Case Report

Patch-and-Glue Sutureless Repair for Blowout Rupture after Myocardial Infarction: Report of Two Cases

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A blowout cardiac rupture is sudden and dramatic. The most appropriate surgical repair remains controversial. We report our experience with blowout rupture treated by sutureless technique. The two cases were males aged 58 and 79 years respectively. Echocardiography confirmed the diagnosis of cardiac rupture. Resuscitation was continued in the operating suite, and the myocardial tear and necrotic area were covered with two sheets of fibrin tissue-adhesive collagen fleece and an equine pericardial patch secured to the heart surface with biologic glue with the aid of cardiopulmonary bypass. Both patients survived and were discharged from our hospital. One has been doing well for 15 months after surgery and the other remains breathing on his own but otherwise nonreactive for 20 months since . We have adopted a patch-and-glue sutureless technique instituting cardiopulmonary bypass for blowout rupture. Cardioplegic arrest was performed to achieve a bloodless surgical field and maximize glue function. All rupture sites should be covered with a properly large patch. This technique is simple, versatile, and considered to be associated with a favorable outcome. (Ann Thorac Cardiovasc Surg 2008; 14: 48–51)

Key words: blowout cardiac rupture, patch-and-glue, sutureless repair, cardiopulmonary bypass, cardioplegic arrest

Introduction

Blowout cardiac rupture is recognized as a lethal complication after myocardial infarction. Emergency surgical intervention is the only available treatment. There are increasing reports in the literature of successful surgery, but the most appropriate surgical repair remains controversial.[1)]

The following two cases constitute our surgical experience with blowout cardiac rupture treated by sutureless technique with fibrin tissue-adhesive collagen fleece (TachoComb: ZLB Behring K.K., Tokyo, Japan), equine pericardial patch (Xenomedica: Edwards Lifesciences LLC, Irvine, CA, USA) and Gelatin-Resorcin Formaldehyde glue (GRF glue: Cardial, Saint-Etinne, France) with the aid of cardiopulmonary bypass and cardioplegic arrest.

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Case Reports

Case 1

A 58-year-old man suffered from back pain for 3 days and visited our hospital on May 13, 2005. Upon admission the CT showed cholelithiasis and he had been put on the operating list for cholecystectomy. At 1:30 p.m. on May 16, he lost consciousness with cardiopulmonary arrest beside the bed. Immediate resuscitative efforts were

undertaken. Echocardiography (UCG) revealed nonhomogenous distribution of pericardial effusion or clot adhesion to the ventricular wall (Fig. 1). Percutaneous cardiopulmonary support (PCPS) and then intra-aortic balloon pumping (IABP) were established immediately. The resuscitation team transported the patient to the operating suite, with the pupils remaining dilated during this period. A median sternitomy was performed as resuscitation continued. After the pericardium was opened, approximately 400 mL of clot was removed. The heart was still beating, and pulsatile squirting bleeding through a 1 cm tear in diameter was found in the lateral wall of the left ventricle. The surrounding area 5 cm in diameter was occupied with hematoma and necrotic tissue. The beating heart was held by hand so as to view the necrotic area. A 5×5 cm square section of TachoComb was placed to cover the whole necrotic area, and manual compression with the TachoComb was continued for 5 min. Although complete hemostasis seemed to be achieved with one sheet of TachoComb alone, we were afraid patch failure might lead to postoperative pseudoaneurysm or rerupture of the left ventricle. Therefore we discontinued PCPS and put the patient on cardiopulmonary bypass (CPB). Another sheet of TachoComb of 1 cm larger size (6×6 cm) was attached over the first one with additional compression for 5 min with cardioplegic arrest. Additionally a large patch of glutaldehyde-treated equine pericardium (7×7 cm) covering the entire infracted area and two TachoCombs already placed was fixed to the heart surface by GRF glue, with the heart still arrested to achieve a relatively dry surface for application[2] and maximize glue function. The bleeding stopped completely, and CPB was discontinued easily, without PCPS which was decannulated in the operating room.

He was transferred to the intensive care unit in a hemodynamically stable condition, but still with dilated pupils. His postoperative course was relatively uneventful with no evidence of neurological activity. He had been breathing on his own, but remained nonreactive otherwise since then. On May 22, 2006 (1 year after operation), he was transferred to an outlying institution, when UCG showed neither pseudoaneurysm nor distortion of the left ventricle.

Case 2

A 79-year-old man was found to be lying unconscious in a bathroom around 2:30 a.m. on November 4, 2005. When he was transported to our hospital by ambulance at 3:30 a.m., his blood pressure was less than 50 mmHg and UCG revealed pericardial effusion and hypocynesis in the lateral wall, indicating cardiac rupture after myocardial infarction that caused cardiac tamponade. He was taken immediately to the operating room with a palpable blood pressure of 60 mmHg.

A median sternotomy was performed. When the pericardium was gradually opened, 400 mL of thrombus and blood was also gradually removed and hemodynamics improved. Exploration revealed the hematoma 5 cm in diameter in the lateral wall of the left ventricle, and pulsatile bleeding through a 1 cm rupture site in diameter was identified. According to the previous experience with Case 1, we decided to do a sutureless patch repair with cardiac arrest. CPB was established and then the aorta was cross-clamped. The whole necrotic area was covered with a 5×5 cm square sheet of TachoComb and manual compression was applied for 5 min. Another sheet of TachoComb 6×6 cm square e was placed over the first one in the same fashion. The two layers of TachoComb were covered with a 7×7 cm square patch of equine pericardium secured to the heart with GRF glue (Fig. 2). He came off CPB without any problems. Hemostasis was achieved.

His postoperative course was uneventful and he was discharged on the 22nd postoperative day. A postoperative catheterization revealed an occluded Obtube Marginal branch and no evidence of pseudoaneurysm and distortion of the left ventricle. He has been doing well for 14 months since the surgery and UCG shows no problems currently.

Comment

Left ventricular free wall rupture generally represents an emergency of the first order, especially if it is a blowout rupture.[1] We have reported our experience with a sutureless patch technique using CPB and cardioplegic arrest to repair blowout rupture after myocardial infarction in our last 2 patients. The initial outcome and follow-up of this small cohort is favorable despite having 1 patient in cardiopulmonary arrest and the other in cardiogenic shock before operation and both of them actively bleeding.

Surgical treatment of cardiac rupture has varied over time and is often individualized depending on the condition of the tear. Traditional and standard repair involves performing infarctectomy including the area of rupture and reconstructing the ventricle.[3] This technique continues to be reported and advocated by some authors, espe-

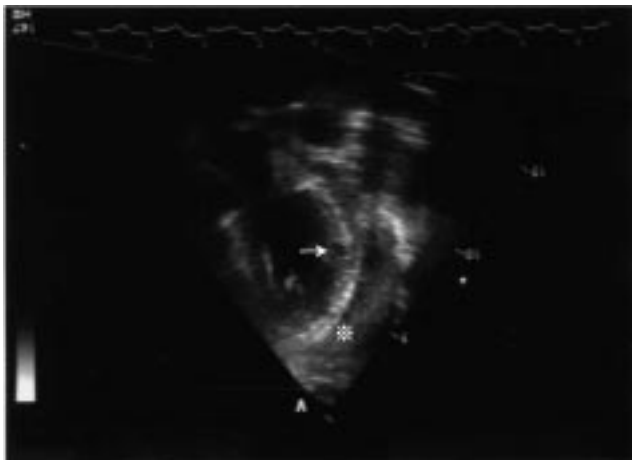

Fig. 1. Preoperative UCG image in apical view.
UCG revealed nonhomogenerous distribution of pericardial effusion or clot adhesion to the ventricular wall (※) and the rupture site in the lateral wall (arrow).

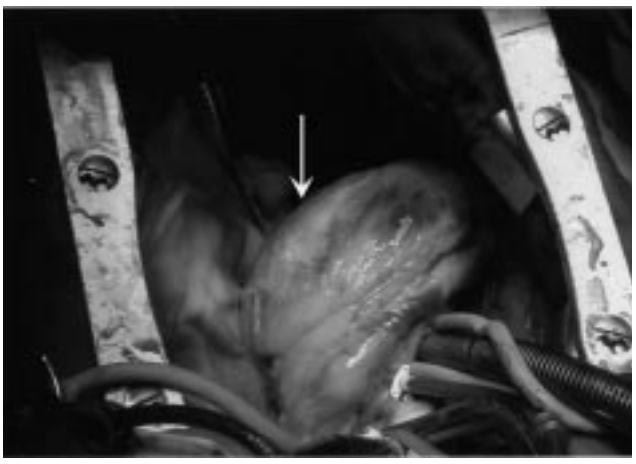

Fig. 2. Intraoperative photograph.
Two sheets of TachoComb were positioned over the whole necrotic area, being covered with a large equine pericardium secured with GRF glue (arrow).

cially if the rupture is of the blowout type.[2,4] When the necrotic area has been small, simple Prolene (Echicon, Somerville, NJ) Teflon (L.R.Bard, Tempe, AZ)-buttressed sutures have been used with or without CPB.[3,4] Both techniques may raise concern of further bleeding and tear of the ventricle if the sutures are placed in the necrotic tissue, and cause further deterioration of left ventricular function due to damage of the nonischemic area and ventricular cavity distortion.

Recently some authors have advocated a completely sutureless technique in which a patch of Teflon, Dacron (Boston Scientific Corporation, One Boston Natick, MA), Goretex (ePTFE: W.L.GORE & ASSOCIATES, Inc., Arizona, USA) or pericardium is secured to the infarcted myocardium with tissue adhesive, avoiding problems related to myocardial friability and ventricular cavity distortion.[5–7] The ruptures were usually sealed or oozing, and the treatments were performed without CPB. Adhesives reported to be applied in this technique have been of several types and include the biologic glues which are fibrin based glue and Gelatin based one (GRF glue). GRF glue has been adopted more often because of greater bonding strength than fibrin glue and its availability.[8] The major limitation of both these biologic glues is that they are only effective in the absence of bleeding. Both have been adopted to treat selected patients with myocardial rupture without CPB but usually if the tear is sealed or is oozing.[4,6] More recently others have reported similar sutureless technique in which a large patch of TachoComb is attached to the necrotic area without CPB, showing good results for the rupture sealed or of the oozing type.[9,10] TachoComb is a collagen fleece coated with fibrin glue, achieving good hemostasis if the rupture is oozing or sealed.[9,10] It has a stronger adhesive and sealing potential than the other fibrin based adhesive biomaterial carbon. Canovas et al.[7] reported favorable results with sutureless repair done with a Goretex patch and Histoacryl (B.Braun Medical AG, Melsungen, Germany) without CPB, experiencing one patch failure with uncontrollable massive bleeding owing to incomplete adherence of the patch to the necrotic area. They stated excessive bleeding had been cited as a relative contraindication to patch-and-glue technique and this technique was not suitable for patients with blowout rupture. Kimura et al.[11] reported impending rerupture after sutureless repair of blowout rupture without CPB, concluding that sutureless repair with TachoComb alone should be avoided in treating blowout rupture.

We have adopted the sutureless technique in the last two patients regardless of a blowout rupture. We established CPB and performed cardioplegic arrest to achieve a completely bloodless surgical field and maximize function of TachoComb and GRF glue, having a good surgical result without postoperative bleeding or need of reoperation due to rerupture, pseudoaneurysm, or uncontrollable massive bleeding caused by incomplete adherence of the patch.[1,2] Technical considerations believed to be important to ensure a completely hemostatic patch using this technique include the following: (i) even patients with actively bleeding tear can be treated provided

they are on CPB to achieve a bloodless surgical field and maximize glue function; (ii) an appropriately large patch must be secured so that it borders on healthy myocardium and supports the whole necrotic area; and (iii) the patch must be held in place until it becomes adherent.[2)]

Conclusion

We have adopted patch-and-glue sutureless technique instituting cardiopulmonary bypass for blowout rupture in our last 2 patients. Cardioplegic arrest was performed to achieve a bloodless surgical field and maximize glue function. All rupture sites should be covered with a large enough patch supporting ventricular cavity pressure to avoid rerupture or pseudoaneurysm. This technique is simple, versatile, and considered to be associated with a favorable outcome.

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