

ORIGINAL ARTICLE

Cardiac Rehabilitation and Outcome in Stable Outpatients With Recent Myocardial Infarction



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Abstract

Objective: To compare the mortality rate and the rate of subsequent ischemic events (myocardial infarction [MI], ischemic stroke, or limb amputation) in patients with recent MI according to the use of cardiac rehabilitation or no rehabilitation.

Design: Longitudinal observational study.

Setting: Ongoing registry of outpatients.

Participants: Patients (N=1043) with recent acute MI were recruited; of these, 521 (50%) participated in cardiac rehabilitation.

Interventions: Not applicable.

Main Outcome Measures: Subsequent ischemic events and mortality rates were registered.

Results: Over a mean follow-up of 18 months, 50 patients (4.8%) died and 49 (4.7%) developed 52 subsequent ischemic events (MI: n=43, ischemic stroke: n=6, limb amputation: n=3). Both the mortality rate (.16 vs 5.57 deaths per 100 patient-years; rate ratio=.03; 95% confidence interval [CI], 0.0–0.1) and the rate of subsequent ischemic events (1.65 vs 4.54 events per 100 patient-years; rate ratio=0.4; 95% CI, 0.2–0.7) were significantly lower in cardiac rehabilitation participants than in nonparticipants. Multivariate analysis confirmed that patients in cardiac rehabilitation had a significantly lower risk of death (hazard ratio=.08; 95% CI, .01–.63; *P*=.016) and a nonsignificant lower risk of subsequent ischemic events (hazard ratio=.65; 95% CI, .30–1.42).

Conclusions: The use of cardiac rehabilitation in patients with recent MI was independently associated with a significant decrease in the mortality rate and a nonsignificant decrease in the rate of subsequent ischemic events.

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The use of cardiac rehabilitation programs in patients with myocardial infarction (MI) has gradually changed in recent years from exercise intervention into a comprehensive program, including smoking cessation, diet modification, control of cardiovascular risk

factors, and behavioral interventions aimed at changing exercise, psychological stress, and vocational components of lifestyle habits.¹⁻⁷ A number of studies have shown that the use of medium- to long-term exercise-based cardiac rehabilitation is effective in reducing mortality and seems to reduce hospital admissions in patients with coronary artery disease.⁸⁻¹⁰ The overall objective of cardiac rehabilitation and secondary prevention is to reduce the risk of major coronary events and deaths in patients with MI and thereby reduce premature disability and mortality, prolong survival, and improve quality of life.¹¹ Cardiac rehabilitation is a cost-effective intervention after an acute MI, and it improves prognosis by reducing recurrent hospitalization and health care costs while prolonging life.^{3,12}

However, cardiac rehabilitation appears to be vastly underused with poor referral, low participation rates, and large variations among countries.^{13,14} In Spain, <5% of patients with recent MI received cardiac rehabilitation in 2010.¹⁵ Possible reasons for this underuse include physicians' skepticism over its benefits, variations in access to cardiac rehabilitation programs in different parts of the country, and preference for exercise at home. In the current study, we aimed to compare the outcome in patients with a recent MI according to the use of cardiac rehabilitation or no rehabilitation. However, because any influence of cardiac rehabilitation on outcome might be biased by the relative influence of potentially confounding covariates (ie, current smoking habit, body weight, tight control of blood pressure levels, serum glucose or cholesterol levels, renal function, or concomitant medications), we considered all these variables and performed a multivariate analysis to identify whether cardiac rehabilitation independently influences outcome.

Methods

Study design

This is a prospective observational study of 1043 patients included in the Risk Factors and Arterial Disease (FRENA) registry that aimed to compare the outcome in patients with a recent MI according to the use of cardiac rehabilitation or no rehabilitation. FRENA was initiated in March 2003 to prospectively record the current clinical management and outcome of stable outpatients with atherosclerotic disease in Spanish hospitals.¹⁶⁻¹⁸ It is an ongoing, multicenter, observational registry of consecutive patients designed to gather and analyze data on treatment patterns and outcomes in patients with symptomatic ischemic disease of the heart, brain, and/or major peripheral arteries.

At baseline, data on demographics, cardiovascular risk factors, comorbidities, and drug therapy were collected. Clinicians at 10 FRENA-enrolling sites managed their patients according to local practice (ie, there was no standardization of treatment). Similarly, patients were enrolled in cardiac rehabilitation or no rehabilitation according to the decision of their physicians. The cardiac rehabilitation program (phase 2) was based on clinical practice guidelines,²⁻⁴ but there was no standardized protocol for all hospitals. Patients who did not participate in cardiac rehabilitation

Table 1 Clinical characteristics and therapeutic strategies according to the use of rehabilitation or no rehabilitation

Characteristic	Cardiac	No	P
	Rehabilitation (n = 521)	Rehabilitation (n = 522)	
Clinical characteristics			
Age (y)	56.0±10.0	67.0±13.0	<.001
Sex (men)	470 (90.0)	372 (71.0)	<.001
Body mass index (kg/m ²)	28.0±4.0	29.0±10.0	.043
Cardiovascular risk factors			
Hypertension	235 (45.0)	364 (70.0)	<.001
Diabetes	128 (25.0)	204 (39.0)	<.001
Hyperlipidemia	171 (33.0)	207 (40.0)	.018
Never smoked	129 (25.0)	245 (47.0)	<.001
Past smoker (>6mo)	110 (21.0)	99 (19.0)	.386
Past smoker (<6mo)	218 (42.0)	73 (14.0)	<.001
Current smokers	64 (12.0)	105 (20.0)	<.001
Alcohol intake	208 (40.0)	153 (29.0)	<.001
Underlying diseases			
Cancer	19 (3.6)	24 (4.6)	.440
Chronic lung disease	55 (11.0)	50 (9.6)	.600
MI characteristics			
STEMI	382 (73.0)	240 (46.0)	<.001
Interventions			
Angioplasty	348 (67.0)	206 (40.0)	<.001
Stenting	353 (68.0)	249 (48.0)	<.001
Bypass	7 (1.3)	34 (6.5)	<.001
Any of the above	381 (73.0)	314 (60.0)	<.001
Physical examination			
Atrial fibrillation	4 (0.8)	29 (5.6)	<.001
Mean SBP levels (mmHg)	122.0±13.0	132.0±16.0	<.001
Mean laboratory levels			
Total cholesterol (mg/dL)	169.0±29.0	174.0±39.0	.010
HDL cholesterol (mg/dL)	42.0±12.0	47.0±12.0	<.001
LDL cholesterol (mg/dL)	104.0±29.0	103.0±34.0	.463
Triglycerides (mg/dL)	134.0±64.0	128.0±76.0	.187
Glucose (mg/dL)	117.0±34.0	120.0±47.0	.263
Creatinine clearance (mL/min)	91.7±27.9	68.1±36.2	<.001
Drugs			
Diuretics	30 (5.8)	182 (35.0)	<.001
Beta blockers	464 (89.0)	407 (78.0)	<.001
ACE inhibitors	289 (56.0)	288 (55.0)	.923
Angiotensin-II antagonists	14 (2.7)	142 (27.0)	<.001
Antiplatelets	516 (99.0)	494 (95.0)	<.001
Acetylsalicylic acid	496 (95.0)	446 (85.0)	<.001
Clopidogrel	406 (78.0)	329 (63.0)	<.001
Anticoagulants	29 (5.6)	72 (14.0)	<.001
Statins	464 (89.0)	454 (87.0)	.300
Insulin	34 (6.5)	79 (15.0)	<.001
Oral antidiabetics	67 (13.0)	147 (28.0)	<.001
Proton pump inhibitors	154 (30.0)	262 (50.0)	<.001

NOTE. Values are mean ± SD, n (%), or as otherwise indicated. Abbreviations: ACE, angiotensin-converting enzyme; HDL, high-density lipoprotein; LDL, low-density lipoprotein; SBP, systolic blood pressure; STEMI, ST-segment elevation myocardial infarction.

had similar care in all other aspects and received advice on the control of risk factors and physical activity counseling, and periodically attended routine outpatient follow-up.

List of abbreviations:

CI confidence interval
FRENA Risk Factors and Arterial Disease
MI myocardial infarction

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