

Evaluation of 56 Cases of Long-Segment Anastomosis of LITA to LAD in Rajaei Heart Center

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Abstract

Background- Long-segment reconstruction of the diffusely diseased left anterior descending artery (LAD) with left internal thoracic artery (LITA) is one of the methods offered in order to deal with complicated, multiple, and long-segment lesions in the LAD. In this prospective study, we analyzed the results obtained with this technique.

Methods- Between Feb. 2007 and Feb. 2009, 56 patients underwent surgery via this technique. The LITA was used as a patch along the opened narrow segment of the LAD from 2 to 8 cm. Data on all the patients were collected, and all the patients were worked up for postoperative complications such as postoperative myocardial infarction, ECG changes, NIHA class, enzymatic changes, and postoperative bleeding. CT-Angiography was performed between 6 to 18 months after surgery in some cases.

Results- Fifty-six cases, comprising 42 (75%) men and 14 (25%) women between 43 and 78 years of age (mean age= 59.8±9.3 years) with multiple and long-segment lesions in the LAD were included in this study. Preoperative risk factors were hypertension (66.1%), diabetes (57.1%), hyperlipidemia (50%), cigarette smoking (50%), renal failure (1.8%), and positive family history (7.1%). Twenty-three (41.1%) patients had remote and 9 (16.1%) had recent myocardial infarction. Significant left main lesions were found in 7 (12.5%) patients, peripheral vascular disease in 3 (5.3%), and preoperative arrhythmias in 2 (3.6%). The mean number of grafts was 2.85 ±1.5. Postoperative complications were arrhythmias in 10 (17.8%) patients, postoperative myocardial infarction in 1 (1.8%), surgical bleeding in 7 (12.5%), infections in 3 (5.3%), plural effusion in 3 (5.3%), tamponade in 2 (3.6%), and pericardial effusion in 1 (1.8%); there was no mortality amongst the patients. CT-angiography, performed in 6 patients between the six and eighteenth postoperative months, revealed patent anastomoses in all the patients.

Conclusion- Long segment and multiple lesions in the LAD pose a challenge for cardiac surgeons. The results of long-segment LAD reconstruction using the LITA are very encouraging (*Iranian Heart Journal 2011; 12 (1):12-16*).

Keywords: left anterior descending artery (LAD) ■ left internal thoracic artery (LITA) ■ long-segment anastomosis

Coronary artery bypass graft surgery (CABG) is an approved cardiac operation and it seems that this operation can increase life expectancy.

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Today, improvement in percutaneous techniques and advent of more comfortable stents that can be used by interventional cardiologists have resulted in more complicated cases being referred to cardiac surgeons for CABG. Endarterectomy is a good solution in more complicated cases of long-segment anastomosis, and the use of sequential (jump) graft is a resolution in multiple stenosis.^{3,5} Moreover, the use of the vein patch for the reconstruction of the LAD has been reported by some authors,⁶ but there is some evidence that endarterectomy in the LAD is not as good as endarterectomy in other coronary tributaries because the origin of the rectangular septal branches that feed the anterior

and middle parts of the ventricular septum are in risk of closure after endarterectomy and it can induce a septal myocardial infarction (MI) and jeopardize the patient's life. Additionally, it needs anticoagulation therapy for six to eight weeks, which itself can induce more risk for hemorrhage and pericardial blood collection after CABG.⁷

In the present study, we sought to evaluate our technique in the management of complicated LAD lesions. We utilized the LITA as a patch for the reconstruction of the long segment of the LAD as an alternative for LAD endarterectomy, vein patch reconstruction, and sequential anastomosis.

Material and Methods

Between Feb. 2008 and Feb. 2009, in a retrospective analysis, data were collected from 56 patients in whom the technique of long-segment LITA to LAD anastomosis for the long-segment lesion of the LAD was used. Our technique was employed for patients who had long-segment and multiple lesions in the LAD, especially those who had at least one patent septal artery in this region with good distal run-off and usually had at least one atherosclerotic downstream plaque after the first stenosis in the LAD. Pump circulation and standard technique for CABG were used for all the patients; diffuse lesions in all the three coronary vessels precluded the use of the off-pump technique in these patients.

The length of a long-segment anastomosis should be at least 2 cm. The LAD was opened and unroofed for long length where the proximal and distal points of the anastomosis had good run-off. The LITA was thereafter opened for the same length, and was anastomosed to LAD this together with two 7-0 prolene suture one from the heel and the other from the toe. Preoperative data such as risk factors, sex, age, and history of remote and recent preoperative MI together with postoperative data such as postoperative complications were collected and transferred to sheets. Multivariate analysis was conducted in regress models with the use of the chi-square test and a mixed model of the ANOVA.

Results

Between Feb. 2008 and Feb. 2009, 56 cases, consisting of 42 (75%) men and 14 (25%) women between 43 and 78 years of age (mean age= 59.8±9.3 years), with multiple and long-segment lesions in the LAD were included in this study. Preoperative risk factors were hypertension in 37 (66.1%) patients, diabetes in 32 (57.1%), hyperlipidemia in 28 (50%), cigarette smoking in 28 (50%), renal failure in 1(1.8%), long-term corticosteroid usage in 1(1.8%), and positive family history in 4 (7.1%) (Fig. 1).²³

Table I. Classic preoperative risk factors

Hypertension	37	66.1%
Diabetes	32	57.1%
Hyperlipidemia	28	50%
Cigarette smoking	28	50%
Positive family history	4	7.1%
Renal failure	1	1.8%
Chronic corticosteroid usage	1	1.8%

LM lesion	7 (12.5%)
Peripheral vascular disease	3 (5.3%)
Preoperative arrhythmias	2 (3.6%)
Cerebrovascular accident	0 (0%)

Twenty-three (41.1%) patients had remote and 9 (16.1%) had recent MI. Significant left main lesions were found in 7 (12.5%) patients, peripheral vascular disease in 3 (5.3%), and preoperative arrhythmias in 2 (3.6%) (Table II).

Table II. Preoperative variants

Remote MI	23 (41.1%)
Recent MI	9 (16.1%)

The mean number of grafts used in the operations was 2.85±1.5. Other concomitant operations were performed in 5 patients and were VSD closure in 1 case, mitral valve repair in 3, and mitral valve replacement in 1. Postoperative complications were arrhythmias in 10 (17.8%) patients, postoperative MI (confirmed by cardiac enzyme analysis,

echocardiography, and ECG changes) in 1 (1.8%), surgical bleeding in 7 (12.5%), infections in 3(5.3%), plural effusion in 3 (5.3%), tamponade in 2 (3.6%), pericardial effusion in 1(1.8%), and hemiplesia in 1 (1.8%) (Table III).

Table III. Postoperative complications

Surgical bleeding	7	12.5%
Arrhythmia	4	7.1%
Infection	3	5.3%
Plural effusion	3	5.3%
Thrombosis	2	3.6%
Tamponade	2	3.6%
pneumothorax	1	1.8%
Pericardial effusion	1	1.8%
Hemiplesia	1	1.8%

There was no mortality amongst our study population. The mean clamp time was 35.9 ± 14 minutes, and the mean pump time was 70 ± 22 minutes. The mean length of the LIMA to the LAD anastomosis was 4 ± 1.2 cm, with the longest being 8 cm and the shortest 2 cm in our study anastomosis shorter than 2cm is not called long segment. The mean ICU length of stay was 2.57 ± 0.9 days in the women and 2.33 ± 0.48 days in the men, and the mean hospital stay was 6.8 ± 2.5 days in the women and 6.3 ± 1.9 days in the men. The follow-up period was 1.4 ± 0.4 months. The mean NYHA class was 2.3 before surgery, which was reduced to 1.5 after surgery; the difference was statistically significant (p value < 0.001). Balloon pumps were not employed in this group of patients.

Discussion

Today, cardiac surgeons have patients with diffuse lesions in the LAD. Thanks to new interventional techniques, simple lesions can now be corrected with stents, and more diffuse lesions with long-segment LAD lesions and multiple lesions are scheduled for CABG. Endarterectomy in the LAD, albeit a known method, still stirs controversy amongst different authors.^{4, 5, 6, and 7} Some authors have reported good results, whilst others are still reluctant to use this technique because of its high rate of perioperative and postoperative mortality.^{7,8} The origin of the rectangular septal branches that feed the anterior and middle parts of the ventricular septum is in risk of closure after endarterectomy and it can induce a septal MI and jeopardize the patient's life. Besides, denuded endothelium after endarterectomy enhances the development of myofibrointimal proliferation, which can produce new thrombus formation and decrease the long-term survival of the graft; it would thereafter require anticoagulation therapy for at least six to eight weeks, which itself can induce more risk for hemorrhage and pericardial blood collection after CABG.^{7,8} Also, the use of the vein as onlay patch is an alternative technique and its use is more difficult and the athromatouse process can progress in the vein portion of the graft.^{6,9} The main goal of this study was to introduce an alternative technique employed in our surgical ward that may be useful in some situations for other surgeons. Creating a long opening in the roof of the LAD until a good distal and proximal run-off point is accessed can provide a view of all side and septal branches so that a secure anastomosis can be reconstructed. We would think that the reconstruction of the LAD with the LITA can destroy all plaques; consequently, plaques cannot create stenosis circumferentially any longer, neointimal proliferation will not exist anymore, and a wide lumen for this part of the LAD can be reconstructed. In this series of 56 patients with long-segment or multiple lesions on the LAD, we reconstructed the LAD with the LITA for above 2 cm and we collected data from all the patients. Our results demonstrated that the mean pump time was 70 ± 22 minutes and the mean clamp time was 35.9 ± 14 minutes. In other words, clamp time and pump time did not increase by comparison with similar figures in other CABG operations. The mean ICU length of stay was 2.57 ± 0.9 days in the women and 2.33 ± 0.48 days in the men, and the mean hospital stay was 6.8 ± 2.5 days in the women and 6.3 ± 1.9 days in the men; this is in the range of simple uncomplicated CABG operations. Postoperative complication in our group was surgical bleeding necessitating reoperation in 7 (12.5%) cases; it is more than the similar figure in simple on-pump CABG. The rates of other complications were not higher than those in other CABG operations (Table. IV).

Postoperative MI was seen in 1 (1.8%) case; this is very low and there was no mortality in this study.

The mean NYHA class before surgery was 2.3, which was reduced to 1.5; the difference was statistically significant (p value < 0.001).

Table IV. Mean ICU and hospital stay and mean follow-up time

ICU stay	Female	2.57+_0.9 Days	0.219
	Male	2.33+_0.48 Days	
Hospital stay	Female	6.8+_2.5 Days	0.437
	Male	6.3+_1.9 Days	
Follow-up	Female	1.8+_0.4 Days	0.69
	Male	1.9+_0.6 Days	
	Sex	Mean+_SD	P value

This means that the quality of life is better with this kind of CABG. Balloon pumps were not utilized in this group of patients, which is of significance in our study. Long-term anticoagulation therapy after surgery was not used in this study except for prophylaxis against deep vein thrombosis and pulmonary embolic with 500 u heparin Q6h IV in first 48 in ICU. We would think that this technique is a good alternative for endarterectomy, sequential anastomosis, and onlay vein patch technique in that it is simple and can be used in all complicated situations. The limitations of our study are a lack of long-term postoperative follow-up and the absence of postoperative angiography.

Conclusion

Long-segment and multiple lesions in the LAD present a challenge for cardiac surgeons and in these situations, the results of long-segment LAD reconstruction are very encouraging and are comparable with those of endarterectomy and multiple sequential anastomoses.

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