

*Case  
Report*

## A Modified Infarct Exclusion Repair of Posterior Postinfarction Ventricular Perforation: Triple-patch Technique for Postinfarction Ventricular Septal Perforation in 2 Female Patients

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**We describe a new technique for the early surgical repair of a posterior postinfarction ventricular septal perforation (VSP) in two consecutive female patients. The occurrence of a posterior VSP is rare, and its repair is technically difficult because the posteromedial papillary muscle is located adjacent to the intraventricular septum. This modification appears to prevent leaks to the right ventricle through the VPS with a single direct patch and the use of two equine pericardial patches to form a single endocardial pouch. The women were 77 and 62 years old, and the time between the onset of acute MI and surgery was 3 and 6 days. On preoperative catheterization, Qp/Qs was 4.18 and 4.01. Neither operative death nor residual shunting was observed.**

**Key words:** posterior ventricular septal perforation, acute myocardial infarction, surgical treatment

### Introduction

Postinfarction ventricular septal perforation (VSP) remains a serious complication of myocardial infarction (MI); it occurs in approximately 1 to 2% of all cases,<sup>1)</sup> which is often fatal unless treated surgically. Despite numerous improvements in the surgical technique, the mortality rate remains at about 19%–40%.<sup>2–4)</sup> The surgical repair of posterior VSP still carries higher rates of mortality and morbidity than does anterior VSP. Perioperative low output syndrome, alteration of the mitral valve function, and residual shunt are all associated with a poor outcome. We performed the early surgical repair

of posterior VSP employing a triple patch technique, developed by cardiovascular surgical group of Tachikawa Medical Center in Japan. In this article, we describe a simple and novel technique to repair posterior VSP.

### Case Report

Both cases of VSP of the posterior type were of women, who were 77 and 62 years old. The time between the onset of acute MI and surgery was 3 and 6 days, respectively. An intra-aortic balloon pump was inserted for hemodynamic stabilization in both patients, and heart catheterization and coronary angiography were performed. Coronaryangiography revealed 90% stenosis of the left anterior descending artery and postero-lateral branch, and 99% severe stenosis at the proximal and middle portion of the right coronary artery (RCA) in one patient, and total occlusion of the RCA at the proximal site in the other patient. Cardiopulmonary bypass was established, and myocardial revascularization was performed while the heart was beating, and before the VSP repair, if required. Concomitant coronary artery bypass

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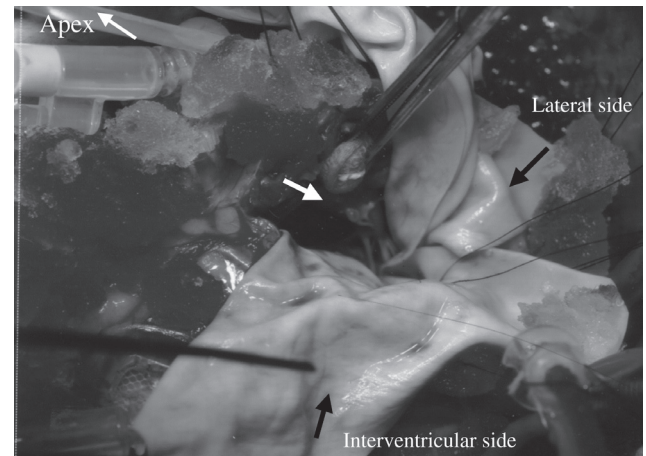
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grafting was performed in the 77-year old patient. Then, we arrested the heart with a cardioplegic solution and lifted the apex with a suction device to expose the posterior descending artery (PDA). Repair was performed through a longitudinal left ventriculotomy in the infarcted area about 0.5–1 cm away from the PDA. The papillary muscles were carefully inspected. First, a tailored small equine pericardial patch was used to close the VSP directly with a running 3-0 polypropylene suture. After the two equine pericardial patches were cut into a rectangular shape, both corners of these patches were sutured and fixed to the fibrous annulus of the mitral valve. Then, one pericardial patch was sutured to the noninfarcted endocardium around the infarct area on the ventricular septum side and another patch was sutured to the posterior wall along a line of the medial margin of the base of the posteromedial papillary muscle using a running 3-0 polypropylene suture (**Fig. 1**). For fixing the edge of the pericardial patch, we brought each final suture outside of the heart was reinforced by using a felt pledget. These two equine patches were then cut and sewn to decide on the final size and shape of the pouch to fit the left ventricular cavity to form an endoventricular pouch. After the VSP patch and endoventricular pouches were sutured, fibrin glue was applied to fill the cavity between the patches. The ventriculotomy was closed in two layers over two Teflon felt strips using 2-0 polypropylene sutures. Both patients survived repair of the VSP. Early postoperative echocardiographic studies showed well-preserved left ventricular function except for the infarcted area with no evidence of residual shunt, and on postoperative catheterization, the Qp/Qs decreased from 4.18 to 1.09 in 71 year old woman, and from 4.01 to 0.92, in the 62 year old woman.

## Discussion

Cooley and colleagues reported the first surgical repair of VSP in 1957.<sup>5)</sup>

Since then, numerous techniques have been successfully employed for the early repair of VSP. David and Komeda reported the possibility of reconstruction of the left ventricle with a single patch repair.<sup>6,7)</sup> This technique further improved rates of surgical mortality, because it involves placing an intracavitary endocardial patch to exclude the infarcted myocardium and maintain the ventricular geometry. From 1996 to 2003, we performed VSP repair in five patients by employing the David-Komeda infarction exclusion method. Although there



**Fig. 1** Intraoperative picture.  
Black arrow: two equine patches, ventricular septum and lateral sides.  
White arrow: posteromedial papillary muscle.

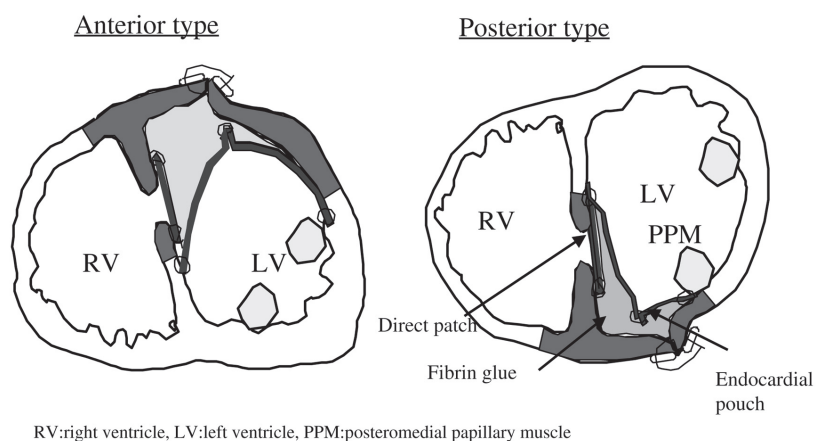
was no operative death, postoperative residual shunting was common (50%, QP/QS>2.0). One patient with VSP recurrence underwent reoperation. One disadvantage of this method is the difficulty in suturing the pouch at the myocardium, because it is necessary to decide on the size and shape of the pericardial pouch beforehand. Subsequently, some modifications of the infarction exclusion method have been devised to prevent postoperative residual shunting.<sup>8–10)</sup> Since 2003, we have also modified the classic David-Komeda infarction exclusion technique using three equine pericardial patches to prevent these postoperative problems.<sup>11)</sup> Employing this procedure, we repaired the anterior VSPs in 4 patients, and posterior VSPs, in 2. Concomitant coronary artery bypass grafting was performed in 3 patients (**Table 1**). Our surgical technique has some advantages. First, a small patch of equine pericardium is used to close the VSP directly, and the cavity of the small patch and out side of the pouch are sealed with fibrin glue (**Fig. 2**). This avoids excessive tension on the fragile ventricular septum and prevents residual shunting. Second, by using two equine pericardial patches sutured to the intact myocardium, we can easily adjust the final size and shape of the endocardial pouch. We performed this method in six patients, and there was no residual shunting.

Surgical repair of posterior VSP still carries higher rates of mortality and morbidity than does the repair of the anterior VSP.<sup>12, 13)</sup> Hirata and colleagues reported an operative mortality rate for the posterior type at 40%, with the cause of death being persistent pump failure. Fatal cases showed both a poor left ventricular function, and A

**Table 1 Clinical results of the 6 patients who underwent triple patch repair.**

Age /sex	VSP	preoperative cardiac support	operation	operation time / aortic clamp time	pre-op Qp/Qs	post-op Qp/Qs	result
77/Female	post	IABP	triple patch repair+CABG(2)	317/120	4.2	1.1	alive
74/Male	ant	IABP	triple patch repair+CABG(1)	510/149	2.5	1.1	dead
81/Male	ant	IABP	triple patch repair+TAP	252/101	1.8	1.5	alive
71/Male	ant	IABP+PCPS	triple patch repair	240/89	3.3	1.0	alive
62/Female	post	IABP	triple patch repair	225/92	4.0	0.9	alive
74/Female	ant	IABP	triple patch repair+CABG(2)	308/90	2.4	1.0	alive
73.2±6.4				308.7±105.4/106.8±23.7	3.0±1.0	1.1±0.2	

VSP, ventricular septal perforation; OP, Operative; Qp/Qs, pulmonary blood flow/systemic blood flow; Ant, anterior; Post, posterior; IABP, intraaortic balloon pumping; CABG, coronary artery bypass grafting; PCPS, percutaneous cardiopulmonary support; TAP, tricuspid annuloplasty. Values represent mean ± standard deviation.

**Fig. 2** Operative schema.

(a) Triple patch repair of the anterior VSP.

(b) Triple patch repair of the posterior VSP.

a | b

right ventricular infarction inducing a dysfunction of the right ventricle. They suggest that the prognosis of posterior VSP may differ according to the site of RCA occlusion.

Some surgeons advocated repairing VSP caused by an inferior MI through a right ventriculotomy or a right atrial approach.<sup>14–16)</sup> They state that this approach showed be used when there is a large MI in which a transventricular approach may lead to increased operative complications.<sup>14–15)</sup> For example, a low perioperative output due to left ventriculotomy, mitral dysfunction due to the derangement of ventricular geometry, and papillary muscle damage due to necrosis or suture are associated with poor operative results. However, these approaches of posterior VSP are not popular because of the poor visual field and technical difficulties. The trabeculation of the right ventricle could not precisely identify VSP.<sup>14)</sup>

Although our technique involves left ventriculotomy through the infarcted area, it is important to obtain a direct view of the VSP location and the margin of the infarcted myocardium, a residual shunt from forming and injury to the papillary muscle. Mitral dysfunction can occur due to derangement of the ventricular geometry or papillary muscle damage caused by myocardial infarction or surgical injury. Care must be taken to avoid surgical damage to the papillary muscle. In our limited experience, by making an incision in the inferior wall of the left ventricle 0.5–1 cm away from the PDA, we can also use this technique in patients with posterior VSP without causing damage to the papillary muscle.

In summary, this “triple patch technique” is simple and reliable, which enabled us to reduce the risk of residual shunting. The procedure also allows us to avoid excessive down sizing of the left ventricle during repair

of the posterior VSP

Even with our limited experience, the exclusion technique described here might reduce operative mortality and incidence of a repeat VSP.

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