Double-patch repair for blow-out type left ventricular free wall rupture after acute myocardial infarction

Taro Nakatsu, MD, PhD, Etsuro Suenaga, MD, PhD, Tatsuya Ozawa, MD, and Yusuke Kawasaki, MD, Osaka, Japan

From the Division of Cardiovascular Surgery, Kansai Electric Power Hospital, Osaka, Japan.

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Address for reprints: Taro Nakatsu, MD, PhD, Division of Cardiovascular Surgery, Kansai Electric Power Hospital, 2-1-7 Fukushima, Fukusima-ku, Osaka, 553-0003, Japan (E-mail: tnakatsu79@gmail.com).

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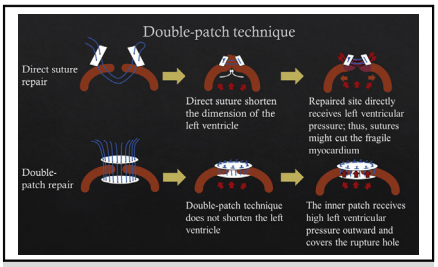


Schema of the double-patch technique compared with direct closure.

CENTRAL MESSAGE

The double-patch technique for repairing blow-out type LVFWR is safe and provides good circulatory status.

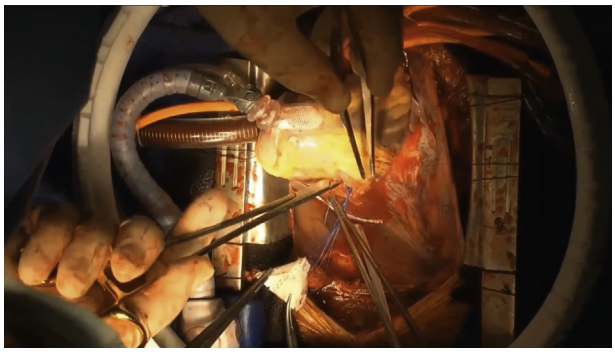
Video clip is available online.

Left ventricular free wall rupture (LVFWR) is one of the most serious complications of acute myocardial infarction (AMI). Particularly, blow-out type LVFWR, characterized by active bleeding, is life-threatening, with a high mortality rate of 49.2% to 71.4%.[1,2] In such cases of active bleeding, the sutureless technique is sometimes inadequate for hemostasis. Moreover, rerupture can occur following direct closure. Thus, the direct closure technique is sometimes inadequate in patients with a blow-out type LVFWR. Therefore, a safe technique for managing blow-out type LVFWR is warranted. We report a case of successful repair of a blow-out type LVFWR using the double-patch technique (Video 1).

CASE REPORT

A 53-year-old man visited the referral hospital for chest pain. Electrocardiography showed ST elevation in leads V3-6. The patient was immediately transferred to the catheter laboratory for diagnosing AMI. At the time of femoral artery puncture, the patient was pulseless. Therefore, cardiopulmonary resuscitation was initiated. Moreover, extracorporeal membrane oxygenation was established. Coronary arteriography showed total occlusion of the circumflex artery segment 13th and 75% stenosis of the first diagonal branch. Echocardiography revealed pericardial effusion, and LVFWR was diagnosed. Pericardial drainage failed.

Consequently, the patient was immediately referred to our hospital for LVFWR repair. Upon arrival, the patient was in shock status. Transesophageal echocardiography showed that the right ventricle was reduced in size due to pericardial effusion. After median sternotomy, a large amount of hemorrhagic effusion was drained from the pericardial incision. Through intraoperative inspection, pulsatile bleeding was found on the posteroinferior wall of the left ventricle (Figure 1). Moreover, ischemic color change was observed around the bleeding site. Therefore, the sutureless technique



VIDEO 1. This is the video showing the outline of this paper. Video available at: https://www.jtcvs.org/article/S2666-2507(22)00345-5/fulltext.

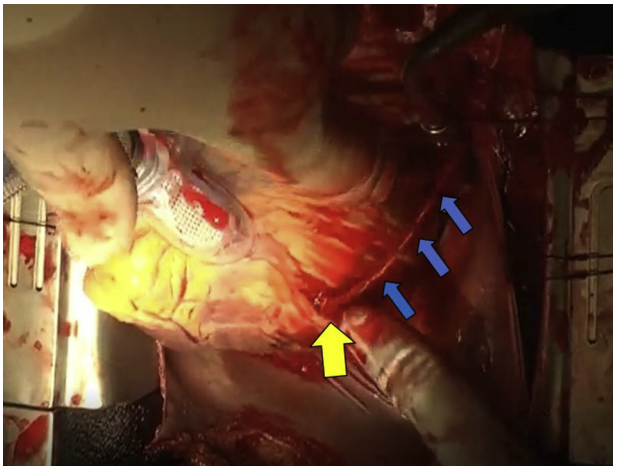


FIGURE 1. Image from intraoperative video. The *yellow arrow* shows the rupture site on the left ventricular posteroinferior wall. The *blue arrows* show the pulsatile bleeding.

was ineffective for hemostasis against active bleeding. Direct suturing while beating was considered to be dangerous to the fragile myocardium around the rupture site injured by AMI. Therefore, we opted to perform a double-patch repair for LVFWR under cardiac arrest.

Cardiopulmonary bypass was established and extracorporeal membrane oxygenation was discontinued. Under cardiac arrest, the margin of the rupture site was trimmed as a reference for myocardial color change. The Dacron patch was trimmed into an octagon and placed inside the left ventricle covering the rupture site with 11 mattress sutures using 4-0 polypropylene (Figure 2, *A*). Furthermore, another Dacron patch was used to cover the outside of the left ventricle with the same 11 mattress sutures (Figure 2, *B*). BioGlue (CryoLife) was inserted into the rupture site between the 2 Dacron patches for reinforcement. Additionally, TachoSil (Nycomed) was applied to cover the patch for further reinforcement. The patient was hemodynamically stable and successfully weaned from cardiopulmonary bypass. Inotropic agent administration was discontinued 2 days postoperatively. The patient was transferred to the referral hospital 19 days postoperatively. Written informed consent was obtained from the patient. This report was approved by the institutional review board (number 21-088; date of approval January 20, 2022).

DISCUSSION

LVFWR is a catastrophic complication of AMI. Particularly, blow-out type LVFWR leads to cardiac tamponade very rapidly with an extremely high mortality. Regarding surgical repair of blow-out type LVFWR, a sutureless technique alone appears insufficient to control bleeding. Moreover, sometimes, it is not possible to achieve safe hemostasis with the direct closure technique due to the fragile myocardium caused by AMI. Kinoshita and colleagues[3] reported a sandwich patch technique for repairing ventricular septal rupture caused by AMI. In our case, we adopted this technique to repair a blow-out type LVFWR. The inner patch receives high left ventricular pressure outward and covers the rupture hole. Moreover, sutures in this technique runs vertically to the myocardium. Thus, the patch sutures hardly cut the fragile myocardium damaged by AMI. Therefore, this double-patch technique is an effective method for repairing blow-out type LVFWR. Direct closure of the rupture hole requires a safety margin, which sometimes reduces left ventricular volume. However, the double-patch technique does not require sutures that shorten the dimension of the left ventricle. Hence, our technique does not reduce left ventricular volume. Therefore, it potentially provides larger cardiac output than does the direct sutures technique. In conclusion, the double-patch technique for repairing blow-out type LVFWR is safe and provides good circulatory status.

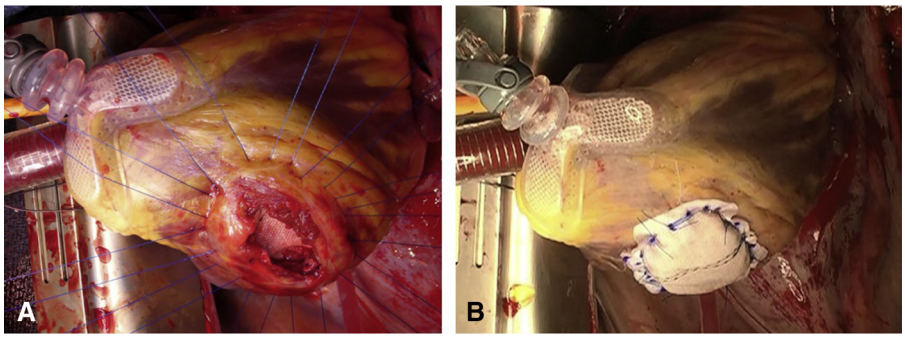


FIGURE 2. A, After resection of the fragile myocardium, an octagonal Dacron patch is placed inside the left ventricle covering the rupture site with 11 mattress sutures using 4-0 polypropylene. B, The other Dacron patch covering the outside of the left ventricle with the same 11 mattress sutures.

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