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THE ROLE OF PHYSICAL ACTIVITY IN SECONDARY PREVENTION AFTER MYOCARDIAL INFARCTION

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Abstract

Physical activity (PA) is one of the fundamental elements of secondary prevention after acute coronary syndrome (ACS) and myocardial infarction (MI), as well as a key component of cardiac rehabilitation (CR). Available evidence indicates that higher levels of PA are associated with lower mortality, reduced risk of recurrent cardiovascular events, better physical capacity, improved quality of life, and more favorable control of cardiovascular risk factors. Despite

these documented benefits, participation in CR and long-term maintenance of the recommended level of PA remain insufficient.

Aim of the study

The aim of this study was to present the role of PA in secondary prevention after MI, with particular emphasis on its impact on prognosis, physical capacity, quality of life, cardiovascular risk factors, and the importance of CR.

Material and methods

A narrative literature review was conducted, including observational studies, randomized clinical trials, meta-analyses, and review articles concerning PA, CR, and secondary prevention after ACS and MI.

Conclusions

PA and exercise-based CR are fundamental elements of post-MI care. Their benefits include improved prognosis, physical performance, quality of life, and modification of major cardiovascular risk factors. Improving access to CR, patient education, and long-term maintenance of PA should remain one of the main goals of secondary prevention.

Keywords: physical activity, cardiac rehabilitation, myocardial infarction, acute coronary syndrome, secondary prevention, quality of life, cardiovascular risk factors

Introduction:

Acute myocardial infarction (AMI) is characterized by myocardial necrosis resulting from prolonged ischemia, most commonly caused by rupture or erosion of an atherosclerotic plaque followed by thrombus formation [1]. The risk of recurrent myocardial infarction and mortality is highest during the first years after MI [2].

Physical activity, according to the World Health Organization, refers to any bodily movement generated by skeletal muscles that results in energy expenditure. It encompasses activities performed during occupational tasks, leisure time, transportation, and routine daily activities such as household duties [3].

PA is included in the recommendations for secondary prevention [4].

Contemporary cardiac rehabilitation is a broad, multidisciplinary intervention designed to lower morbidity and mortality in patients with cardiovascular disease. Its major benefits also include fewer rehospitalizations, as well as improved quality of life and functional status [5].

Epidemiological evidence consistently indicates that higher levels of physical activity are associated with reduced all-cause mortality and lower cardiovascular morbidity [6]. The aim of this review is to discuss the role of physical activity in the secondary prevention of myocardial infarction.

State of knowledge:

1. Effects of physical activity on mortality and recurrent cardiovascular events

Prospective observational data showed that achieving or maintaining guideline-recommended levels of physical activity after acute coronary syndrome was associated with a marked reduction in mortality, ranging from approximately 29% to nearly 50% compared with physical inactivity [7].

Another analysis found that both moderate and high levels of physical activity were associated with significantly lower hazard ratios and reduced risks of cardiovascular and non-cardiovascular rehospitalization, with no significant differences between these activity levels, suggesting that even moderate physical activity confers substantial benefit [4].

A separate study conducted by Teng Li demonstrated a dose–response relationship between physical activity and prognosis after myocardial infarction, showing that higher levels of physical activity were associated with lower all-cause mortality. These associations remained consistent across different post-MI periods and after adjustment for confounding factors [8].

Orjan Ekblom found that physically active patients were more likely to participate in cardiac rehabilitation and had significantly lower mortality, while maintaining or increasing physical activity was associated with a comparable reduction in risk [9].

Evidence from randomized clinical trials and Cochrane analyses showed that exercise-based cardiac rehabilitation reduced cardiovascular mortality and hospitalizations while improving quality of life, although its effect on all-cause mortality remained less clear [5].

A meta-analytic assessment further demonstrated that cardiac rehabilitation was associated with an approximately 26% reduction in cardiovascular mortality (NNT $\approx$ 37) and an approximately 18% reduction in the risk of fatal and non-fatal myocardial infarction (NNT $\approx$ 100) during long-term follow-up [10].

In another study, physiological data also indicated that exercise training improved coronary perfusion, enhanced endothelial function, and promoted vascular adaptation. In patients with coronary artery disease, including those after myocardial infarction or revascularization, regular exercise was associated with an approximately 20% reduction in all-cause mortality and a 26% reduction in cardiovascular mortality [2].

Analyses focusing on rehabilitation programmes suggested that the survival benefit of cardiac rehabilitation depended on training intensity, adherence, completion rates, and improvements in physical capacity, such as increases in peak oxygen uptake (pVO_2). The same report also

noted that, despite its established benefits, cardiac rehabilitation remains underutilized, which may limit its impact on population-level mortality and highlights the need to improve access, implementation, and patient participation [11].

Finally, lifestyle-focused analyses showed that greater adherence to ideal lifestyle factors, particularly higher levels of physical activity, was associated with more favorable clinical profiles and significantly lower risks of recurrent coronary heart disease and mortality. These associations remained significant after multivariable adjustment, whereas Mediterranean diet adherence lost significance and abdominal obesity showed no independent association with outcomes [12].

2. Effects on functional capacity and quality of life

Randomized evidence reported improvements in left ventricular function (LVEF +4.1% vs. -1.7%), enhanced physical performance, particularly in older patients, and benefits across multiple domains of quality of life. Meta-analyses and interventional data presented in the same article also showed an increase in PA levels, for example by approximately 1000 steps per day, together with a reduction in rehospitalization rates (12.5% vs. 26.5%), which translated into better functional outcomes [7].

In another cohort, individuals who remained physically active both in the early period after MI and at 1-year follow-up had higher health-related quality of life, a more favorable clinical profile, and better cardiac function [9].

Another report found that participants who felt sufficiently confident to engage in higher-intensity exercise experienced improvements in cardiorespiratory fitness, physical performance, and psychological well-being [6].

Findings from the short-term rehabilitation programme described by T. Yoshida indicated improvements in quality of life and subjective well-being, and these benefits persisted over time despite partial attenuation during longer follow-up [13].

A separate analysis linked exercise-based CR with improvements in selected domains of health-related quality of life, particularly mental well-being, physical functioning, vitality, and social functioning, although no consistent improvement was observed in global EuroQol 5 Dimensions (EQ-5D) scores [10].

François Flammer emphasized that optimizing these effects requires not only structured training but also patient education, improved health literacy, and strengthened self-efficacy. The same work also highlighted the role of non-cardiac factors such as age, sex, body composition, and psychological resources, and identified insufficient information and lack of system-level support as major barriers to participation in PA programmes [14].

Another analysis identified aerobic fitness as a strong prognostic factor, with each 1 Metabolic Equivalent of Task (MET) increase associated with a 13% reduction in all-cause mortality and a 15% reduction in the risk of cardiovascular events. The authors also emphasized the importance of long-term maintenance of PA and referred to current recommendations of at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity exercise per week, supplemented by resistance training and supported by strategies such as self-monitoring [15].

3. Effects on cardiovascular risk factors

A separate review reported that CR was associated with reductions in cholesterol levels, blood pressure, and smoking rates, with the greatest benefits observed in multidisciplinary programmes combining exercise training with education, dietary counselling, and behavioural support [5].

Another analysis showed that regular exercise supported weight control, improved metabolic regulation, and helped slow the progression of cardiovascular disease, making it an important non-pharmacological strategy for secondary prevention. The same article also emphasized its clinically relevant role in blood pressure control, as appropriately prescribed exercise reduced both resting and exercise blood pressure and supported safe long-term management [16].

A separate analysis demonstrated that exercise favorably modified cardiovascular risk factors at the physiological level. Although its additional effect on lowering LDL-C levels was limited in patients already treated with statins, it improved LDL particle quality, increased HDL-C levels, and reduced triglyceride concentrations. The same work also reported that both aerobic and resistance training were associated with modest but clinically meaningful reductions in blood pressure, lowering systolic blood pressure by approximately 2–4 mmHg and diastolic blood pressure by about 3 mmHg [1].

Finally, the findings from another study suggested that exercise-based CR should be regarded not only as a strategy to improve functional recovery, but also as an important tool for comprehensive cardiovascular risk factor modification [13].

4. Role of cardiac rehabilitation

In one study, exercise was described as a fundamental component of cardiac rehabilitation, and programmes tailored to an individual patient's exercise capacity and clinical status were shown to improve physical capacity, promote long-term maintenance of activity, and provide cardioprotective effects even at lower levels of activity. The same analysis also indicated that optimal results are achieved with regular exercise performed 4–5 times per week, while appropriately prescribed resistance training may further improve physical performance and daily functioning [16].

Another study showed that participation in cardiac rehabilitation after myocardial infarction was associated with better clinical outcomes and greater adherence to treatment, whereas the absence of rehabilitation was linked to a higher risk of adverse events during follow-up [17].

In a separate cohort of patients who survived 30 days after acute coronary syndrome, long-term prognosis remained burdened by substantial mortality, reaching 10.9% at 1 year and 28.2% at 5 years. In that cohort, participation in comprehensive cardiac rehabilitation was low, as only 21% of patients attended despite mandatory referral; however, participation in rehabilitation was independently associated with lower all-cause mortality (HR 0.763; 95% CI 0.720–0.809). The authors also reported that direct admission to a PCI-capable center and percutaneous revascularization were associated with better survival, whereas older age, diabetes, cardiogenic shock, the need for mechanical ventilation, reinfarction during follow-up, elevated creatinine levels, and atrial fibrillation on admission were associated with worse prognosis [18].

A subsequent study found that only approximately 45% of patients achieved the recommended level of regular physical activity after myocardial infarction, indicating suboptimal adherence to physical activity recommendations and the need for better patient education and more effective support strategies [19].

Registry data presented in the study by Maria Bäck indicated that exercise-based cardiac rehabilitation constitutes a cornerstone of secondary prevention after myocardial infarction; however, targets for participation in exercise programmes (20–60%) and performance of exercise capacity testing ($\geq 60\%$) were not consistently achieved. The same report also noted that although smoking cessation rates (60–70%) and blood pressure control (70–75%) showed moderate success, lifestyle-related factors, particularly physical activity, remained insufficiently addressed, highlighting the need for improved access, programme standardization, and continuous monitoring through national registries [20].

Finally, another analysis showed that the proportion of patients reporting insufficient physical activity 1 year after myocardial infarction increased over time from 57.0% to 61.5% ($p < 0.0001$), indicating a worsening trend in long-term health behaviours [21].

Conclusion

PA is a fundamental component of secondary prevention after ACS and MI. The evidence reviewed in this paper indicates that higher levels of PA are consistently associated with lower mortality, reduced risk of recurrent cardiovascular events, and fewer rehospitalizations. These benefits appear to follow a dose–response pattern, although even moderate levels of activity may provide substantial prognostic value.

Beyond its impact on survival and recurrent events, PA also improves functional capacity, cardiorespiratory fitness, and health-related quality of life. Exercise-based CR contributes to better physical performance, improved left ventricular function, and favorable changes across several physical and psychological domains of quality of life. At the same time, regular exercise exerts beneficial effects on major cardiovascular risk factors, including blood pressure, lipid profile, weight control, and metabolic regulation, supporting its role as an important non-pharmacological therapeutic strategy.

CR provides the most structured and clinically effective framework for implementing PA in routine care. Its benefits appear to be greatest when exercise training is integrated with education, behavioural support, and individualized long-term management. Nevertheless, the reviewed literature also suggests that participation in rehabilitation programmes and long-term adherence to PA recommendations remain insufficient, which may limit the full clinical potential of these interventions.

Overall, PA and exercise-based CR should be regarded as essential elements of comprehensive post-MI care. Their effects extend beyond functional recovery and symptom improvement, contributing to risk factor modification, better long-term prognosis, and improved quality of

life. Further efforts should therefore focus on optimizing programme delivery, supporting sustained patient engagement, and improving integration of PA into long-term secondary prevention strategies.

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