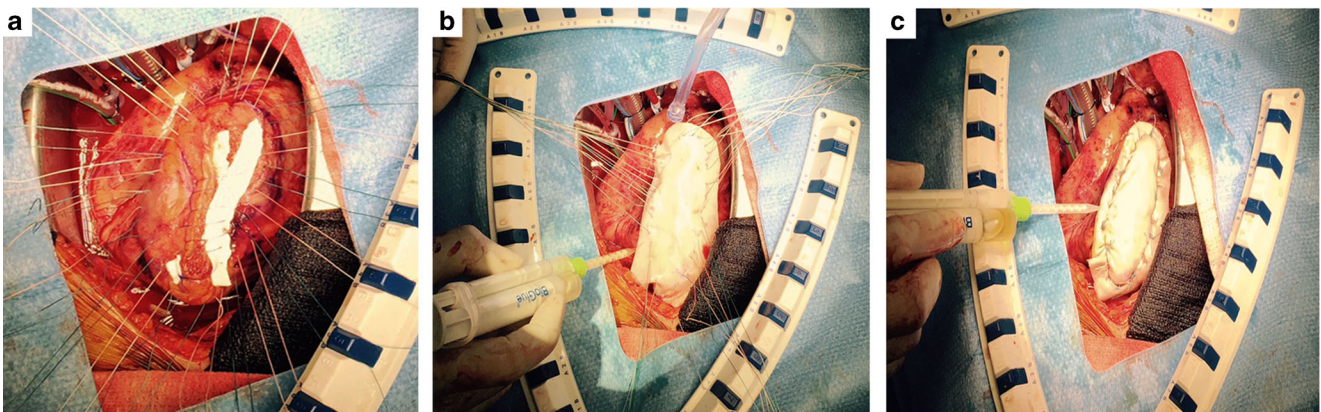
A redundant part of the patch has been brought through the ventriculotomy as a sandwich. Full thickness 2–0 Ethibond pledgeted sutures have been passed from inside LV for the attachment of bovine pericardial patch

LAD is performed. Appropriate resection of anterior wall of LV is done. Stay sutures with or without hand-held retractors are used to expose the VSD (Fig. 1a). A series of 2–0 Ethibond pledgeted (Ethicon Inc., Somerville, NJ) sutures are placed around the margins of VSD with pledgets inside the right ventricle (RV) (Fig. 1b). These sutures are placed as far away as possible from the infarcted margin. A “D”-shaped felt patch, at least twice the size of the defect is prepared. The sutures are passed through the margins of the patch corresponding to the VSD and tied (Fig. 1c). A series of 2–0 Ethibond sutures are placed full thickness in the wall of LV through the junction of infarcted and non-infarcted areas (Fig. 1c). The redundant portion of the felt patch is sandwiched during the repair of ventriculotomy with 2–0 polypropylene, two-layer running closure reinforced with one or two additional strips of felt on either side of ventriculotomy (Fig. 2a). A large bovine pericardial patch is prepared and the second row of sutures placed full thickness through the LV are passed through the patch (Fig. 2b). A layer of bioglue (Cryolife Inc., Kennesaw, GA) is injected between the epicardium and the patch prior to tying

these sutures over the patch. Finally, bioglue is injected around the free margins of the patch (Fig. 2c).

## Discussion

We describe a technique to repair post MI VSD using full thickness interrupted sutures passed through the interventricular septum with pledgets on RV side. Use of an epicardial patch avoids any significant resection of anterior wall of LV during the repair of ventriculotomy and minimizes the risk of bleeding. All sutures for both the septal and the epicardial patches are placed as far away from infarcted area as possible. Limited resection of the anterior wall of LV with placement of LV sutures and tying them over the epicardial patch helps remodel the LV by reduction in the end diastolic volume. This is based upon the visual assessment of LV size corresponding to the expected LV end diastolic volume. A similar technique can be used to repair an inferior VSD. Our experience with the current technique is limited. We have used this technique in



**Fig. 2** **a** A felt strip has been used to reinforce the ventriculotomy suture line with running polypropylene in two layers. **b** Pledgeted Ethibond sutures have been passed through a large bovine pericardial patch

placed on the epicardial surface. Bioglue is injected inside the patch prior to tying the sutures. **c** Pericardial patch has been used to reinforce the ventriculotomy. Bioglue is injected around the margins of the patch

two patients with satisfactory mid-term outcome. There was no recurrence of VSD in either case. There has been a debate in the literature regarding the need for grafting LAD in patients with anterior VSD. In our opinion, there is possibly no benefit in grafting the vessel if the anterior wall is infarcted and apparently demarcated at the time of cardiac surgery.

**Compliance with ethical standards** This study was not funded by any institution. All procedures performed in this study were in accordance with ethical standards of the institutional and/or the national research committee and with the 1984 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the patient for the publication of the clinical information.

**Conflict of interest** The authors declare that they have no conflict of interest.

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