A Case of LMT Reconstruction Using Superficial Femoral Artery Graft in the Patient with Type A Acute Aortic Dissection

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A 76-year-old woman underwent a Bentall procedure for acute aortic dissection. A dissection involving half of the proximal portion of the left main coronary artery trunk was confirmed. The dissected site was resected, and a section of the superficial femoral artery was harvested and used as an interposition graft between conduit and the residual left main trunk. Two years after surgery, the graft remained well patent. If the coronary dissection involves only the left main artery trunk, the superficial femoral artery should be used as an artery graft for the anatomical reconstruction, potentially leading to better early and late outcomes.

Keywords: coronary artery dissection, superficial femoral artery graft, bentall’s operation

INTRODUCTION

Aortic root replacement is indicated in patients with acute aortic dissection who have annuloaortic ectasia or external rupture of the aortic root. The coronary ostium is generally reconstructed by the button technique, but reconstruction is challenging if the dissection involves a coronary artery. We describe our experience with a patient in whom external rupture of the left main trunk was found during surgery for aortic dissection. The affected site was removed and reconstructed with a superficial femoral artery graft, resulting in a good outcome.

CASE REPORT

The patient was a 76-year-old woman with a history of hypertension and asthma (being treated with oral therapy). Her family history was not relevant to the current disorder. The patient presented to a local physician because of chest pain and was admitted for follow-up observation. Subsequently, the chest pain resolved, but contrast-enhanced computed tomography (CT) of the chest revealed a dissection of the ascending aorta, with an increase in lumen diameter. Retention of pericardial fluid was noted. The patient was referred to our center to undergo surgery. On admission, the height was 146 cm, the body weight was 43 kg, the blood pressure was 157/97 mmHg, and the pulse rate was 120 beats per minute. The patient did not have chest pain at presentation. On chest auscultation, there was no cardiac murmur.

Chest radiography showed that the cardiothoracic ratio was 63.5%, indicating an upper mediastinal extension. On 12-lead electrocardiography, the sinus rhythm was normal. The heart rate was 120 beats per minute. The axis of the heart was normal, with no ST-segment deviation. Contrast-enhanced CT of the chest revealed a thrombosed-type acute aortic dissection. An ulcer-like projection was found in the descending aorta. The dissection was classified as DeBakey type IIIIR (Fig. 1). The diameter of the ascending aorta had increased to 55 mm, with pericardial fluid retention. The pericardial fluid appeared to be bloody because the CT attenuation...
value of the pericardial fluid ranged from 40 to 50 Hounsfield units, suggesting a rupture of the ascending aorta. An emergency operation was thus performed.

Transesophageal ultrasonography showed that the diameter of the sinus of Valsalva had increased to 58 mm. We therefore decided to perform an aortic root replacement. Artificial grafts were anastomosed end-to-side to the right axillary artery. The pericardium was incised after extracorporeal circulation had begun. The pericardial fluid was bloody, but there was no evidence of active bleeding. The ascending aorta was clamped. When a coronary artery cuff was formed, the dissection was found to involve about half of the circumference of the left main trunk. A rupture hole was noted in the adventitia around the left main trunk (LMT). Because there were no other adventitial ruptures, this site was considered the source of bleeding.

Conventional reconstruction using the button technique was not feasible. On further examination, the dissection was found to involve only the proximal half of the entire length of the left main trunk. We decided to resect the involved portion. Because it was considered difficult to directly anastomose the left coronary artery to a conduit, we used a portion of the left superficial femoral artery as an interposition graft. About 4 cm of the left superficial femoral artery was harvested. The left superficial femoral artery was reconstructed using a left great saphenous vein. Because the diameter of the aortic annulus was 23 mm, a 19-mm St. Jude Medical Mechanical Hemodynamic Plus® prosthesis was placed in a 22-mm Hemashield® straight graft to form a conduit. The conduit was sutured to the aortic valve annulus with 13 2-0 Ethibond EXCEL® sutures. The superficial femoral artery graft was anastomosed end-to-end to the distal portion of the left main trunk, using 6-0 Prolene® sutures. Next, the proximal end of the superficial femoral artery graft was anastomosed end-to-side to the conduit, using 5-0 Prolene® sutures (Fig. 2). The length of the interposition graft was about 2 cm. Subsequently, low-temperature

Fig. 1
A: A dissection involving half of the proximal portion of the left main coronary artery trunk was confirmed at surgery. The diameter of the ascending aorta had increased to 55 mm. An ulcer-like projection was found in the descending aorta (white arrow).
B: Pericardial fluid retention was evident. The CT attenuation value of the pericardial fluid ranged from 40 to 50 Hounsfield units, suggesting rupture of the aorta.
C: A cross-sectional slice of the LMT (white arrow). Dissection of the LMT was unclear.
LMT: left main trunk; CT, computed tomography

Fig. 2 Intraoperative findings.
The superficial femoral artery graft was anastomosed end-to-end to the conduit.
(Black arrow: superficial femoral artery graft)
circulatory arrest was performed, and the distal end of the ascending aorta was reinforced with a Teflon felt strip and anastomosed to the conduit. The duration of aortic clamping was 312 minutes.

After the completion of aortic root replacement, the patient was easily weaned from extracorporeal circulation. The durations of extracorporeal circulation (377 minutes) and surgery (625 minutes) were prolonged, leading to severe cardiac edema. Primary sternal closure was, therefore, difficult, and the patient was transferred to the intensive care unit without closing the sternum. On the third postoperative day, secondary sternal closure was performed.

Coronary angiography before discharge showed no anastomotic stricture (Fig. 3). About 2 years after surgery, coronary artery CT showed no clinically significant strictures (Fig. 3). The patient is now being followed up on an outpatient basis.

**DISCUSSION**

Our patient required aortic root replacement because of type A acute aortic dissection with an enlarged sinus of Valsalva. Reconstruction by the Bentall technique was precluded by adventitial rupture of the LMT. We initially considered ligation of the left main trunk, followed by bypass surgery with a great saphenous vein graft. However, we decided to resect the dissected left main trunk and then perform anatomical reconstruction using the autologous superficial femoral artery as an interposition graft.

Three alternative methods can be used for coronary artery reconstruction: graft interposition, coronary cuff reinforcement, and CABG. Piehler et al. performed coronary artery reconstruction using small-caliber artificial grafts, but anastomosis to the artificial graft was difficult because the distal diameter of the left main trunk was less than 5 mm. A technique using the great saphenous vein as an interposition graft has been proposed, but carries the risk of kinking if the graft is too long. The development of late graft disease can be life-threatening. LMT cuff reinforcement is a commonly used technique. In patients with adventitial rupture of the LMT, however, the use of a Carrel patch is not feasible. Ligation and bypass with a saphenous vein graft is simple and straightforward. However, this technique carries the risk of graft disease because artificial vessel grafts are used as the reconstructed aorta.

The superficial femoral artery can be easily harvested, has an adequate wall thickness, and is easy to handle even in deep regions; anastomosis is thus relatively easy to perform. The caliber of an autologous superficial femoral artery graft is only slightly larger than that of the distal end of the left main trunk, and the use of an autologous graft decreases the risk of graft disease.

To our knowledge, a reconstruction procedure similar to the one described in this study has not been documented previously. Morimoto et al. reported that interposition methods are useful, and our techniques may be advantageous in patients who undergo root replacement in second cardiac operation. However, the superficial
femoral artery has a relatively higher risk of atherosclerosis, potentially leading to stenosis or occlusion. Two years after surgery, graft patency is good in our patient, but close follow-up is required to ensure that the graft remains patent.

**Conclusions**

In our patient, dissection involving the main trunk of the left coronary artery was detected during surgery for aortic dissection. The dissection was resected, and reconstruction was done with a superficial femoral artery graft. The superficial femoral artery was used for the reconstruction because it is anatomical and associated with long-term patency. Outcomes are good, 2 years after surgery.

**References**


