

# Infarction Exclusion Technique with Transmural Sutures for Postinfarction Ventricular Septal Rupture

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**We present a case of postinfarction ventricular septal rupture (VSR) who underwent successful repair using a modified infarction exclusion technique. In our procedure a heterologous pericardial patch is sutured to healthy endocardium in the free wall and septum all around the infarcted area. Interrupted circular mattress sutures were placed through the ventricular wall in such a way as to exclude the VSR and the infarcted muscle of the left ventricle. We describe herein a novel procedure for repairing postinfarction VSR, by the transmural infarction exclusion technique. (Ann Thorac Cardiovasc Surg 2004; 10: 39–41)**

**Key words:** infarction exclusion technique, transmural sutures, postinfarction ventricular septal rupture

## Introduction

Operation for postinfarction ventricular septal rupture (VSR) is associated with high operative mortality in the acute phase of the myocardial infarction. The conventional procedure established by Daggett et al.<sup>1)</sup> has been reported to prolong postoperative heart failure and is associated with high mortality.<sup>2)</sup> The infarction exclusion technique proposed by David et al.<sup>3)</sup> and Komeda et al.<sup>4)</sup> has the advantage of postoperative right and left ventricular function, however the exclusion procedure may be a difficult surgical technique and create residual shunt due to fragile myocardium from using endoventricular continuous sutures.<sup>5)</sup> We describe a procedure performed with a modification of the infarction exclusion technique to dispel some concerns.

## Case Report

A 71-year-old female patient was referred to our institution with acute myocardial infarction. She complained

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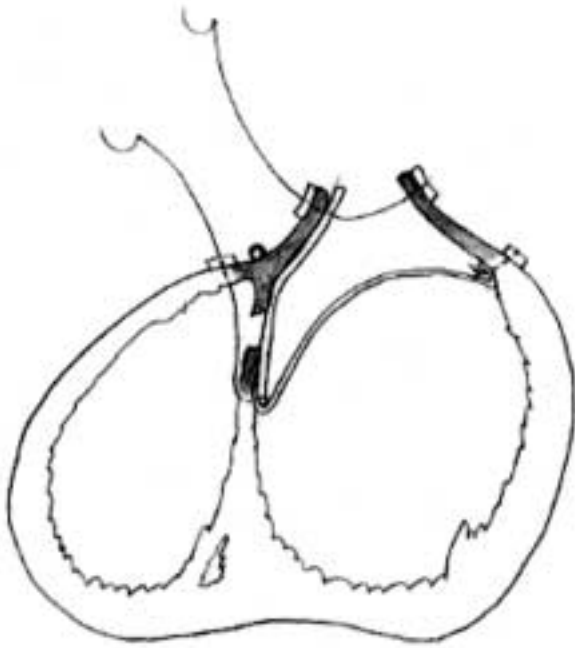
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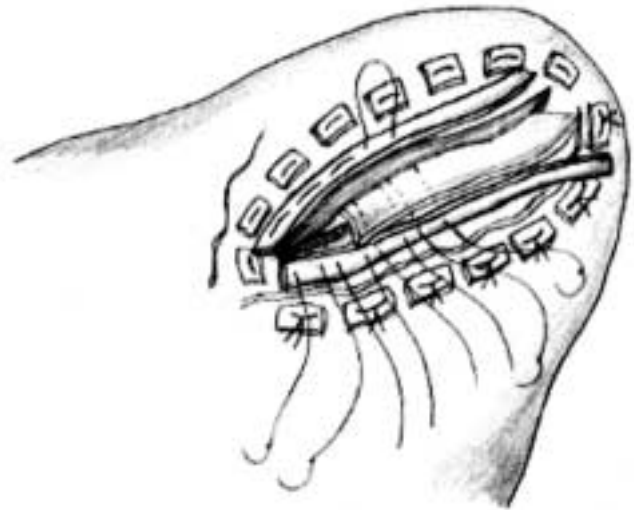
of back pain. Her blood pressure was 70/40 mmHg with a continuous venous infusion of dopamine hydrochloride, 10  $\mu\text{g}/\text{kg}/\text{min}$ , and her heart rate was 123 beats/min. Echocardiograph revealed an aneurysmal left ventricle at the apex and akinetic at the anteroseptal wall. Cardiac catheterization showed a large left-to-right shunt at the ventricular level and there was a pulmonary to systemic flow ratio of 2.55, pulmonary arterial mean pressure of 27 mmHg, and pulmonary capillary wedge pressure of 21 mmHg. Left ventricular end-diastolic volume was 235 ml and end-systolic volume was 169 ml. Left ventricular ejection fraction was 28%. Coronary angiogram showed a total occlusion in the left anterior descending artery (LAD) just distal to the first diagonal artery. During the catheter examination, an intraaortic balloon pump (IABP) was inserted due to cardiogenic shock.

The patient was taken to the operating room immediately to repair the VSR. The operation was performed with cardiopulmonary bypass under mild systemic hypothermia. Cardiac arrest was accomplished by infusion of cold blood cardioplegia. Aneurysmal dilatation of the left ventricle (LV) was located on the anterior-apical portion. A left anterior ventriculotomy was made parallel to the LAD. A VSR was identified in the midportion of the ventricular septum. The infarcted septal wall appeared fragile. No infarcted tissue was excised. A heterologous pericardial patch preserved by a glutaraldehyde chemical fixa-



**Fig. 1.** Interrupted mattress sutures on the free wall of the left ventricle (LV) are placed sequentially through Teflon felt on the epicardial surface of the LV, left ventricular wall, a pericardial patch on endocardium, and on the septal wall side sequentially through a Teflon felt patch and the pericardial patch on the perforated interventricular septum, ventricular septum, right ventricular wall, and Teflon felt on the right ventricular epicardial surface of just the right side of left anterior descending artery (LAD).

tion process was tailored in a round shape of 4×4 cm. The pericardial patch was sutured with several 3-0 polypropylene horizontal mattress sutures along the line of the lower part of the non-infarcted intraventricular wall. The sutures were brought outside the heart on the free wall of the LV and inside the heart on the septal wall side. The interrupted mattress sutures on the free wall and postero-inferior wall of LV were placed sequentially through a Teflon felt on the epicardial surface of the LV, left ventricular wall, a heterologous pericardial patch on endocardium, and on the septal wall side sequentially through a Teflon felt patch and the pericardial patch on the perforated interventricular septum, ventricular septum, right ventricular wall, and Teflon felt on the right ventricular epicardial surface of just the right side of LAD (Fig. 1). Gelatin-resorcinol-formaldehyde (GRF) glue was applied to fill the space between the Teflon felt patch on the interventricular septum and the pericardial patch. The ventriculotomy was closed using 2-0 polypropylene buttress sutures with a Teflon felt strip on either side of the



**Fig. 2.** Ventriculotomy was closed using 2-0 polypropylene buttress sutures with a Teflon felt strip on either side of the incision and including the free edge of the Teflon felt patch.

incision and including the free edge of the Teflon felt patch (Fig. 2). The cardiopulmonary bypass weaning was easy. The patient was weaned from IABP at 12 hours after the operation. She had an uneventful postoperative course. Postoperative cardiac catheterization demonstrated no residual shunt. Swan-Ganz catheter examination revealed normal pressure study. The cardiac output index was 2.54 l/min/m<sup>3</sup>. The left ventricular end-diastolic volume was 138 ml and the end-systolic volume was 83 ml. The left ventricular ejection fraction was 40%. One year after the operation, she was well.

## Discussion

Repair of postinfarction VSR using the infarction exclusion technique<sup>3,4</sup> has been reported to be excellent in restoring postoperative ventricular function as compared with traditional operative technique, infarctectomy and reconstruction of the left and right ventricular walls.<sup>1</sup> However, the infarction exclusion technique is technically difficult due to the need for repair with a continuous suture requiring a large patch placed in a three-dimensional manner. Some reports described residual shunt after the infarction exclusion operation.<sup>5</sup> In the acute phase of myocardial infarction the margin between infarcted and healthy myocardium was often unclear. The technique may be insufficient for suturing fragile myocardium in the acute phase of myocardial infarction. In our method a pericardial patch is fixed tightly on endocardium with

transmural sutures, therefore our technique may reduce the risk of residual shunt. The method allows fairly easy suture of the pericardial patch to exclude the infarcted area. We usually use a round shaped patch of 4×4 cm in the midportion of the ventricular septum.

Musumeci et al.<sup>6)</sup> reported the application of GRF biological glue in the space between the pericardial patch and infarcted septum. Theoretically the method may contain the risk of contamination of the systemic circulation with formaldehyde because GRF glue is directly applied on the interventricular septum with a ventricular septal defect. Our method prevents the risk of the Teflon felt patch being on the interventricular septum.

The concern about our operative technique is the effect on right ventricular function because of the reduction of some right ventricular volume. The other concern is the myocardial damage of the transfixed suture line. The postoperative cardiac catheter study demonstrated normal pressure data and cardiac output, and normal contraction of the left ventricular wall except for the infarcted anteroseptal wall. These drawbacks can be minimized. Our method is technically easy and is effective for the prevention of residual leakage.

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