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Two Cases Using "Epi-Endocardial Patch Repair" for Postinfarction Left Ventricular Rupture

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ABSTRACT **The treatment points of left ventricular (LV) free wall rupture after acute myocardial infarction (MI), so far, are to prevent a deterioration of LV function after MI and to prevent a recurrence or extension of the dissection of the infarcted/necrotic myocardium to stop bleeding.[1] We report two cases of LV rupture after myocardial infarction that underwent epicardial patch repair using deep epicardial sutures reaching LV subendocardial area ("epi-endocardial patch" repair). The procedure was done under beating condition with cardiopulmonary bypass in the first case and with preoperatively percutaneous cardiopulmonary support system (PCPS) in the second case to prevent a deterioration of LV function. Hemostasis was effective and complete, and extension of the intramuscular dissection was well blocked. The patients recovered LV function soon. The epi-endocardial sutures can be placed safely without inducing new ischemia, and the method might be possible with beating condition.** *(J Card Surg 2003;18:164-166)*

Left ventricular (LV) free wall rupture remains a grave complication after acute myocardial infarction (MI). The points of treatment, so far, are to prevent a deterioration of LV function after MI and to prevent a recurrence or extension of the dissection of the infarcted/necrotic myocardium to stop bleeding.[1] Here we present two cases that underwent a newly modified method of repairing the LV with free wall rupture.

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PATIENTS AND TECHNIQUE

Case 1

The patient was a 57-year-old male who was admitted to the hospital because of cardiogenic shock after MI. An intra-aortic balloon pump (IABP) and a percutaneous cardiopulmonary support system (PCPS) were required for the patient. His coronary angiogram showed that the vessel responsible for the MI was the left anterior descending artery, and echocardiography suggested a cardiac rupture. During the operation, squirting bleeding from the epicardial tear on the LV anterior wall was detected. Cardiopulmonary bypass (CPB) was connected, and ascending aorta was cross-clamped. After the left ventriculectomy (LVtomy), the infarcted LV area was excluded from the rest of the LV using a bovine pericardial patch that was sutured to the endocardium of the LV around the MI area.[2] The

LVtomy was closed by employing the bovine pericardial strip. After the heart started beating spontaneously, bleeding from the LV suture line associated with subepicardial hematoma was noted, which suggests bleeding from the suture line of the endocardial patch and recurrence of the intramyocardial dissection.

The bleeding or hematomatous site was reinforced by using deep epicardial sutures from the epicardial side (epi-endocardial repair) with the buttress bovine pericardium strip to the normal area around the bleeding or hematomatous site under the beating condition on CPB. The bleeding and extension of the hematoma/dissection was stopped completely, and CPB was weaned off easily without using PCPS.

Case 2

The patient was a 66-year-old male who developed cardiogenic shock after acute MI. The coronary angiogram showed that the posterolateral branch of the right coronary artery was occluded. Both echocardiography and pericardiocentesis suggested a cardiac rupture. The patient required cardiopulmonary resuscitation and had inserted IABP and was transferred to our hospital. On arrival, the patient had severe hypotension, and therefore PCPS was started. In emergency operation, the pericardial space was filled with blood. Bleeding point was confirmed from the epicardial tear on the LV posterolateral wall. Since the patient's infarction did not involve the septum and his preoperative condition was grave, we decided to avoid LVtomy and to repair the LV using epi-endocardial sutures under the beating condition on PCPS in order to stop the intramyocardial dissection and epicardial bleeding. Large U-stay sutures of 3-0 polypropylene with Teflon pledget were placed on the epicardium of the normal LV area around the MI; the suture was advanced deep down to the subendocardial area of the LV wall (Fig. 1). Care was taken not to damage or compress the coronary vessels on the epicardial surface. All of these stitches were passed through a large bovine pericardial patch with the size of the MI or ischemic area, and the area including the rupture site was covered with the patch. Just before the patch was secured, fibrin glue was sprayed on the tiny space between the patch and the epicardium for further stabilization of the area. The bleeding was stopped completely, and PCPS was weaned off easily in the operating room.

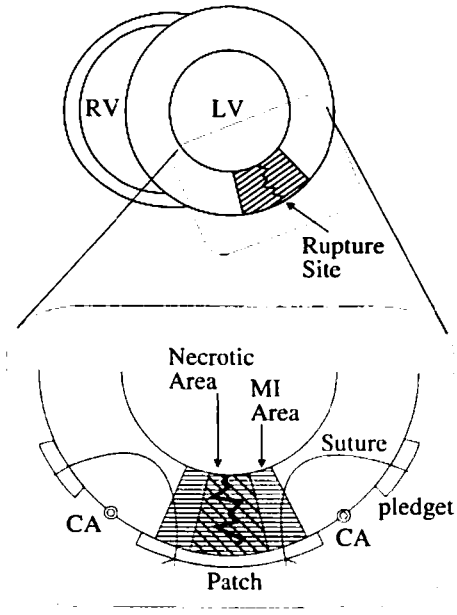

Figure 1. *Schematic illustration of the concept of the "epi-endocardial" patch repair. Upper panel illustrates the cross-sectional view of both ventricles, including the rupture or infarcted LV wall. Lower panel shows a magnified view of the operated area of the LV wall. The patch that was supported by pledgeted sutures sewn deep in the LV wall nearly reaching the endocardium covered the ruptured or infracted LV wall; the sutures were sewn from healthy epicardium without the LVtomy. CA = coronary artery.*

DISCUSSION

Previous reports described the suturing technique with epicardial felts[3] or the covering technique with large epicardial patch.[4,5] These methods of working on the infarcted LV wall are associated with possible rerupture of the fragile suture sites. Padro and coworkers described a method to place a patch on the epicardium covering the rupture site by using fibrin glue.[6] This method can work well when the intramuscular dissection no longer extends. In LV rupture due to acute MI, however, the dissection often extends because the infarcted LV wall is very fragile, which causes the above methods to be associated with recurring rupture. In order to stop the extension of the dissection, an endocardial patch,[2] which covers the "entry" of the dissection as well as the area around it, is ideal. However, the method

requires LVtomy, which can further deteriorate the LV function by employing a cardiopulmonary bypass and aortic cross-clamp.

In our first case, LV wall repaired by the endocardial patch method provoked the recurrence of LV wall dissection after the heart started beating spontaneously. In order to maintain the LV function and to reinforce the LV around the fragile MI area, we tried the epi-endocardial suture that modified the endocardial patch method to match the beating condition with CPB. This method stopped bleeding completely and made possible CPB weaning without PCPS. In the second case, in spite of grave preoperative LV condition, the epi-endocardial suture method to match the beating condition on PCPS blocked bleeding completely without deterioration of LV, and PCPS was easily weaned off in the operating room.

We tried to prevent the extension of the dissection by placing the deep epicardial sutures to relatively healthy epicardium, not the infarcted one.In our limited experiences, the epi-endocardial sutures can be placed safely without inducing new ischemia, and the method might be possible under the beating condition in some selected cases. However, if the interventricular septum is infarcted, the endocardial patch repair via LVtomy should be better because otherwise the ventricular septal perforation might develop later. One of the concerns of the method is possible impairment of the LV function due to large suture/patch area, but both cases had a good LV function postoperatively. Perhaps it was because the ruptured LV often has a good wall motion in the area remote from the infarction.

The epi-endocardial sutures can be placed safely without inducing new ischemia, and the method might be possible with beating condition due to treatment of LV free wall rupture.

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