

Long Segmental Reconstruction of Diffusely Diseased Left Anterior Descending Coronary Artery Using Left Internal Thoracic Artery with Extensive Endarterectomy

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In coronary artery bypass grafting, a diffusely diseased left anterior descending coronary artery (LAD) is an obstacle to achieving complete revascularization, consequently leading to the possibility of a poor prognosis. Long segmental reconstruction with or without endarterectomy is a revascularization method for treating diffusely diseased coronary arteries. Herein, we report a successful case of long segmental reconstruction of a diffusely diseased LAD using a left internal thoracic artery onlay patch after endarterectomy.

Key words: 1. Coronary artery bypass surgery
2. Coronary artery disease

CASE REPORT

In coronary artery bypass grafting (CABG), the left anterior descending artery (LAD) and the left internal thoracic artery (LITA) are the best combination with respect to both long-term patency and clinical outcomes. For a surgeon, this combination is the best tool to overcome percutaneous coronary intervention. However, in cases involving a diffusely diseased LAD, complete revascularization cannot be achieved with the conventional grafting technique, because the side branches diverging from the diseased segments cannot be perfused. Long segmental reconstruction (LSR) with or without endarterectomy is a revascularization method for treating diffusely diseased coronary arteries. Herein, we report a case of LSR of a diffusely diseased LAD using the LITA after endarterectomy.

A 47-year-old male with hypertension, non-insulin-depend-

ent diabetes, and dyslipidemia was admitted to our hospital due to exertional chest discomfort. He had a history of stroke without sequelae three years previously and acute myocardial infarction four weeks previously. A preoperative angiogram showed that he had triple-vessel disease with a diffusely diseased LAD showing severe proximal stenosis (Fig. 1A). Echocardiography revealed regional wall motion abnormalities in the LAD and the left circumflex artery areas and mild left ventricular systolic dysfunction (left ventricular ejection fraction=47%).

After a median sternotomy, his left internal thoracic artery (LITA) and right internal thoracic artery (RITA) were harvested, along with saphenous vein grafts. After the pericardium was opened, the RITA was anastomosed to the left side of the LITA with a continuous running suture using 8-0 polypropylene (Prolene; Ethicon, Piscataway, NJ, USA), forming a Y-anastomosis. The distal ends of both internal thoracic ar-

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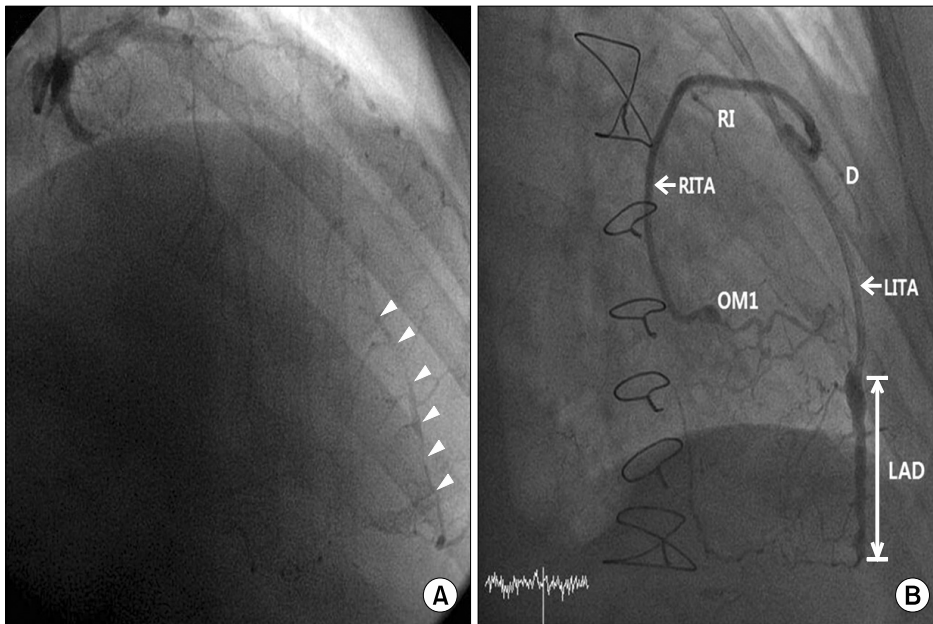


Fig. 1. Coronary artery angiography. (A) A preoperative angiogram shows a diffusely diseased LAD coronary artery with multiple segmental lesions, although the diameter of the non-diseased region was >1 mm. (B) A postoperative angiogram via the LITA shows that the diameter of the reconstructed LAD had increased and the side branches (diagonal branches and septal perforators) were also visible. LAD, left anterior descending; D, diagonal branch; RI, ramus intermedius; OM1, the first obtuse marginal branch; LITA, left internal thoracic artery; RITA, right internal thoracic artery.

teries were clipped for pressure dilatation. Cardiopulmonary bypass was instituted with ascending aorta and bicaval cannulations. After cardioplegic arrest, a coronary incision was made in the middle portion of the LAD. The atheromatous core was carefully dissected from the adventitia with a fine spatula and forceps. The proximal atheromatous core was sharply divided, in order to avoid removing the most proximal stenotic lesion. The distal end of the atheromatous core was also divided sharply when it reached the intact intima. The divided intima of the distal LAD was tacked with 8-0 polypropylene sutures. The raw surface of the LAD was flushed with saline and the flaps were removed, taking care not to cause distal embolism with fragments of the incised plaque. The matched length of the LITA was anastomosed to the incised LAD (approximately 5.5 cm) (Fig. 2A). Several 7-0 and 8-0 polypropylene sutures were used to perform the anastomosis using an over-and-over suture technique. The first diagonal, ramus intermedius, and the first obtuse marginal branch were bypassed sequentially with the RITA; and the distal right coronary artery, the posterior descending artery, and the second obtuse marginal branch were bypassed sequentially with a saphenous vein graft from the ascending aorta. The aortic cross-clamping and cardiopulmonary bypass times were 241 and 305 minutes, respectively. Continuous intravenous unfractionated heparin infusion was initiated on the

day of the operation, after confirming the absence of excessive bleeding. Anti-platelet agents (aspirin and clopidogrel) and warfarin (with a target international normalized ratio of 2.0) were started on the first postoperative day. Intravenous heparin was discontinued after the warfarin target international normalized ratio was achieved. Despite suffering from a postoperative embolic cerebral infarction, the patient was discharged without neurological sequelae on the fourteenth postoperative day. Postoperative angiography revealed complete patency of the LITA and the LAD (Fig. 1B). At clinical follow-up performed five months later, the patient was in good condition and had not experienced a return of angina.

DISCUSSION

In CABG surgery, complete revascularization is one of the most important factors that influence long-term mortality and morbidity. However, in cases involving a diffusely diseased LAD, complete revascularization is not always possible because conventional bypass techniques involving only the distal LAD cannot provide sufficient blood supply to the side branches, including the diagonal branches and septal perforators.

In this situation, the implantation of multiple drug-eluting stents in the diffusely diseased coronary artery has been per-



Fig. 2. Intraoperative photographs. (A) The left anterior descending artery was reconstructed with a long segmental patch anastomosis using the left internal thoracic artery. (B) A specimen of the endarterectomized core.

formed in several institutions. However, stent implantation involves a risk of compromising the flow to the side branches and in-stent restenosis. In order to overcome these obstacles, some surgeons have invented and performed the technique of long-patch reconstruction of the LAD with or without endarterectomy, reporting feasible clinical and angiographic results [1-8].

The optimal endarterectomy technique remains controversial. Two surgical methods have been developed, known as the closed method (traction technique) and the open method. The closed method is performed by traction of the endarterectomized intima through a small arteriotomy. It does not require much time and the anastomosis is technically easy. In contrast, the open method involves long arteriotomy and total removal of the atheromas under direct visualization. Fukui et al. [1] criticized the closed method because the diagonal branches and septal perforators may be torn off despite gentle traction, and the distal end of the lumen may become occluded with a thrombus or dissection due to insufficient endarterectomy. In this report, we used the open method of performing endarterectomy, as the openings of the septal and diagonal branches and the distal end of the LAD can be di-

rectly observed and endarterectomized with confidence. Furthermore, complete extraction of the atherosclerotic plaque is an essential prerequisite for this procedure. In general, the worst outcomes are associated with incomplete endarterectomy. Any residual intimal flaps should be removed carefully to prevent obstruction of the tributary vessels.

With respect to the selection of an onlay patch, in general, two options exist: the LITA or a saphenous vein onlay patch. In previous reports describing the use of a saphenous vein, the LITA was grafted to either the hood of the vein patch or the proximal end of the LAD arteriotomy. Although Myers et al. [5] have reported that the reconstruction method did not have a significant impact on long-term survival, some Japanese investigators recommend using the LITA for reconstruction rather than a saphenous vein graft because of the superior patency rate of the LITA [1-3,6], and we agree with their argument. Additionally, the use of retrograde cardioplegia is recommended not only for optimal myocardial protection, but also for mechanical flushing and clearance of any debris that may have embolized distally.

The major causes of suboptimal results after coronary en-

endarterectomy are related to triggering of the coagulation cascade by the lack of endothelium in the early stages and myofibroblastic proliferation in the late stages [1,2]. Therefore, strict management of antiplatelet and anticoagulation therapy should be implemented after endarterectomy.

A search of the literature published in Korea about LSR with endarterectomy only revealed one report [9]. In that report, the coronary arteries were reconstructed using a saphenous vein graft instead of an internal thoracic artery graft. Therefore, to the best of our knowledge, this is the first reported case in Korea of a diffusely diseased LAD that was reconstructed with long patch angioplasty using the LITA after extensive endarterectomy. Although the reconstruction was performed successfully, further studies are warranted to substantiate and validate the long-term viability of this method.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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