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FUNCTIONAL AND CLINICAL IMPROVEMENT AFTER CARDIAC REHABILITATION FOLLOWING PCI: A CASE REPORT

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ABSTRACT
ST-elevation myocardial infarction (STEMI) may result in left ventricular systolic dysfunction and reduced functional capacity despite successful coronary revascularization. Phase II cardiac rehabilitation (CR) is an important component of secondary prevention following percutaneous coronary intervention (PCI). To describe the clinical course, structured CR program, and functional and clinical outcomes following PCI in a patient with LV dysfunction. This case report used clinical data obtained from the patient's medical history, physical examination, cardiovascular evaluation, exercise testing, and echocardiography. A 57-year-old man with anterior STEMI underwent successful PCI of the left anterior descending artery. He completed three CR sessions before discontinuing the program for non-medical reasons. One year later, he returned to resume Phase II CR and completed 12 supervised sessions twice a week. Each session included a warm-up, aerobic exercise using a treadmill and ergometer, and resistance training. Exercise intensity and progression were individually prescribed according to the FITT principle (frequency, intensity, time, and type), taking into account the patient's functional capacity, cardiovascular response, and perceived exertion. Clinical and functional outcomes were assessed by comparing baseline and post-intervention findings from the 6-minute walk test, ergometer stress test, and echocardiography. These assessments were used to evaluate changes in exercise tolerance, hemodynamic response, and left ventricular systolic function. The 6-minute walk test distance increased from 360 to 500 m, exercise capacity from 2.9 to 4.3 METs, and heart-rate recovery from 7 to 16 beats/min. LVEF increased from 31% to 45%, with improvement in regional wall motion. No exercise-related adverse symptoms were reported. Structured and supervised CR was associated with improved functional capacity and cardiac function in this post-PCI patient.

Keywords: cardiac rehabilitation; functional capacity; left ventricular dysfunction; percutaneous coronary intervention; ST-elevation myocardial infarction

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INTRODUCTION

ST-elevation myocardial infarction (STEMI) is a life-threatening manifestation of coronary artery disease caused by acute coronary occlusion and requires prompt reperfusion therapy to limit myocardial ischemia and tissue necrosis (Chen, Zhang, Lai, Wang, & Liu, 2026; Collet et al., 2021; Zhou et al., 2025). Myocardial injury following STEMI may result in significant left ventricular (LV) systolic dysfunction and impaired functional capacity (Liang, Hu, & Liao, 2024; Prabhu, Maiya, & Prabhu, 2020; Zhou et al., 2025). Patients recovering from an acute coronary event may continue to experience reduced exercise tolerance and impaired functional capacity, which are associated with increased cardiovascular morbidity and mortality (Chen et al., 2026; Mansilla-Chacón et al., 2021; Prabhu et al., 2020). Phase II cardiac rehabilitation (CR), consisting of supervised aerobic and resistance exercise with individualized exercise prescriptions, is a Class I recommendation for secondary prevention and is intended to support cardiovascular recovery and reduce hospital readmissions (Adam et al., 2025; Ambrosetti et al., 2021; Chen et al., 2026). Despite its established role, adherence to CR remains challenging, with interruptions and early discontinuation limiting completion of prescribed rehabilitation because of patient-related and socioeconomic barriers (Ambrosetti et al., 2021; Prabhu et al., 2020; Sukul et al., 2019). Patients with residual LV dysfunction require appropriate monitoring and individualized exercise

prescriptions based on the FITT principle (frequency, intensity, time, and type) to maintain exercise safety and effectiveness (Adam et al., 2025; Ambrosetti et al., 2021; Zhou et al., 2025). The 6-minute walk test (6MWT) and metabolic equivalents (METs) provide objective measures of functional capacity, whereas echocardiography allows assessment of cardiac parameters, including left ventricular ejection fraction (LVEF) and regional wall-motion abnormalities (Adhitya, Tedjasukmana, Ginanjar, & Friska, 2025; Coulshed, Coulshed, & Pathan, 2023; Zhou et al., 2025). We report the case of a patient with anterior STEMI and LV systolic dysfunction who underwent percutaneous coronary intervention (PCI) and initially discontinued CR after three sessions. One year later, the patient resumed CR and completed 12 supervised sessions. Functional capacity and cardiac function were evaluated using the 6MWT, exercise capacity in METs, heart rate recovery, and echocardiographic parameters. This case report aims to describe the clinical course, implementation of a structured cardiac rehabilitation program, and changes in functional capacity and cardiac function following rehabilitation in a patient with LV systolic dysfunction after PCI.

METHOD

This case report describes a 57-year-old man with anterior ST-segment elevation myocardial infarction (STEMI) who underwent percutaneous coronary intervention (PCI) followed by Phase II cardiac rehabilitation. Clinical data were obtained from the patient's medical history, physical examination, cardiovascular assessment, exercise testing, and echocardiography. The patient participated in a supervised cardiac rehabilitation program based on the FITT principle, with exercise prescription individualized according to his clinical condition and functional capacity. Clinical and functional evaluations were performed at baseline and after completion of 12 supervised rehabilitation sessions. These evaluations were used to assess changes in functional capacity, exercise tolerance, hemodynamic response, and left ventricular systolic function following the rehabilitation program.

RESULT

Case Description, Cardiac Rehabilitation, and Evaluation

A 57-year-old man presented to the hospital with acute-onset left-sided chest pain radiating to the back, accompanied by nausea and diaphoresis. The symptoms had begun approximately 2 hours before hospital admission. His medical history was significant for poorly controlled type 2 diabetes mellitus. He had no known history of hypertension, dyslipidemia, or other chronic medical conditions. Electrocardiography demonstrated an anterior ST-segment elevation myocardial infarction (STEMI). Coronary angiography revealed critical stenosis of the proximal left anterior descending (LAD) artery and total thrombotic occlusion of the mid-LAD. Diffuse 80–90% stenosis was also observed in the proximal right coronary artery (RCA). The patient subsequently underwent successful PCI of the LAD, with restoration of coronary blood flow.

Following PCI, the patient initially enrolled in a Phase II cardiac rehabilitation program and completed three supervised sessions. The program was subsequently discontinued for non-medical reasons. One year later, he returned to resume Phase II cardiac rehabilitation. At that time, he reported no recurrent chest pain, palpitations, or diaphoresis. He was alert and cooperative, with stable hemodynamic parameters and vital signs within normal limits. Based on the clinical assessment, he was considered suitable for supervised exercise training. At the time of rehabilitation, his medications consisted of clopidogrel 75 mg once daily, bisoprolol 1.25 mg once daily, atorvastatin 20 mg once daily, and sacubitril/valsartan 50 mg twice daily.

The patient participated in supervised exercise sessions twice weekly. Each session consisted of warm-up exercises, aerobic training using a treadmill and ergometer, and resistance exercises. Exercise prescription was individualized according to the FITT principle (frequency, intensity, time, and type) and adjusted based on the patient's baseline functional capacity, cardiovascular response to exercise, and perceived exertion. The patient completed all 12 supervised Phase II cardiac rehabilitation sessions with good exercise tolerance and without exercise-related adverse events. Clinical and functional assessments were performed at baseline and after completion of the 12-

session program. These assessments included vital signs, the 6-minute walk test (6MWT), an ergometer stress test, echocardiography, and evaluation of patient-reported symptoms.

Following completion of the rehabilitation program, functional capacity and exercise performance improved compared with baseline. This improvement was demonstrated by an increased 6MWT distance and greater exercise capacity on ergometer testing. Heart rate recovery also improved after completion of the program. At baseline, exercise tolerance was primarily limited by generalized fatigue, whereas after rehabilitation, the main limiting symptom was leg discomfort. Functional status improved from class III to class II–III (Tables 1 and 2).

Table 1.
6-Minute Walk Test (6MWT)

Parameter	Baseline	Post Intervention
Distance (m)	360	500
Symptoms	None	None

Table 2.
Ergometer Stress Test (WHO Protocol)

Parameter	Baseline	Post Intervention
METs	2.9	4.3
HR recovery (bpm)	7	16
NYHA Functional class	III	II–III
Exercise stop reason	Fatigue	Leg discomfort
Symptoms during test	None	None

Echocardiographic assessment demonstrated improvement in left ventricular systolic function, with an increase in left ventricular ejection fraction (LVEF) and favorable changes in regional wall motion. The left ventricular dilatation observed at baseline was no longer present on the post-rehabilitation assessment, which demonstrated a normal left ventricular size with concentric remodeling. Right ventricular systolic function remained preserved throughout the assessment period (Table 3).

Table 3.
Echocardiography

Parameter	Baseline	Post Intervention
LVEF	31%	45%
LV segmental motion	Akinetic: mid anteroseptal, anterior, extensive apical; hypokinetic: basal anteroseptal, basal-mid inferoseptal, anterolateral, basal anterior, apical lateral	Hypokinetic: anteroseptal, anterior, apical septal; other segments normokinetic
LV size / remodeling	LV dilatation	Normal, concentric remodeling
RV function (TAPSE)	Normal (2.4 cm)	Normal (2.1 cm)

Hemodynamic parameters remained stable between the baseline and post-rehabilitation assessments. Vital signs and oxygen saturation showed no clinically significant deterioration (Table 4). The patient did not experience chest pain, dyspnea, palpitations, or other exercise-related symptoms during the supervised rehabilitation sessions. Overall, completion of the 12-session Phase II cardiac rehabilitation program was associated with improvements in functional capacity, exercise tolerance, and selected echocardiographic parameters, while hemodynamic stability was maintained throughout the rehabilitation period (Tables 1–4).

Table 4.
Vital Signs and Symptom Monitoring

Session	Pre-exercise HR (bpm)	Post-exercise HR (bpm)	Pre-exercise BP (mmHg)	Post-exercise BP (mmHg)	SpO2 (%)	Observed Symptoms
Initial	66	74	105/61	119/70	98	None
Final	75	95	125/78	135/80	97	None

DISCUSSION

ST-elevation myocardial infarction (STEMI) is a critical manifestation of coronary artery disease characterized by acute coronary occlusion, resulting in myocardial hypoxia and tissue ischemia

(Zhou et al., 2025). The present patient had a high-risk anterior STEMI involving critical proximal LAD stenosis, total thrombotic occlusion of the mid-LAD, and diffuse proximal RCA stenosis. Prompt reperfusion through percutaneous coronary intervention (PCI) successfully restored coronary blood flow; however, revascularization cannot immediately reverse established myocardial injury or the underlying atherosclerotic disease process (Chen et al., 2026; Zhou et al., 2025). Residual left ventricular (LV) systolic dysfunction was evident, with an initial LVEF of 31% and extensive regional wall-motion abnormalities. Extensive myocardial injury may contribute to ventricular remodeling, impaired cardiac function, and reduced exercise capacity following myocardial infarction (Mansilla-Chacón et al., 2021; Zhou et al., 2025). Structured cardiac rehabilitation (CR) therefore represents an important component of secondary prevention following coronary revascularization (Ambrosetti et al., 2021; Chen et al., 2026).

Phase II CR is an important component of secondary prevention following a cardiac event and aims to improve physical performance, functional capacity, and cardiovascular recovery (Chen et al., 2026; Zhou et al., 2025). Patients with reduced LVEF require supervised aerobic and resistance training with individualized exercise prescriptions to improve exercise capacity while maintaining safety (Ambrosetti et al., 2021; Liang et al., 2024). The FITT principle provides a practical framework for adjusting exercise frequency, intensity, time, and type according to baseline functional capacity and clinical response (Ambrosetti et al., 2021). The rehabilitation program of these patients' consisted of twice-weekly supervised sessions incorporating treadmill and ergometer exercise with resistance training. Exercise intensity and progression were individualized according to the patient's functional capacity, cardiovascular response, and perceived exertion. Individualized exercise prescription is particularly relevant in patients with LV dysfunction because appropriate training may promote favorable adaptations in cardiovascular and muscular performance (Prabhu et al., 2020; Zhou et al., 2025). Completion of all 12 supervised sessions without exercise-related adverse events supports the feasibility and tolerability of structured CR in this patient (Ambrosetti et al., 2021; Zhou et al., 2025).

The 6-minute walk test (6MWT) and metabolic equivalents (METs) provide objective measures of functional and exercise capacity (Coulshed et al., 2023). In this patient, the 6MWT distance increased from 360 to 500 m, representing a 140-m improvement following the rehabilitation program. This increase exceeded the reported minimal clinically important difference (MCID) of approximately 25–30 m in cardiac populations, indicating a clinically meaningful improvement in walking capacity. Exercise capacity assessed by ergometry also increased from 2.9 to 4.3 METs, further supporting an improvement in exercise tolerance (Liang et al., 2024). Cardiorespiratory fitness has important prognostic implications, and higher exercise capacity is generally associated with lower cardiovascular and all-cause mortality risk (Prabhu et al., 2020; Tucker & Haykowsky, 2018). The concurrent improvement in 6MWT distance and METs therefore indicates an overall improvement in functional performance following the rehabilitation program.

Heart-rate recovery (HRR) increased from 7 to 16 beats/min after rehabilitation. Impaired HRR has been associated with increased mortality risk, whereas improvement in HRR may reflect more favorable autonomic and cardiovascular recovery following exercise training (Anari et al., 2015; Zhou et al., 2025). The patient also maintained stable hemodynamic responses throughout the rehabilitation program. Heart rate and blood pressure responded appropriately to exercise without chest pain, dyspnea, or palpitations (Ambrosetti et al., 2021). These findings indicate good exercise tolerance and support the feasibility of supervised training during post-MI recovery (Zhou et al., 2025). Objective changes were also observed in cardiac function. LVEF increased from 31% to 45%, while regional wall-motion assessment demonstrated fewer abnormal segments after rehabilitation. Exercise-based CR has been associated with favorable changes in ventricular remodeling and myocardial function (Liang et al., 2024; Zhou et al., 2025). Nevertheless, the improvement in LVEF should be interpreted cautiously because recovery of LV function after STEMI may reflect multiple contributing factors, including successful PCI, pharmacological therapy, and the natural course of post-MI recovery (Peretti et al., 2020; Zhou et al., 2025).

Therefore, the observed echocardiographic changes should be considered in the context of CR as an adjunct to coronary revascularization rather than as an isolated treatment effect (Liang et al., 2024).

The rehabilitation program was well tolerated despite the patient's initially reduced LVEF and known multivessel coronary artery disease. Supervised monitoring allowed exercise prescription to be individualized and cardiovascular responses to be assessed throughout training (Ambrosetti et al., 2021). Exercise intensity was progressively adjusted according to the patient's clinical and functional responses, with no exercise-related complications reported. The absence of chest pain, dyspnea, palpitations, or other adverse symptoms supports the tolerability of structured and supervised CR in this clinical setting (Ambrosetti et al., 2021; Zhou et al., 2025).

Patient adherence remains a major challenge in CR, as interruption or non-completion of prescribed sessions is common (Ambrosetti et al., 2021; Prabhu et al., 2020). In this case, the patient discontinued Phase II CR after three sessions and returned approximately one year later to resume rehabilitation. Completion of 12 supervised sessions after this interruption demonstrates the feasibility of renewed participation and was accompanied by improvements in functional and cardiac parameters. However, this case does not establish that delayed rehabilitation is equivalent to early participation. Rather, it illustrates that patients who previously discontinued CR may still benefit from re-engagement in a structured rehabilitation program and may demonstrate meaningful functional improvement (Ambrosetti et al., 2021; Chen et al., 2026).

Several limitations should be acknowledged. As a single-patient case report, this study has no control or comparator group, limiting the ability to establish a causal relationship between CR and the observed outcomes (Zhou et al., 2025). The observed improvements may have resulted from a combination of successful PCI, pharmacological therapy, natural post-MI recovery, and structured CR (Liang et al., 2024; Peretti et al., 2020). In addition, the relatively short observation period limits assessment of whether the observed benefits were maintained over the long term. Nevertheless, this case demonstrates the potential value of supervised CR with objective pre- and post-rehabilitation assessment. Structured CR may support improvements in functional capacity and may be associated with favorable changes in cardiac function in selected post-PCI patients with LV dysfunction when exercise is individualized and closely monitored (Ambrosetti et al., 2021; Zhou et al., 2025).

CONCLUSION

This case report describes the clinical course and outcomes of a 57-year-old man with anterior STEMI and significant coronary artery disease who underwent successful PCI followed by structured Phase II cardiac rehabilitation. After completing 12 supervised rehabilitation sessions, the patient demonstrated improvements in functional capacity, exercise tolerance, and left ventricular systolic function, while maintaining stable hemodynamic responses and experiencing no exercise-related adverse events. Individualized and supervised cardiac rehabilitation may support functional recovery and may be associated with favorable cardiac outcomes in selected post-PCI patients with LV dysfunction. These findings highlight the potential value of structured cardiac rehabilitation as an adjunct to optimal medical therapy and coronary revascularization.

REFERENCES

Adam, C. A., Erskine, J., Akinci, B., Kambic, T., Conte, E., Manno, G., … Perone, F. (2025, March 1). Exercise Training and Cardiac Rehabilitation in Patients After Percutaneous Coronary Intervention: Comprehensive Assessment and Prescription. Journal of Clinical Medicine, Vol. 14. Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/jcm14051607

Adhitya, Tedjasukmana, D., Ginanjar, E., & Friska, D. (2025). Safety of Six Minute Walking Test in Hospitalized Post- percutaneous Coronary Intervention Patients: Analysis of Vital Signs, Borg Scale, and Angina Scale Responses. Acta Medica Indonesia, 57.

Ambrosetti, M., Abreu, A., Corrà, U., Davos, C. H., Hansen, D., Frederix, I., … Zwisler, A. D. O. (2021). Secondary prevention through comprehensive cardiovascular rehabilitation: From knowledge to implementation. 2020 update. A position paper from the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology. European Journal of Preventive Cardiology, 28(5), 460–495. https://doi.org/10.1177/2047487320913379

Anari, L. M., Ghanbari-Firoozabadi, M., Ansari, Z., Emami, M., Nasab, M. V., Nemaiande, M., … Neishaboury, M. (2015). Effect of Cardiac Rehabilitation Program on Heart Rate Recovery in Coronary Heart Disease. In The Journal of Tehran University Heart Center J Teh Univ Heart Ctr (Vol. 10). Retrieved from http://jthc.tums.ac.ir

Chen, M., Zhang, L., Lai, J., Wang, J., & Liu, T. (2026, December 1). Impact of cardiac rehabilitation on cardiovascular outcomes in patients with coronary artery disease following percutaneous coronary intervention: a meta-analysis. BMC Cardiovascular Disorders, Vol. 26. BioMed Central Ltd. https://doi.org/10.1186/s12872-026-05887-6

Collet, J. P., Thiele, H., Barbato, E., Bauersachs, J., Dendale, P., Edvardsen, T., … Siontis, G. C. M. (2021). 2020 ESC Guidelines for The Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation. European Heart Journal, 42(14), 1289–1367. https://doi.org/10.1093/eurheartj/ehaa575

Coulshed, A., Coulshed, D., & Pathan, F. (2023, November 1). Systematic Review of the Use of the 6-Minute Walk Test in Measuring and Improving Prognosis in Patients With Ischemic Heart Disease. CJC Open, Vol. 5, pp. 816–825. Elsevier Inc. https://doi.org/10.1016/j.cjco.2023.08.003

Liang, H., Hu, X., & Liao, H. (2024). Effects of different early cardiac rehabilitation exercise treatments on the prognosis of acute myocardial infarction patients receiving percutaneous coronary intervention. Clinics, 79. https://doi.org/10.1016/j.clinsp.2024.100408

Mansilla-Chacón, M., Gómez-Urquiza, J. L., Martos-Cabrera, M. B., Albendín-García, L., Romero-Béjar, J. L., Cañadas-De La Fuente, G. A., & Suleiman-Martos, N. (2021, December 1). Effects of supervised cardiac rehabilitation programmes on quality of life among myocardial infarction patients: A systematic review and meta-analysis. Journal of Cardiovascular Development and Disease, Vol. 8. MDPI. https://doi.org/10.3390/jcdd8120166

Peretti, A., Maloberti, A., Garatti, L., Palazzini, M., Triglione, N., Occhi, L., … Riccobono, S. (2020). Functional Improvement After Outpatient Cardiac Rehabilitation in Acute Coronary Syndrome Patients is Not Related to Improvement in Left Ventricular Ejection Fraction. High Blood Pressure and Cardiovascular Prevention, 27(3), 225–230. https://doi.org/10.1007/s40292-020-00374-1

Prabhu, N. V., Maiya, A. G., & Prabhu, N. S. (2020). Impact of Cardiac Rehabilitation on Functional Capacity and Physical Activity after Coronary Revascularization: A Scientific Review. Cardiology Research and Practice, Vol. 2020. Hindawi Limited. https://doi.org/10.1155/2020/1236968

Sukul, D., Seth, M., Barnes, G. D., Dupree, J. M., Syrjamaki, J. D., Dixon, S. R., … Gurm, H. S. (2019). Cardiac Rehabilitation Use After Percutaneous Coronary Intervention. Journal of the American College of Cardiology, 73(24), 3148–3152. https://doi.org/10.1016/j.jacc.2019.03.515

Tucker, W. J., & Haykowsky, M. J. (2018, July 1). Predictors of Cardiorespiratory Fitness Improvements With Cardiac Rehabilitation: Lower Baseline Fitness With the Most to Gain, Gains the Most. Canadian Journal of Cardiology, Vol. 34, pp. 819–820. Elsevier Inc. https://doi.org/10.1016/j.cjca.2018.04.020

Zhou, J., Cai, L., Zhang, W., Chen, Z., Huang, C., Zheng, Y., … Shen, J. (2025). Effect of exercise rehabilitation training on cardiac function and quality of life after PCI for acute myocardial infarction. Frontiers in Cardiovascular Medicine, 12. https://doi.org/10.3389/fcvm.2025.1662376