Postinfarction ventricular septal perforation repair with endoventricular circular patch plasty using double patches and gelatin–resorcinol–formaldehyde biological glue

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Abstract

We describe a technique for repairing the ventricular septal perforation 10 days post acute anteroseptal myocardial infarction using the modified infarction exclusion method. The repair involves endoventricular circular patch plasty and application of gelatin–resorcinol–formaldehyde biological glue in the space between a Teflon felt patch on the infarcted septum and a bovine pericardial patch in the left ventricular cavity. Its use in a patient resulted in an almost normal shaped interventricular septum and left ventricular cavity as well as normal left ventricular function. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Repair of postinfarction ventricular septal perforation (VSP) has been associated with a high operative mortality rate. The surgical technique established by Daggett and colleagues [1] has become one of the most successful and conventional of cardiovascular surgical procedures. Komeda and David suggested a new technique for surgical repair of postinfarction ventricular septal defect without removal of the infarcted ventricular muscle [2,3]. This infarction exclusion technique decreased the incidence of surgical mortality. We demonstrate a modified infarction exclusion technique using gelatin–resorcinol–formaldehyde (GRF) biological glue for septoplasty that was applied to a VSP 10 days post anteroseptal AMI.

2. Case report and surgical technique

A 77-year-old woman underwent urgent surgery for VSP 10 days post AMI in January 2000. Echocardiogram showed a large left-to-right shunt at the ventricular level, with a left-to-right shunt ratio of 75%. Coronary angiogram showed a 100% stenosis in the left anterior descending artery (LAD) just distal to the first diagonal artery. Pulmonary artery pressure was 70/45 mmHg. Left ventriculogram (LVG) showed an aneurysmal formation at the septal wall and a dilated akinetic area in the anterolateral wall (Fig. 1, left side). The patient was managed preoperatively with an intra-aortic balloon pump. The operation was performed with cardiopulmonary bypass and moderate systemic hypothermia. Cold crystalloid cardioplegia was used. On initial surgical inspection, the hemorrhagic epicardial surface of the anterior infarction was bulging. The septal defect was approached through a left anterior ventriculotomy, made parallel to the LAD artery. The septal perforation was identified in the midportion of the interventricular septum. The infarcted septal wall bulged toward the right ventricle and appeared fragile. First, a purse-string suture of 3–0 monofilament thread was placed in the lower part of the non-infarcted interventricular septal endomyocardium, completely encompassing the base of infarcted antero-apical endomyocardium (Fig. 2). The purse string suture was tightened. A 3 × 4 cm bovine pericardial patch was then sutured with continuous 4–0 monofilament suture along the line of the tightened purse-string suture. The suture on the lateral side was brought outside the heart and buttressed to a strip of Teflon felt that was applied to the left ventricular epicardial surface. A Teflon felt patch was sutured in the perforated interventricular septum with 2–0 horizontal mattress sutures and Teflon felt pledget.
Two solutions of GRF glue were mixed and kneaded on a plate just before use. Large amounts of the slightly sticky glue were densely applied to fill the space between right side Teflon felt patch and left side pericardial patch. The two patches were held together by finger pressure from the epicardial surface for about 5 min until polymerization took place and adhesion occurred. The ventriculotomy was closed simply over two strips of Teflon felt (Fig. 2).

3. Results

The patient’s post-operative course was uneventful. Post-operative enhanced CT disclosed an almost normal shaped septal wall formed by the GRF glue occupying the space between two septal patches (Fig. 2). An LVG also showed an almost normal LV and excellent LV function. No residual shunt was observed (Fig. 1, right side).

4. Discussion

Patients with VSP due to anteroseptal AMI often have a dilated akinetic area in the anteroseptal and apical walls, sometimes with aneurysmal change. Komeda and David surgical technique [2,3] is an application of the Vincent Dor principle of infarct exclusion [4]. We applied Dor’s infarct exclusion technique to our case. The difference between the Dor and Komeda-David operations is in the use of the purse-string suture (Fontan stitch) in the healthy myocardium surrounding the infarcted area to reduce the base of infarcted area. The tightened purse-string suture forms a small ridge on the patch suture line, allowing fairly easy suture of the smaller bovine patch in an almost two-dimensional manner to exclude the infarcted area. Komeda-David technique requires a larger patch placed in a three-dimensional manner. We filled the space between the Teflon felt patch on the infarcted septum and the bovine patch in the left ventricular cavity with a generous amount of GRF glue to reinforce the suture lines of both patches and to aid in reconstruction of the septum. Musumeci et al. reported that GRF biological glue used as a sealant between the patch and the interventricular septum would prevent early patch dehiscence and subsequent recurrence of the ventricular septal defect [5]. Hata et al. [6] reported an autopsy case in which excellent growth of collagen and elastic fibers were found 36 days after surgical repair of a VSP with GRF glue. Post-operative enhanced CT scan in our patient provided an almost normal shaped interventricular septal wall with full wall thickness by the GRF glue sandwiched between double patches. The double-patch technique is useful to avoid contamination of the systemic circulation by the glue and to provide a dry field before applying the large amount of GRF glue.

Fig. 1. Preoperative (left side) and postoperative (right side) left ventriculograms in right anterior oblique view. Arrows indicate aneurysmal formation of the infarcted septum.
GRF glue required for septoplasty. The technique described here led to satisfactory validation of its utility with normalization of LV shape and function in our patient. Further experience with this technique is required.

References


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