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Original Research Article

Comparison of Left Ventricular Function Utilizing Transthoracic Echocardiography in Anterior Wall Myocardial Infarction (AWMI) Before and after Percutaneous Coronary Intervention (PCI) to Left Anterior Descending Artery (LAD) in Single Vessel Disease

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Abstract:
Objective: To determine the frequency of left ventricular remodeling and mean change in LV function parameters, after PCI to LAD in single vessel disease.
Study Design: Prospective cross-sectional study.
Place and Duration of Study: Cardiology department of PIC, Lahore from 16 May 2024 to 16 November 2025.
Methodology: This study was done after taking ethical approval from IRB of Punjab Institute of Cardiology, Lahore. This study was done on 74 patients diagnosed with anterior wall MI and undergoing PCI to LAD in single vessel disease. Data collection was done using pre-designed proforma. At baseline and 3 months follow echocardiography was done LV remodeling was defined as increase in LVEF with corresponding decrease in LVEDD and LVESD compared to baseline values. Data analysis was performed using SPSS version 26, with p-value 0.05 considered significant.
Results: The mean increase in LVEF was 5.22 ± 0.14 (95% CI: −5.254 to −5.188; t = −312.79; p < 0.001), mean decrease in LVEDD was 2.11 ± 0.09 mm (95% CI: 2.087 to 2.131; t = 193.29; p < 0.001), and mean decrease in LVESD was 2.06 ± 0.05 mm (95% CI: 2.043 to 2.067; t = 353.30; p < 0.001). Left ventricular remodeling was observed in 25 (34%) patients.
Conclusion: The results of this study suggest that PCI to LAD results into left ventricular remodeling in patients with anterior wall myocardial infarction, and potentially improving overall cardiac performance.

Keywords: PCI, Left ventricular remodeling, LV function parameters.

INTRODUCTION

Globally, the prevalence of Myocardial Infarction (MI) in individuals under 60 years of age was estimated at about 3.8%, and in those over 60 years at about 9.5%. (1) Meanwhile, in Pakistan it has been estimated that one in every five adults may have underlying coronary artery disease, and the incidence of acute MI is on the rise. (2)

When not managed promptly, acute MI often resulted in severe complications due to left ventricular dysfunction. (3) Early restoration of blood flow improved patient survival by reducing infarct size, preserving LV function, and minimizing post-infarction complications. (4) PCI emerged as the standard treatment for acute STEMI, with primary goal of restoring arterial patency while preserving myocardial cell integrity and thereby improving overall ventricular function. (5)

In survivors of acute MI, recovery of left ventricular is

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key determinant of long-term outcomes. LV performance may change over time due to ventricular remodeling and gradual myocardial recovery. (6) Previous studies consistently demonstrated significant improvements in LV function following PCI. (7)

Infarction involving left anterior descending artery is particularly associated with more extensive myocardial damage and higher likelihood of LV dysfunction due to its large perfusion territory. (8) While advanced imaging methods like cardiac MRI and strain imaging can assess these changes, they are costly and less accessible. (9) Echocardiography, being inexpensive, non-invasive, and widely available, remains the preferred tool for evaluating LV function and monitoring recovery. (10)

Objective

Given these observations, the present study aimed to generate local data on the frequency and degree of LV remodeling after PCI in patients with anterior wall MI caused by left anterior descending artery.

METHODOLOGY

After obtaining ethical approval from Institutional Review Board, Lahore (Ref: RTPGME-Research-363, dated: 06-05-2025), this prospective observational study was conducted at Department of Cardiology, PIC, Lahore, from 16 May 2025 to 16 November 2025. Data were collected using structured proforma and maintained by principal investigator. Before patient's enrollment written informed consent was obtained from them. Inclusion criteria: Patients of either gender, aged 18–65 years, diagnosed with acute anterior wall MI or undergoing PCI to left anterior descending artery for single-vessel disease confirmed on coronary angiography were included. Anterior wall MI diagnosed using ECG; ST-segment elevation ≥1 mm in minimum two contiguous precordial leads [V1–V4]. (11)

Exclusion criteria: Patients were excluded if they presented with Killip class III or IV, had pre-PCI LVEF <30%, or having GFR <90 ml/min/m², chronic liver disease, or pulmonary disease. Pregnant females, alcoholics, and patients with prior MI history, PCI, or CABG were also excluded. A sample size of 74 patients was calculated, based on 95% confidence level, 10% absolute precision, and expected frequency of left ventricular remodeling after PCI of 26%. (12) Patients were enrolled through non-probability consecutive sampling. All enrolled patients underwent thorough clinical assessment. Demographic data including name, age, gender, and BMI were recorded. Risk factors such as diabetes mellitus (HbA1c >7%), hypertension (BP >140/90 mmHg), dyslipidemia, and smoking status were documented. Baseline investigations including CBC, RFTs, cardiac enzymes, and ECG were performed. Baseline transthoracic echocardiography was conducted to measure LVEF, LV end-diastolic dimension, and LV end-systolic dimension prior to PCI. All patients underwent PCI performed by team of cardiologists with a minimum of four years' interventional experience, and achievement of reperfusion (defined as TIMI grade 3 flow) was recorded. Post-procedure, patients remained admitted in coronary care unit for at least 24 hours. All patients received standard post-PCI therapy. Lifestyle modifications, including dietary control, smoking cessation, and management of blood pressure and glycemic levels, were reinforced.

Repeat transthoracic echocardiography was performed at three months post-PCI to re-evaluate LVEF, LVEDD, and LVESD. Echocardiography was performed by single experienced cardiologist using the same ultrasound machine for consistency. Left ventricular remodeling was defined as an increase in LVEF with corresponding decrease in LVEDD and LVESD compared to baseline values. Patients who expired or were lost to follow-up during the study period were excluded from the final analysis. Data analysis was performed using SPSS version 26.0. Quantitative variables were presented as mean ± standard deviation. Qualitative variables were presented as frequencies and percentages. Changes in echocardiographic parameters before and after PCI were compared using paired sample t-test. Post-stratification, chi-square test was applied to assess associations of LV remodeling with age, gender, and risk factors; p-value <0.05 was considered statistically significant.

Figure: Patient Flow Diagram

Total patients assessed for eligibility (n = 98)

↓

Excluded (n = 24)

• Did not meet inclusion criteria (n = 15)

• Declined to participate (n = 5)

• Lost before baseline assessment (n = 4)

↓

Patients enrolled (n = 74)

↓

Underwent PCI to LAD artery (n = 74)

↓

Follow-up at 3 months completed (n = 74)

↓

Included in final analysis (n = 74)

RESULTS

As shown in table mean age of patients was 54.66 ± 8.21 years (range: 35–65 years). Out of the total, 45 (61%) were male and 29 (39%) were female. The mean BMI was 23.05 ± 1.91 kg/m². Among the participants, 24 (32.4%) were diabetics, 27 (36.5%) had hypertension, 20 (27.0%) had dyslipidemia, and 21 (28.4%) were smokers (Table 1)

Table 1. Clinico-demographic characteristics of participants (n=74)

Age (years)	**Mean ± SD**	**54.66 ± 8.21**

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	Minimum	35
	Maximum	65
Gender frequency (%)	Male	45 (61%)
	Female	29 (39%)
BMI (kg/m2)		23.05 ± 1.91

Diabetics		24 (23.4%)
Hypertension		27 (36.5%)
Dyslipidemias		20 (27%)
Smoker		21 (28.4%)

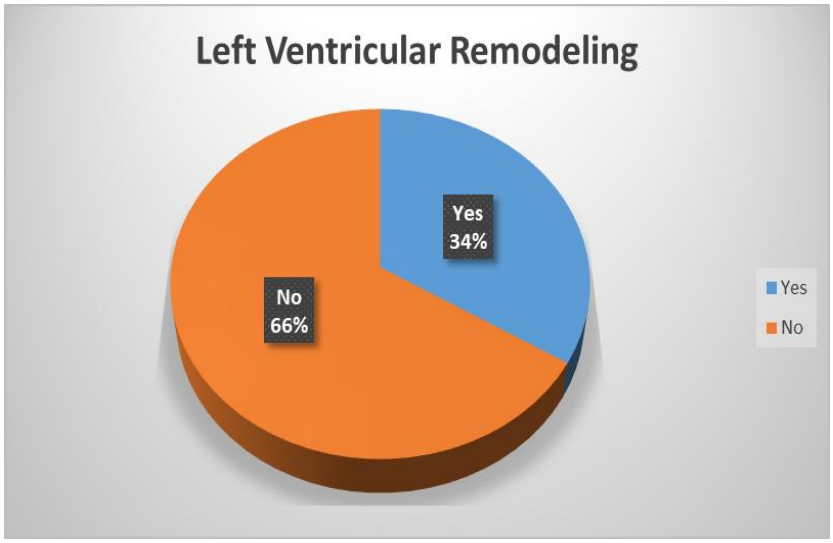
The mean change in left ventricular parameters showed statistically significant difference before and after PCI as shown in table II. The mean increase in LVEF was 5.22 ± 0.14 (95% CI: −5.254 to −5.188; t = −312.79; p < 0.001), the mean decrease in LVEDD was 2.11 ± 0.09 mm (95% CI: 2.087 to 2.131; t = 193.29; p < 0.001), and mean decrease in LVESD was 2.06 ± 0.05 mm (95% CI: 2.043 to 2.067; t = 353.30; p < 0.001) (Table 2).

Table 2. Mean change in left ventricular parameters (n=74)

	Mean± SD	**95% CI of Difference**		**t**	**df**	**p-value**
		Lower	Upper			
Pre LVEF – Post LVEF	5.22± 0.143	-5.254	-5.188	-312.792	73	<0.001*
Pre LVEDD –post LVEDD	-2.109 ± 0.093	2.087	2.131	193.293	73	<0.001*
Pre LVESD - Post LVESD	-2.055 ± 0.050	2.043	2.067	353.298	73	<0.001*

Left ventricular (LV) remodeling was observed in 25 (34%) patients, while 49 (66%) showed no remodeling as shown in figure

Figure: Frequency of left ventricular remodeling (n=74)



Stratification of data with respect to effect modifiers showed no statistically significant association of LV remodeling

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with gender (p = 0.688), diabetes (p = 0.231), hypertension (p = 0.654), dyslipidemia (p = 0.551), smoking (p = 0.959), or age group (p = 0.809) (Table 3).

Table 3. Data stratification with respect to effect modifiers

Variable	Category	LV remodeling		Total	p-value
		Yes Frequency (%)	No Frequency (%)		
Gender	Male	16 (64.0%)	29 (59.2%)	45 (60.8%)	0.688
	Female	9 (36.0%)	20 (40.8%)	29 (39.2%)	
Diabetes	Yes	10 (40.0%)	14 (28.6%)	24 (32.4%)	0.231
	No	15 (60.0%)	35 (71.4%)	50 (67.6%)	
Hypertension	Yes	10 (40.0%)	17 (34.7%)	27 (36.5%)	0.654
	No	15 (60.0%)	32 (65.3%)	47 (63.5%)	
Dyslipidemia	Yes	7 (28.0%)	13 (26.5%)	20 (27.0%)	0.551
	No	18 (72.0%)	36 (73.5%)	54 (73.0%)	
Smoker	Yes	7 (28.0%)	14 (28.6%)	21 (28.4%)	0.959
	No	18 (72.0%)	35 (71.4%)	53 (71.6%)	
Age group	Upto 45 years	5 (20.0%)	11 (22.4%)	16 (21.6%)	0.809
	>45 years	20 (80.0%)	38 (77.6%)	58 (78.4%)	

DISCUSSION

In current study, after PCI to LAD mean increase in LVEF, mean decrease in LVEDD, and mean decrease in LVESD was statistically significant; $p < 0.001$. Overall, left ventricular remodeling was observed in 34% patients. Similarly, Mahmoud Abd el-Sabour, conducted study involving 152 patients with acute STEMI, and 32.2% found to have LV remodeling, defined LVEDV increase of more than 20% six months post-PCI.(13) Sabry et al, found 26% incidence of LV remodeling at three-month follow-up in patients with anterior STEMI who underwent successful PCI.(12) In contrast, larger cohort study conducted by Lei et al, found that only 18.9% patients experienced LV remodeling during six-month follow-up period.(14) Hou et al, show an increase in LVEF post-PCI in around 50% patients.(15) Zhang et al, observed early LV remodeling (24-hours post PCI) in 54.8% and among 29.9% at 6 months follow-up.(16) However, in current study only LV remodeling assessed at 3-months follow-up. Adly et al, observed LV remodeling in 38.7%, and its long-term predictors included extensive anterior myocardial infarction ($p < 0.001$) and left anterior descending artery as infarct-related vessel ($p = 0.03$). (17) Infarct size following PCI has been shown to correlate with decreased risk of left ventricular LV remodeling, underscoring the importance of timely intervention.(18) PCI not only limits infarct expansion but also contributes to improvement in LV ejection

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fraction and reduction in LV hypertrophy, reflecting favorable impact on overall cardiac function.(19) However, despite successful revascularization and significant enhancement in LV performance, some patients may still develop adverse ventricular remodeling. This highlights the need for continuous post-procedural monitoring and appropriate management strategies to prevent or minimize long-term structural and functional deterioration of the heart. (20)

In current study, cardiac and cerebrovascular events were not assessed during follow-up period, which limits the ability to evaluate the long-term prognostic impact of left ventricular remodeling after PCI. Additionally, no comparison group was included, which restricts the study's capacity to determine relative outcomes or causality. Furthermore, follow-up was limited to three months, and longer-term echocardiographic and clinical outcomes were not evaluated.

CONCLUSION

The results of the current study suggest that PCI to LAD promotes favorable left ventricular remodeling in patients with anterior wall myocardial infarction, and potentially improving overall cardiac performance.

REFERENCES

1. Salari N, Morddarvanjoghi F, Abdolmaleki A, Rasoulpoor S, Khaleghi AA, Hezarkhani LA, et al. The global prevalence of myocardial infarction: a systematic review and meta-analysis. BMC Cardiovasc Disord. 2023;23(1):206. https://doi.org/10.1186/s12872-023-03231-w.
2. Baloch F, Arshad A, Sethi SM, Tai JM. Acute myocardial infarction from a lower-middle income country-A comprehensive report on performance measures and quality metrics using National Cardiovascular Data Registry. PLoS One. 2023;18(11):e0294396. https://doi.org/10.1371/journal.pone.0294396.
3. Damluji AA, van Diepen S, Katz JN, Menon V, Tamis-Holland JE, Bakitas M, et al. Mechanical Complications of Acute Myocardial Infarction: A Scientific Statement From the American Heart Association. Circulation. 2021;144(2):e16-e35. https://doi.org/10.1161/CIR.0000000000000985.
4. Saito Y, Kobayashi Y. Complete revascularization in acute myocardial infarction: a clinical review. Cardiovasc Interv Ther. 2023;38(2):177-86. https://doi.org/10.1007/s12928-022-00907-6.
5. Ahmad Y, Howard JP, Arnold A, Prasad M, Seligman H, Cook CM, et al. Complete Revascularization by Percutaneous Coronary Intervention for Patients With ST-Segment–Elevation Myocardial Infarction and Multivessel Coronary Artery Disease: An Updated Meta-Analysis of Randomized Trials. J Am Heart Assoc. 2020;9(12):e015263. https://doi.org/10.1161/JAHA.119.015263.
6. Sathvik M, Kalva ECSS, Suma G. A study on acute myocardial infarction and its prognostic predictors. Cureus. 2023;15(2). DOI: 10.7759/cureus.34775.
7. Batra MK, Malik MA, Khan KA, Rai L, Kumar R, Shah JA, et al. Left Ventricular Functional Remodeling after Primary Percutaneous Coronary Intervention. J Cardiovasc Echogr. 2022;32(1):12-6.
8. Wang H, Fu X. Effects of sacubitril/valsartan on ventricular remodeling in patents with left ventricular systolic dysfunction following acute anterior wall myocardial infarction. Coronary Artery Disease. 2021;32(5):418-26. DOI: 10.1097/MCA.0000000000000932.
9. Lange T, Stiermaier T, Backhaus SJ, Boom PC, Kowallick JT, de Waha-Thiele S, et al. Functional and prognostic implications of cardiac magnetic resonance feature tracking-derived remote myocardial strain analyses in patients following acute myocardial infarction. Clin Res Cardiol. 2021;110(2):270-80. https://doi.org/10.1007/s00392-020-01747-1.
10. Huang X, Liu Y, Guan B, Yang W, Sun S, Luo J, et al. Comprehensive Assessment of the Left Ventricular Systolic Function in the Elderly with Acute Myocardial Infarction Using Echocardiography. Int J Gen Medi. 2022;15(null):1437-45. https://doi.org/10.2147/ijgm.s348594.
11. Konijnenberg LS, Damman P, Duncker DJ, Kloner RA, Nijveldt R, Van Geuns R-JM, et al. Pathophysiology and diagnosis of coronary microvascular dysfunction in ST-elevation myocardial infarction. Cardiovasc res. 2020;116(4):787-805. https://doi.org/10.1093/cvr/cvz301
12. Sabry A-S, El-Rabat K, Attia A, Abd El-Fatah H. Left ventricular remodeling in patients with primary percutaneous coronary intervention for anterior myocardial infarction. Benha Medical Journal. 2020;37(3):731-8. https://doi.org/10.21608/bmfj.2020.112400
13. MAHMOUD ABD EL-SABOUR MKA, AMR A.A. YOUSSEF HS-E. Early Predictors of Left Ventricular Remodeling after Primary Percutaneous Coronary Intervention. Med J Cairo Univ. 2018;86(September):3285-92. https://doi.org/10.1016/j.ehj.2018.05.003
14. Yi L, Zhu T, Qu X, Buayiximu K, Feng S, Zhu Z, et al. Predictive value of early left ventricular end-diastolic volume changes for late left ventricular remodeling after ST-elevation myocardial infarction. Cardiol J. 2024;31(3):451-60. https://doi.org/10.5603/cj.90492
15. Hou C, Guo M, Ma Y, Li Q, Liu C, Lu M, et al. The Coronary Angiography-Derived Index of Microcirculatory Resistance Predicts Left Ventricular Performance Recovery in Patients with ST-Segment Elevation Myocardial Infarction. J

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Interv Cardiol. 2022;2022(1):9794919. https://doi.org/10.1155/2022/9794919.

16. Zhang L, Bai M, Deng A, Zhang Z. Evaluation of Left Ventricular Remodeling and Prognosis after PCI in Acute Myocardial Infarction Using Real-Time, Three-Dimensional Echocardiography Combined with Layer-Specific Strain Imaging. Heart Surg Forum. 2024;27(9):E1017-E28. DOI: 10.59958/hsf.7705
17. Adly YA, Taher HS-E, Youssef AA. Long-term follow up of left ventricular remodeling in ST segment myocardial infarction patients after primary percutaneous coronary intervention. J Curr Med Res Pract. 2023;8(4):177-81. https://doi.org/10.4103/jcmrp.jcmrp_70_23
18. Bochaton T, Claeys MJ, Garcia-Dorado D, Mewton N, Bergerot C, Jossan C, et al. Importance of infarct size versus other variables for clinical outcomes after PPCI in STEMI patients. Basic res cardiol. 2020;115(1):4. https://doi.org/10.1007/s00395-019-0764-8
19. Khademi R, Jafari M, Rahmanian M, Taherkhani M. Echocardiographic Evaluation of Left Ventricular Function Six Weeks Post-Primary Percutaneous Coronary Intervention: A Prospective Study. J Clin Cardiol. 2024;5(2):109-15. https://doi.org/10.33696/cardiology.5.063
20. Chen S, Zhao Y, Ma Z, Zhang Y, Liu K, Fu L, et al. The impact of myocardial infarct size dynamics on left ventricular remodeling in STEMI patients after primary percutaneous coronary intervention. Zhonghua xin xue guan bing za zhi. 2025;53(6):653-60. https://doi.org/10.3760/cma.j.cn112148-20240608-00324

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