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Assessment of Left Ventricular Function and Coronary Artery Patency in Patients with Left Anterior Descending Coronary Artery Reconstruction by Internal Thoracic Artery

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ABSTRACT
Background: Coronary artery bypass grafting (CABG) is a procedure that aims to revascularize coronary arteries, especially the left anterior descending (LAD) artery, improving survival and quality of life.
Aim: This study aimed to assess left ventricular function and coronary artery patency in cases undergoing reconstruction of the diffusely diseased LAD using 2D speckle tracking strain imaging echocardiography and CT Coronary angiography.
Patients and methods: This prospective observational research has been performed on 116 cases with coronary artery disease (CAD) at the Department of Cardiology, Menoufia University Hospital and the National Heart Institute between May 2023 and May 2025. The cases have been separated into 2 equal groups: Group I (n = 58), who underwent LAD artery reconstruction with a left internal thoracic artery (LITA) patch, and group II (n = 58), who underwent standard LITA–LAD bypass grafting.
Results: The study showed significant improvement in left ventricular ejection fraction (LVEF), global longitudinal strain (GLS), and longitudinal strain rate (LSr) at 6 and 12 months postoperatively compared to preoperative values in both groups, with greater improvement in left anterior descending artery (LAD) reconstruction patients. Operative, cross-clamp, and bypass times were shorter in the LAD reconstruction group, while postoperative complications, intensive care unit (ICU)/hospital stay, and LITA patency at follow-up were similar between groups.
Conclusion: LAD reconstruction with a LITA patch improved left ventricular function and reduced operative time versus standard CABG, without increasing complications or hospital stay.
Keywords: Coronary artery disease, Left anterior descending artery, LITA patch angioplasty, Left ventricular function.

INTRODUCTION

Coronary artery bypass grafting elevates life expectancy and enhances the quality of life. Its main aim is to completely revascularize coronary arteries, especially the LAD artery [(1)].

In last few years, the number of percutaneous coronary interventions (PCI) utilized in treating cases with significant lesions is increasing. Accordingly, persons having coronary artery bypass grafting are more likely to have complicated and extensive CAD. Nevertheless, until the revolution of reconstructive operation, these cases have been considered not surgical candidates and treated medically [(2)].

One of the coronary artery bypass grafting strategies for treating severe diffuse coronary artery disease is the reconstruction of the left anterior descending. The major advantage of this approach is that it permits simultaneous revascularization of the myocardium fed by the side branches of the extensively diseased coronary arteries [(3)].

The traditional grafting to the distal left anterior descending alone would not give this advantage since it would not perfuse the stenotic and more proximal segments. Moreover, there is a considerable possibility of early graft occlusion [(4)]. Conversely, extended revascularization with laying open the entire diseased left anterior descending segment and patching it with an in-situ left internal thoracic artery (LITA) appeared to be a safer approach and provide complete myocardial revascularization [(5)].

Echocardiography is a versatile imaging modality for evaluation of left ventricular systolic function, diastolic function, and even myocardial and coronary perfusion. Nevertheless, the accuracy and reproducibility of the left ventricular ejection fraction measurement remains dependent on image quality, on ventricular loading conditions, heart rate and operator experience [(6)]. Evaluating the myocardial global longitudinal strain with 2D speckle tracking gives a precise and reproducible measurement of regional and global LV contractility [(7)].

Also, the advancement in the technology of computed tomography (CT) makes CT coronary angiography a popular diagnostic modality for assessment of coronary arteries and bypass grafts. CTA is a relatively painless noninvasive procedure when compared to invasive coronary angiography, and it is well tolerated by most of the cases. All these etiologies make CTA a primary technique in assessment of graft patency and dysfunction [(8)].

This study aimed to assess left ventricular function and coronary artery patency in patients undergoing reconstruction of the diffusely diseased LAD using 2D speckle tracking strain imaging echocardiography and CT Coronary angiography.

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PATIENTS AND METHODS

This prospective observational research has been performed on 116 cases with coronary artery disease at the Department of Cardiology, Menoufia University Hospital, and the National Heart Institute between May 2023 and May 2025. The cases have been separated into 2 equal groups: Group I (number = 58), who underwent left anterior descending artery reconstruction with a left internal thoracic artery patch, and group II (n = 58), who underwent standard LITA–LAD bypass grafting.

Inclusion criteria: Cases of both genders aged ≥ eighteen years with coronary artery disease who had a diffusely diseased left anterior descending artery involving a long segment with numerous consecutive lesions.

Exclusion criteria: Patients who refused participation, who had an ejection fraction (EF) < 35%, who required associated valvular heart surgery, who undergone redo coronary artery bypass grafting and who required reconstruction for extensive CAD affecting vessels other than the LAD.

Preoperative: Preoperative assessment included detailed history and physical examination focusing on demographic data, cardiovascular risk factors, prior ICU admission, myocardial infarction, coronary interventions (PTCA, stenting), vascular disease, stroke/TIA, chest or renal disorders, and family history of high-risk conditions (obesity, diabetes, hypertension, hypercholesterolemia and ischemic heart disease). Laboratory workup included CBC, fasting blood sugar, renal/liver/thyroid function tests, viral serology (HBV, HCV & HIV), and lipid profile (LDL-C & HDL-C). Chest X-ray to assess cardiac size, lung fields, and aortic calcification/dilatation. ECG evaluated ischemic changes, Q-wave infarction, hypertrophy, and arrhythmias. Risk stratification was done using EuroSCORE II (low: 1–2, medium: 3–5 & high: ≥ 6) [9]. Two-dimensional speckle-tracking echocardiography (GE Vivid S5, Philips EPIQ 5) was performed with images acquired during breath-hold over ≥ 3 cardiac cycles. Endocardial borders were manually traced, followed by automated region-of-interest (ROI) generation and manual adjustment when needed. LV global longitudinal strain (LV-GLS) has been calculated from two-, three-, and four-chamber views as the mean of all segments, with reduced GLS defined as > −19.1% [10]. Image analysis followed standard protocols, avoiding pericardium in ROI, and generated segmental and bull's-eye GLS displays (Figure 1) [11]. Intra- and inter-observer concordance for GLS was 98% and 97% respectively.

Additional imaging included duplex ultrasonography of lower limb and carotid vessels for peripheral arterial disease and stenosis assessment, non-contrast chest CT for lung and aortic evaluation, and coronary angiography to confirm diffusely diseased LAD segments with multiple consecutive lesions.

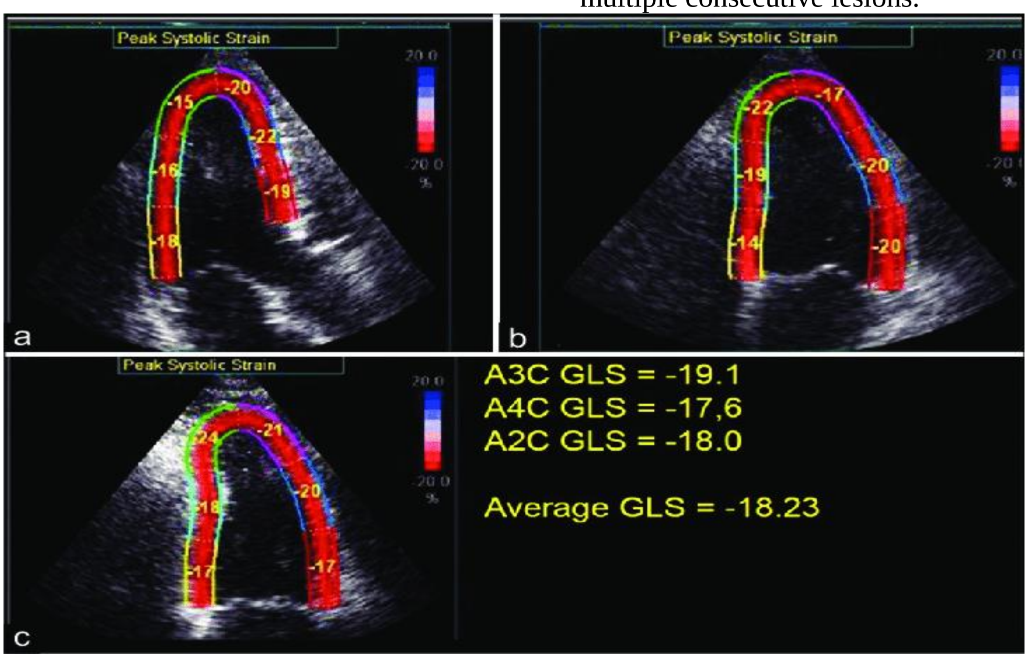

Figure (1): Speckle tracking echocardiography demonstrating the longitudinal strain of the basal, mid and apical segments in A3C, panel a, A4C panel b, and A2C panel c [11]

Intraoperative:

LAD reconstruction was indicated when diffuse atheromatous disease involved the LAD and major branches, making standard distal anastomosis inadequate, or when proximal septal perforators would be isolated by disease [5].The left internal thoracic artery (LITA) has been anastomosed to the left anterior descending with 7-0 or 8-0 polypropylene running sutures, excluding side-wall plaques to create a new lumen from the LITA and non-diseased coronary artery; severe stenosis was managed with endarterectomy [5].

Conventional CABG was performed under general anesthesia via median sternotomy. Following systemic heparinization. Cardiopulmonary bypass (CPB) has been established using aortic and right atrial cannulation, and the heart has been arrested with cold cardioplegia. Conduits included LITA, saphenous vein grafts, and occasionally the radial artery, with LITA–LAD as the primary graft and vein grafts to other vessels (RCA & obtuse marginal branches). Distal anastomoses were completed before proximal ones to the ascending aorta. After grafting, patients were weaned from CPB, hemostasis secured, and pacing wires and chest drains placed before sternal closure. Postoperative care included intensive monitoring and secondary prevention therapy [12].

Postoperative: Postoperative care included mechanical support (ventilator & intra-aortic balloon pump) when indicated intraoperatively or in the ICU, with documentation of ventilation hours and ICU stay. Chemical support (adrenaline & noradrenaline) was administered as required. Monitoring included ECG for ischemic changes (ST elevation & hyperacute T waves), cardiac enzymes (troponin & CK-MB), blood gases, and blood glucose levels. Chest X-ray (postero-anterior) was performed to detect pneumothorax, pleural effusion, or other complications. Recorded postoperative complications included bleeding, thromboembolic events (acute limb ischemia, transient ischemic attack & stroke), wound infection, pleural effusion, phrenic nerve injury, pericardial effusion and lung collapse.

Follow-up: Echocardiographic strain imaging was repeated at 6 and 12 months postoperatively for both groups, and results were compared with preoperative measurements. Multi-slice CT coronary angiography has been also conducted at six and twelve months to evaluate graft patency. Heart rate reduction to < 60 bpm was achieved utilizing beta-blockers or non-dihydropyridine calcium channel blockers to optimize image quality and reduce radiation exposure [13].

Ethical considerations: The research has been approved by the Ethics Committee of the Faculty of Medicine, Menoufia University, Egypt. Written informed consents were attained from all participants. Privacy and confidentiality were ensured by assigning secret codes and maintaining individual patient files, with all data used solely for the current research. Participation was voluntary, and any unexpected risks during the study were promptly disclosed to both participants and the ethical committee. The study followed The Declaration of Helsinki through its execution.

Statistical analysis

Data were analyzed utilizing IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Qualitative parameters have been represented as frequencies and percentages, whereas quantitative variables have been defined utilizing range, mean, standard deviation, median, and interquartile range (IQR). Normality has been evaluated utilizing the Shapiro–Wilk and Kolmogorov–Smirnov tests, with statistical significance set at $p \leq 0.05$ **[14]**. Tests included Chi-square or Fisher's exact test for categorical parameters, Student's t-test or Mann–Whitney test for two-group quantitative comparisons, Kruskal–Wallis test for multiple group comparisons, and ROC curve analysis to evaluate diagnostic performance, with the area under the curve (AUC) interpreted as acceptable (>50%) or excellent (close to 100%).

RESULTS

Table (1) showed that the age of cases varied from 47–72 years in the LAD reconstruction group with a mean of 60.6 ± 6.93 and from 45–73 years in the standard CABG group with a mean of 61.21 ± 6.79 years with no significant difference in age or sex distribution. In the LAD reconstruction group, 31 patients were smokers, 30 were hypertensive, 32 were diabetics, 28 had dyslipidemia, 37 were obese, and 32 had a positive family history. In the standard CABG group, the corresponding numbers were 36, 39, 35, 31, 32, and 28 respectively. All risk factors demonstrated no significant variance among the 2 groups.

Table (1): Comparative analysis of baseline demographic and cardiovascular risk factors between patients undergoing LAD reconstruction and standard CABG

		Patients who had LAD reconstruction (n=58)	Patients with standard CABG (n=58)	P value
Age (years)	**Mean ± SD**	60.59 ± 6.93	61.21 ± 6.79	0.627
	Range	47 - 72	45 - 73	
Sex	**Male**	36 (62.07%)	38 (65.51%)	0.699
	Female	22 (37.93%)	20 (34.48%)	
Smoking		31 (53.45%)	36 (62.06%)	0.347
HTN		30 (51.72%)	39 (67.24%)	0.089
DM		32 (55.17%)	35 (60.34%)	0.572
Dyslipidemia		28 (48.28%)	31 (53.44%)	0.577
Obesity		37 (63.79%)	32 (55.17%)	0.344
Family history		32 (55.17%)	28 (48.27%)	0.457

LAD: Left Anterior Descending, **CABG:** Coronary Artery Bypass Grafting, **SD:** Standard Deviation

Table (2) showed that there was no statistically significant variance in Euro score II among cases who underwent LAD reconstruction and those who had standard CABG (p = 0.059). The median Euro score II was 1.11 (IQR: 0.91–1.22) in the LAD reconstruction group and 1.13 (IQR: 0.96–1.28) in the standard CABG group, indicating comparable preoperative risk profiles.

Table (2): Distribution of the studied patients regarding their Euro Score II

		Patients who had LAD reconstruction (n=58)	Patients with Standard CABG (n=58)	P value
Euro score II	**Median**	1.11	1.13	0.059
	IQR	0.91 - 1.22	0.96 - 1.28	

Euro score: European system for cardiac operative risk evaluation, **IQR:** Interquartile range.

Table (3) showed that LVEF was significantly improved at six months and twelve months in comparison with preoperative (P-value below 0.001). Similarly, GLS and LSr were significantly improved at six months and twelve months in comparison with preoperative (P-value below 0.001).

Table 3: Distribution of the examined cases who had LAD reconstruction regarding their preoperative and postoperative LV function by 2D speckle tracking

	n = 58			
		Preoperative	**6 months**	**12 months**
LVEF (%)	**Mean ± SD**	49.6 ± 8.46	56.1 ± 6.06	60.2 ± 3.3
	P value		**<0.001***	**<0.001***
GLS	**Mean ± SD**	-15.4 ± 2.12	-18.6 ± 2.16	-19.6 ± 2.5
	P value		**<0.001***	**<0.001***
LSr($^{S-1}$)	**Mean ± SD**	-1.28±0.22	-1.84±0.25	-1.82±0.23
	P value		**<0.001***	**<0.001***

LVEF: Left Ventricular Ejection Fraction, **GLS:** Global longitudinal strain, **LSr:** Longitudinal Strain rate

Table (4) showed that regarding the extent of the difference over the periods through LVEF% in the study group, there were statistical significant increase (p<0.01) between preoperative LVEF (49.6 ± 8.46) and 6 months post-operatively (56.1 ± 6.06). LVEF showed a significant improvement at 6 months postoperatively compared to preoperative (P value<0.001). Regarding the extent of the difference over the periods through GLS and LSr in the study group that there were a statistically significant decrease between preoperative and 6 months postoperatively (P value<0.001). GLS and LSr showed significant improvement at 6 months compared to preoperative.

Table (4): The extent of the difference over 6 months of the studied patients who had LAD reconstruction regarding their LV function by 2D speckle tracking.

	n = 58				
		Preoperative	**6 months**	**Mean Diff.**	**Change%**
LVEF (%)	**Mean ± SD**	49.6 ± 8.46	56.1 ± 6.06	6.5	13.1
	Range	35 - 60	44 - 62		
	P value		**<0.001***		
GLS	**Mean ± SD**	-15.4 ± 5.12	-18.6 ± 5.16	-3.2	-20.77
	Range	-26 - 14.5	-26 - 17.4		
	P value		**<0.001***		
LSr($^{S-1}$)	**Mean ± SD**	-1.28±0.22	-1.84±0.25	-0.56	-43.75%
	Range	-1.85--0.96	-2.25--1.26		
	P value		**<0.001***		

***:** significant as P-value below 0.05

Table (5) showed that in regard to the extent of the difference over the periods through LVEF% in the study group, there were statistical significant increase (p<0.01) between preoperative LVEF (49.6 ± 8.46) and 12 months (60.2 ± 3.3) postoperative. LVEF showed a significant improvement at twelve months postoperative in comparison with preoperative (P-value below 0.001). Regarding the extent of the difference over the periods through GLS and LSr in the study group there were a statistically significant decrease between preoperative and 12 months postoperatively (P value<0.001). GLS and LSr showed significant improvement at six months and twelve months in comparison with preoperative.

Table (5): The extent of the difference over 12 months of the studied patients who had LAD reconstruction regarding their LV function by 2D speckle tracking

		Preoperative	**12 months**	**Mean Diff.**	**Change%**
LVEF (%)	**Mean ± SD**	49.6 ± 8.46	60.2 ± 3.3	10.6	21.37
	Range	35 - 60	53 - 66		
	P value		**<0.001***		
GLS	**Mean ± SD**	-15.4 ± 5.12	-19.6 ± 5.5	-4.2	-27.27
	Range	-26 - 14.5	-26 - 19.5		
	P value		**<0.001***		
LSr($^{S-1}$)	**Mean ± SD**	-1.28±0.22	-1.82±0.23	-0.54	-42.18%
	Range	-1.85--0.96	-2.32--1.28		
	P value		**<0.001***		

Table (6) showed that LVEF was similar preoperatively and at 6 months between groups but was significantly higher at 12 months in LAD reconstruction patients (p < 0.001). GLS was comparable preoperatively and improved significantly at 6 and 12 months in LAD reconstruction versus standard CABG (p = 0.02 and p = 0.0314). LSr showed similar preoperative values but greater improvement at 6 and 12 months in LAD reconstruction patients (p < 0.001).

Table (6): Comparison between LV assessments by 2D speckle tracking of the two studied groups

	n = 58			
		Preoperative	**6 months**	**12 months**
LVEF (%)	**LAD reconstruction**	49.59±8.46	56.09±6.06	60.17±3.3
	Standard CABG	50.09±6.69	55.52±5.32	57.21±4.64
	P value	0.725	0.592	**<0.001***
GLS%	**LAD reconstruction**	-15.41±5.12	-18.58±5.16	-19.61±5.5
	Standard CABG	-15.54±4.8	-16.36±4.97	-17.39±5.44
	P value	0.892	**0.020***	**0.031***
LSr($^{S-1}$)	**LAD reconstruction**	-1.28±0.22	-1.84±0.25	-1.82±0.23
	Standard CABG	-1.26±0.19	-1.25±0.48	-1.54±0.19
	P value	0.527	**<0.001***	**<0.001***

Table (7) showed that significant reductions in operative, cross-clamp, and bypass times were observed in the LITA patch angioplasty group versus standard CABG with no significant difference in graft number or inotropic support. Postoperative complications, ICU/hospital stay, and LITA patency at 6 and 12 months were comparable between groups.

Table (7): Comparison between the two studied groups regarding perioperative finding and LITA patency

		LITA patch angioplasty	Standard CABG	P-value
Operative data	Operative Time (min)	249.03± 25.12	277.96± 21.45	0.046*
	Cross-Clamp Time(min)	58.3± 6.4	65.01± 4.1	0.026*
	Total bypass Time(min)	83.96± 10.4	94.87±10.34	0.048*
	Number of Grafts	3.82± 1	3.82±1	1
	Need For inotropic support	25(43.01%)	32(55.17%)	0.726
Postoperative data	Arrhythmia	11(18.96%)	17(29.31%)	0.082
	Wound infection	2(3.44%)	2(3.44%)	1
	Renal dysfunction	0	0	
	Chest infection	1(1.72%)	1(1.72%)	1
	Myocardial infarction	0	0	
	Exploration	2(3.44%)	4(6.88%)	0.062
	IABP Support	0	0	
ICU Stay (hrs.)		75.27± 8.3	77.96± 8	0.742
Hospital Stay(days)		8.3± 0.94	9.41± 0.98	0.281
6 months post Op. MSCT	Patent	58 (100%)	58 (100%)	
	Non-patent	0 (0%)	0 (0%)	
12 months post Op. MSCT	Patent	57 (98.28%)	56 (96.55%)	0.862
	Non-patent	0 (0%)	2 (3.44%)	0.50

CABG: Coronary Artery Bypass Grafting, **ICU:** Intensive Care Unit, **IABP:** Intra-Aortic Balloon Pump, **IQR:** Interquartile Range, **LITA:** Left Internal Thoracic Artery, **min:** Minutes, **MSCT:** Multi-Slice Computed Tomography, Post Op: Postoperative.

DISCUSSION

The baseline characteristics of patients undergoing LAD reconstruction and standard CABG were similar, with no significant differences in age, sex, or risk factors like hypertension, smoking, diabetes, dyslipidemia, obesity, and family history. The Euro score II values were also similar among the 2 groups, with no significant difference. This suggests that any observed differences in outcomes among the 2 groups, such as LV function, were not due to baseline disparities in demographics or comorbidities. There was no statistically significant variance in Euro Score II among cases who underwent LAD reconstruction and those who had standard CABG, ($p = 0.059$). The median Euro Score II was 1.11 (IQR: 0.91–1.22) in the LAD reconstruction group and 1.13 (IQR: 0.96–1.28) in the standard CABG group, indicating comparable preoperative risk profiles.

In our study, LAD reconstruction significantly improved LV function, with LVEF rising from 49.6 ± 8.46% to 60.2 ± 3.3% and GLS from −15.4 ± 5.12% to −19.6 ± 5.5% at 12 months (both $p < 0.001$). LSr increased from −1.28 ± 0.22 to −1.82 ± 0.23 S^{-1} ($p < 0.001$). Compared to standard CABG, which also showed improvement, LAD reconstruction achieved greater gains in LVEF, GLS, and LSr at follow-up. Consistently, **Awad *et al.*** [15] conducted a study aiming to compare various methods of LAD surgical reconstruction utilizing endarterectomy and patch plasty. They studied thirty cases with a mean age of 59.3 ± 9.1 years, and 80% were man. Preoperatively, 70% of patients had unstable angina. Parallel to our results, **Awad *et al.*** [15] found significant improvements in EF postoperatively, with their patients' mean EF increasing to 55.2 ± 14.2%. Similarly, our study also showed a notable increase in EF, from 49.6 ± 8.46% preoperatively to 60.2 ± 3.3% at 12 months, highlighting the effectiveness of study technique in improving left ventricular function in both studies. Both studies also report a significant postoperative improvement in NYHA classification, with 83.3% of Awad ***et al.***'s patients and a comparable proportion in our study moving to NYHA Class I.

These results align with **Keen *et al.*** [16] who assessed the alterations in left ventricular (LV) systolic function in response to coronary artery reconstruction surgery. In this study, 2,838 consecutive patients were analyzed, with a subgroup of 375 patients undergoing preoperative and postoperative echocardiographic assessment of LV function. The subgroup with preoperative LV dysfunction demonstrated a significant enhancement in left ventricular ejection fraction, increasing from 36 ± 9% preoperatively to 41 ± 12% postoperatively ($P<0.001$). The average improvement in LVEF was 5%, with a range of −23% to 33%. The 5% mean increase in LVEF demonstrated that coronary artery reconstruction surgery led to a significant recovery of LV systolic function. **Papestiev *et al.*** [17] performed a prospective research aimed at evaluating alterations in left ventricular systolic function following coronary artery bypass grafting in cases with both normal and abnormal preoperative LV function. They assessed 47 cases preoperatively and at 4 to 6 months postoperatively using

TTE. Their results revealed significant improvement in LV ejection fraction (LVEF) in patients with preoperative left ventricular dysfunction, from 40.05 ± 8.65% to 45.85 ± 9.04% (p-value equal to 0.008). However, in contrast to our findings, they observed a significant decline in LVEF in cases with normal preoperative function, decreasing from 64.70 ± 9.72% to 59.44 ± 9.75% (p-value equal to 0.008). This discrepancy may be attributed to the different surgical techniques or follow-up durations between the two studies.

As regarding GLS, **Gozdzik *et al.*** [18] conducted a study to assess LV function in cases prior to and following CABG utilizing speckle tracking echocardiography. They reported that preoperative GLS was significantly reduced in 73.91% of their patients, and it remained a critical marker for evaluating early outcomes. Similarly, in our research, we found a significant enhancement in global longitudinal strain postoperatively. In contrast, **Gozdzik *et al.*** [18] found a reduction in global longitudinal strain during the first 6 months postoperatively, followed by gradual improvement, whereas in our study, we noted consistent improvements in GLS at both 6- and 12-months post-surgery. This difference may be due to variations in surgical techniques, patient populations, or postoperative care strategies between the two studies.

Importantly, while LS measures myocardial deformation, LSr reflects the rate of that deformation—making it a more dynamic marker of contractile performance. LSr showed no significant change at 6 months (-1.26 ± 0.19 vs. -1.25 ± 0.48, p = 0.938) but improved significantly at 12 months to -1.39 ± 0.39 ($p < 0.001$). These results, which reflected that LSr improved significantly only after 12 months highlights its potential as a late indicator of myocardial functional recovery.

In our study, when comparing patients of LITA patch angioplasty to patients of standard CABG, statistically significant reductions in operative time, cross-clamp time, and total bypass time have been observed in the LITA group ($P < 0.05$), suggesting that LITA patch angioplasty is a more time-efficient procedure. However, no significant differences were noted in other clinical outcomes. Supporting our results, **Fukui *et al.*** [5] conducted a retrospective study aimed at assessing the clinical and angiographic results of extensive reconstruction of the diffusely diseased left anterior descending utilizing an ITA graft. They studied 213 cases who had extensive left anterior descending reconstruction, with or without endarterectomy, between 2004 and 2009. Their findings demonstrated excellent early and one-year patency rates of 95.7% and 93.4% respectively, and a 1.4% operative mortality rate. Additionally, freedom from death and other cardiac or cerebrovascular events was 91.5% at three years. Furthermore, confirming our study, **Kato *et al.*** [16] conducted a study aimed at assessing long-term results and angiographic patency following long segmental LAD reconstruction utilizing the left internal thoracic artery in cases with diffusely diseased coronary arteries. They studied 112 cases, with a mean age of sixty-three years, undergoing long segmental LAD reconstruction, with or without endarterectomy, and followed them over a 10-years period. Their results demonstrated a 99% early patency rate of the left internal thoracic artery and a 100% midterm and long-term patency rate. Additionally, the five- and ten-year survival rates were ninety-one percent and seventy-four percent, correspondingly, with freedom from major adverse cardiac events (MACE) at 77% over 10 years. They also found a significant variance among both groups concerning the operation time, cross-clamp time, and cardiopulmonary bypass time with only 1.8% early mortality rate and a 5.4% perioperative myocardial infarction rate, while our study found no perioperative myocardial infarctions or early deaths [15]. Furthermore they reported a 93.3% patency rate at six months, closely aligning with our 100% patency rate at six months and 98.28% at 12 months.

In our study, postoperatively, 11 patients (18.96%) of LAD reconstruction group experienced arrhythmias, while the majority (81.03%) did not. Wound infection occurred in 2 patients (3.44%), and there were no cases of renal dysfunction, MI, or the need for IABP support. Additionally, one patient (1.72%) had a chest infection, and 2 patients (3.44%) required surgical exploration. These findings suggest that LITA patch angioplasty is related to a low complication rate and favorable post-operative outcomes.

However, regarding postoperative complications, in contrast to our findings, **Awad *et al.*** [15] documented a higher frequency of atrial fibrillation (20%), mediastinitis (6.7%), and bleeding requiring exploration (13.3%) in the endarterectomy group in comparison with the patch plasty group, while we observed lower rates of complications overall. Notably, no cases of MI, renal dysfunction, or the need for IABP support were reported in our study. Whereas **Awad *et al.*** [15] observed MI (3.3%) and a mortality rate of 3.3%. This can be attributed to differences in study population or disease severity between both studies.

LIMITATIONS

The study sample size was relatively small, limiting the generalizability of the results to a larger population. The study did not assess long-term functional capacity or quality of life post-surgery, which could have provided additional insights into patient outcomes. The exclusion of patients with extensive CAD beyond the LAD limits the applicability of the findings to those with more widespread coronary involvement.

RECOMMENDATIONS

LITA patch angioplasty should be considered the preferred surgical approach for patients with diffusely diseased LAD. Multicenter studies involving larger patient cohorts are recommended to validate its long term outcome and broader applicability. Future studies should include a comprehensive assessment of functional capacity, quality of life and patient satisfaction post-surgery.

CONCLUSIONS

Our findings indicated that LITA patch angioplasty represented a superior alternative to conventional CABG for diffusely diseased LAD. Furthermore, this technique yielded greater enhancement in cardiac function and myocardial strain parameters, alongside a lower incidence of postoperative complications. Collectively, these advantages underscored the role of LITA patch angioplasty as a preferred strategy in selected patients with complex LAD pathology.

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