Postmyocardial Infarction Cardiac Rehabilitation in Low Risk Patients. Results With a Coordinated Program of Cardiological and Primary Care

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Introduction and objectives. To assess the efficacy of cardiac rehabilitation with a mixed primary and cardiological care program in patients with low-risk myocardial infarction.

Patients and method. The participants in this 12-month prospective study were 153 consecutive patients with low-risk myocardial infarction (MI) referred to their primary care center for follow-up care. Of these patients, 113 were referred to a mixed primary and specialized care program that included physical exercise, cardiovascular risk control, an antismoking program, health education talks and psychological evaluation. The other 40 patients served as controls. We analyzed the results after 3 months and 1 year of follow-up.

Results. There were no differences between the two groups at baseline. After 1 year, improvements were seen in smoking habit (4.6% vs 15.6%; *P*<.05) and body mass index (26 [2] vs 29 [2]; *P*<.05). Dyslipidemia, glucose and blood pressure were similar in both groups after follow-up. Greater improvements in the group of patients who participated in the program were seen after 1 year in quality of life (78 [2] vs 91 [2]; *P*<.05), exercise capacity (10.3 [2] vs 8.4 [3]; *P*<.01) and return to active employment (84.6% vs 53.3%; *P*<.05).

Conclusions. After 1 year of follow-up, the cardiac rehabilitation program coordinated by cardiological and primary care services for low-risk post-MI patients improved quality of life, and increased exercise tolerance, active employment, and the number of participants who quit smoking. The mixed program also reduced body mass index. These results suggest the need for similar programs.

Key words: *Cardiac rehabilitation. Low risk myocardial infarction. Primary care.*

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Rehabilitación cardíaca postinfarto de miocardio en enfermos de bajo riesgo. Resultados de un programa de coordinación entre cardiología y atención primaria

Introducción y objetivos. Evaluar la eficacia de un programa de rehabilitación cardíaca para pacientes con infartos de miocardio de bajo riesgo coordinados por la cardiología especializada y en colaboración con atención primaria.

Pacientes y método. Un total de 153 pacientes con infarto de miocardio de bajo riesgo fueron remitidos de forma consecutiva al centro de atención primaria para proseguir con el control evolutivo. En 113 pacientes se aplicó un programa conjunto que incluía ejercicio físico, control de los factores de riesgo, programa antitabaco, charlas de educación sanitaria y valoración psicológica. Los 40 pacientes restantes en los que no se aplicó el programa formaron el grupo control.

Resultados. No se observaron diferencias basales entre los 2 grupos. A los 3 y a los 12 meses mejoró el abandono de tabaco (4,6 frente al 15,6% a los 12 meses; $p < 0,05$) y el índice de masa corporal (26 ± 2 frente a 29 ± 2 a los 12 meses; $p < 0,05$). La dislipemia, la glucemia y la presión arterial estuvieron controladas por igual. El grupo activo mejoró la calidad de vida al año de seguimiento (78 ± 2 frente a 91 ± 2, $p < 0,05$), la capacidad de esfuerzo medida en equivalentes metabólicos (10,3 ± 2 frente a 8,4 ± 3; $p < 0,01$) y el retorno laboral (el 84,6 frente al 53,3%; $p < 0,05$).

Conclusiones. En enfermos con antecedentes de infarto de miocardio de bajo riesgo que realizan un programa de rehabilitación cardíaca coordinado entre cardiología y atención primaria se observa una mejoría de la calidad de vida y de la tolerancia al esfuerzo, un mayor retorno laboral, un mayor abandono del hábito tabáquico y una disminución del índice de masa corporal al año de seguimiento. Estos resultados indican la necesidad de potenciar programas similares.

Palabras clave: *Rehabilitación cardíaca. Infarto de miocardio de bajo riesgo. Atención primaria.*

Regrettably, during the revision phase of this article Dr. Salvador Espinosa Caliani died.

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ABBREVIATIONS

RF: risk factors.
BMI: body mass index.
MET: metabolic equivalents.
CR: cardiac rehabilitation.

INTRODUCTION

Cardiovascular diseases are the main cause of death in developed countries, especially ischemic heart disease, which is the primary cause of death in males and the second in females. Ischemic heart disease is followed in importance by cerebrovascular disease and arterial hypertension.[1] These lead to a great number of people with disabilities and huge economic costs. Intervention strategies must be promoted to reduce cardiovascular morbidity and mortality, increase quality of life, shorten sick-leave, and encourage return to employment. These strategies should be efficient regarding the prevention and treatment of cardiovascular diseases.

Currently, cardiac rehabilitation (CR) is understood as a group of multidisciplinary measures, that brings together a range of professionals (cardiologists, primary care doctors, rehabilitation specialists, physiotherapists, registered nurses, psychologists, diet and nutrition specialists, and social workers). They attempt to improve the physical capacity of the affected person via physical exercise, improve their psychological state and understanding of the disease so that they can take better care of themselves, control cardiovascular risk factors and return to employment and social life in conditions equal to or better than they had before the appearance of cardiac disease. In short, it is an attempt to change the life-style of these people on a permanent basis.

The efficiency of CR has been well demonstrated. Different studies have concluded that carrying out these programs improves morbidity and mortality by at least 25% after myocardial infarction.[2,3] In addition, there is an improvement in quality of life, an increase in return to employment, reductions in drug consumption and an excellent cost/efficiency ratio with economic benefits.[4] These data have likewise been demonstrated in Spain.[5,6] Cardiac rehabilitation is an integral approach to the prevention of cardiovascular disease, especially secondary disease.

However, despite the aforementioned, it is difficult to explain why, in Spain, the number of patients included in these RC programs is around 2%-4% of all potential candidates, with fewer than 20 centers in the entire country actively offering the program. These data contrast with those of other countries with a similar level of development, where the inclusion in these programs is 30%–50%.[7] This has been explained in various ways: the doctors' lack of confidence in the benefits of these programs, which leads to them not being recommended, or a lack of trust on the part of the patient, who thus does not implement them; the low number of patients included in the programs has been attributed to the lack of resources or inadequate support from the authorities to create and equip such units as this would involve having to solve immediate problems regarding short-term budgets, etc.

CR programs could be promoted and more patients rehabilitated by using all the means available. Primary attention is especially relevant in this context, as it should and can be actively involved in the process. Low-risk patients can be rehabilitated at primary care centers (Table 1), with the cardiologist acting as the general coordinator of the program, and the family doctor in charge of the cardiovascular problem as the local coordinator.[8]

AIMS

These types of programs can be implemented at primary care centers without the need for strict cardiological monitoring, since problems arising from physical exercise in these low-risk patients is effectively nil. Thus, if we take into account that most heart-attack patients belong to this group, the number of patients who would benefit from these programs would increase considerably. They could benefit from the use of primary care material and human resources under the coordination of a specialist cardiologist. Our aim was as follows: to assess the efficacy of a mixed primary and cardiological care program in patients with low-risk myocardial infarction to rehabilitate a greater number of patients.

PATIENTS AND METHODS

A total of 153 consecutive patients undergoing CR after a low-risk myocardial infarction were included. The program was offered to all of them. However,

TABLE 1. **Conditions for Ischemic Heart Disease to be Considered a Low-Risk Event***

Clinical intervention without complications
Normal or slightly depressed ventricular function
Exercise capacity equal to or higher than 7 MET
Absence of spontaneous or inducible ischemia data from any kind of test
No angina or equivalent
No dangerous ventricular arrhythmias
No known cardiac insufficiency

*MET indicates metabolic equivalents.

some did not accept the program for a variety of reasons (a prompt return to employment, living far from the program center, no interest in doing it, etc.). These patients formed the control group. A total of 113 patients were included in the group following the program and 40 in the control group. The program consisted of several phases. In Phase I (intra-hospital), an initial contact with the group was established, where patients were informed about the CR program and their possible participation. After discharge from hospital, patients were sent to their specific CR practice with a risk-stratified clinical report. If the patient agreed to take part in the program, he/she signed an informed consent document. Participants were then provided with some leaflets about their disease, performed the Velasco-del Barrio[9] Quality of Life Test and had their risk factors assessed (we tried to follow the recommendations and consensus of the main cardiac societies).[10,11] Finally, exercise was prescribed according to an ergometry test limited by symptoms and they were sent to the primary care center.

Phase II (convalescence) began in the primary care center. The family doctor acting as the local coordinator introduced the entire team (doctor assistant, physiotherapist, nurse, psychologist, social worker, specialist in dietetics and nutrition) before starting with the core aspects of the program. This first meeting was taken as an opportunity for the patient and the team to get to know each other. Each patient was also asked about their experience of the cardiovascular event, was informed about the objectives of the program and was given a working schedule in writing. This involved physical exercises three times a week, with 24 sessions in total, a monthly reminder session, a program of brisk walks, health education talks, dietary and nutritional advice and one visit to the psychologist.

The health education talks consisted of several sessions beginning with basic anatomical and functional information about the heart so that patients could gain better understanding of their condition. The risk factor concept was explained, as well as the most important risks involved and the way to prevent them. Ischemic heart disease, its different forms and treatment were also addressed, and issues such as sex, diet and exercise were discussed. Each session lasted around 20 min and most of the time was allocated to discussions. The final session was an open discussion of all the issues previously addressed so that patients had the opportunity to openly ask questions.

During the psychological evaluation, a cross-sectional descriptive study was designed to analyze the social and demographical variables obtained through a semi-structured interview. The following psychological variables were also evaluated: anxiety-depression, Type A behavioral pattern, hostility and response to stress as measured by standardized psychometric tests. Once a week, there was a group session that lasted 1.5 hours each in which seven modules were taught. This included theory, *in situ* tasks and tasks at home. Patients were taught how to relax and breath properly. If some specific problem was detected, the patient was sent to the mental health department.

Once the health-center stage ended, patients were sent back to the CR practice. This took place around 3 months after their first visit, and was repeated after 1 year. A clinical assessment and an ergometry test were again performed. In addition, the Quality of Life Test was repeated, risk factors assessed, walking schedule followed up and psychological results evaluated. Echocardiography was performed only if a cardiac event had taken place since the initial visit.

Phase III (maintenance) began at this stage. An attempt was made to encourage patients to participate in the new groups, attend the reminder sessions, and act in general as assistant instructors and promoters. In this regard, the role of cardiology patient associations is very useful.

Our study compared the results of this program 3 months after its start and after the first year of follow-up. Cardiovascular risk factors (smoking, dyslipidemia, hypertension, diabetes, excess weight and family background) were analyzed in each group at 3 months and after 1 year. Exercise capacity was evaluated from metabolic equivalents (MET) obtained from symptom limited exercise test, which were performed after phase II (3 months) and 1 year later. Results were compared to baseline values. The procedure followed was always the same: treadmill test, ergometry limited by symptoms and Bruce protocol. Quality of life was evaluated with the Velasco-del Barrio test, which is specific to post-infarction patients, has been validated in Spanish and has 40 items. It is a negative test, i.e. the lower the scoring, the better the quality of life.[9]

As is systematically done in our center, all the patients from the control group were advised at the time of discharge to follow a suitable diet, control cardiovascular risk factors and take some exercise.

Statistical Analysis

Data were analyzed with the SPSS statistical package (Statistical Package for Social Sciences, version 8.0 for Windows). Quantitative variables are expressed as mean±standard deviation (SD) and qualitative variables as percentages. Qualitative variables were compared with the χ^2 test (or Fisher's exact test, if the expected frequencies were <5). Quantitative variables were compared with Student's *t* test. Statistical significance was set at $P<.05$.

TABLE 2. **Baseline Values for Risk Factors in Both Groups***

	Active Group (n=113) n (%)	Control Group (n=40) n (%)	*P*
Smoking	93 (86.1)	35 (77.8)	NS
Dyslipidemia	67 (62)	25 (62.5)	NS
HT	38 (35.2)	16 (35.6)	NS
DM	13 (12)	7 (15.6)	NS
Excess weight BMI, 25-29.9	53 (50)	25 (55.6)	NS
Obesity BMI≥30	25 (23.6)	15 (33.3)	NS
FBIHD	21(19.4)	6 (13.3)	NS
Quality of life			
Velasco-del Barrio test	88±24	90±30	NS
Exercise capacity (MET)	8±2	8.6±0.9	NS

*FBIHD indicates family background of ischemic heart disease; DM, diabetes mellitus; HT, hypertension; BMI, body mass index; MET, metabolic equivalents; NS, non-significant.

TABLE 3. **Baseline Risk Factor Pattern***

	Baseline, Mean±SD	3 Months, Mean±SD	12 Months, Mean±SD	*P*
Total cholesterol, mg/dL				
CR	214±40	203±34	193±57	NS
Control	219±34	201±28	199±19	
Triglycerides, mg/dL				
CR	171±92	157±119	137±69	NS
Control	175±75	175±110	154±81	
HDL, mg/dL				
CR	40±8	42±7	42±7	NS
Control	39±8	39±8	42±6	
LDL, mg/dL				
CR	140±38	130±35	124±37	NS
Control	134±30	128±27	125±17	
Blood glucose, mg/dL				
CR	105±28	111±31	109±38	NS
Control	113±35	114±38	120±40	
SBP, mm Hg				
CR	122±17	127±22	129±12	NS
Control	123±12	129±20	135±23	
DBP, mm Hg				
CR	76±12	82±11	83±12	NS
Control	78±10	80±14	84±17	
Smoking, %				
CR	86.1	6.5	4.6	<.05
Control	77.8	22.2	15.6	

*SBP indicates systolic blood pressure; DBP, diastolic blood pressure; HDL, high-density lipoproteins; LDL, low-density lipoproteins; CR, cardiac rehabilitation; SD, standard deviation; NS, non-significant.

RESULTS

Only ten of the 153 patients were women. The average age in the active group was 49.9±8.4 years and 53.5±9.5 years in the control group, with no significant differences between them. No differences were observed in patients' baseline characteristics such as sex, location of acute infarction of myocardium, ventricular function, medication at the time of discharge and functional class. The withdrawal rate before completing 1 year follow-up was 20% in the active group and 23% in the control group, without significant differences. Baseline risk factors for the active and control groups, as well as their values after follow-up, are shown in Tables 2 and 3. There were no baseline differences between the 2 groups, or after follow-up. However, the percentage of patients who quit smoking was greater in the active group than in the control group (6.5% after 3 months and 4.6% after 12 months vs 22.2% after 3 months and 15.5% after 12 months; $P<.05$). Similarly, a greater reduction of Body Mass Index (BMI) was found in the study group, as shown in Figure 1 (26±2 after 3 months and 26±2 after 12 months compared to 28±2 after 3 months and 29±2 after 12 months; $P<.05$). The other RF did not have statistical significance.

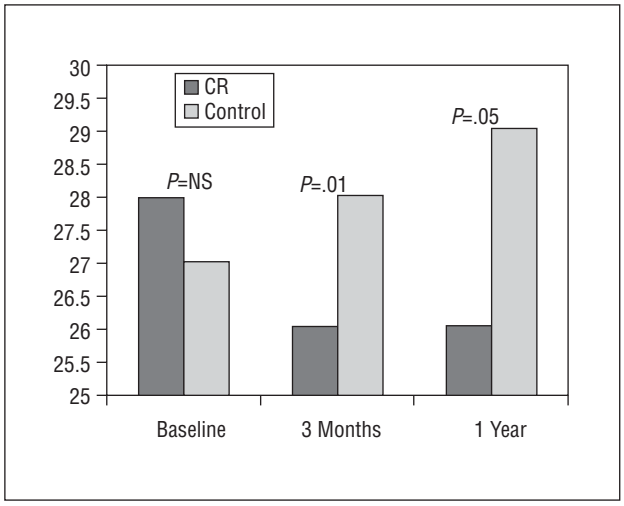

Fig. 1. Body Mass Index. Notice that Body Mass Index improves at 3 months and after 1 year in the active group. CR indicates cardiac rehabilitation; NS, non-significant.

Figure 2 shows the results of the Quality of life Test (Velasco-del Barrio) after 3 months and 12 months (86±3 vs 99±3 after 3 months and 78±2 vs 91±2 after 12 months). A slight improvement in quality of life was detected after 3 months, and became obvious after the first year of follow-up.

The results for exercise capacity are shown in Figure 3. A clear increase, as measured by the increase in baseline MET values at 3 months and 12 months, is found in the active group compared to the control group (at 3 months, 9.7±2 vs 8.4±3 MET; $P=.025$; at 12 months, 10.3±2 vs 8.4±3 MET; $P=.004$).

Return to active employment was also greater in the rehabilitated group. This difference was significant after 1 year of follow-up, as shown in Figure 4 (84.6 vs 53.3%; $P=.016$).

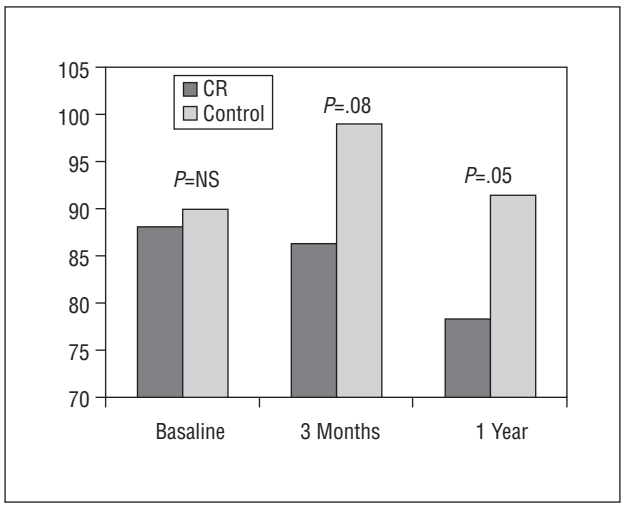

Fig. 2. Quality of Life Test (Velasco-del Barrio). Quality of life tends to improve at 3 months and is significantly better after 1 year in the experimental group. CR indicates cardiac rehabilitation; NS, non-significant.

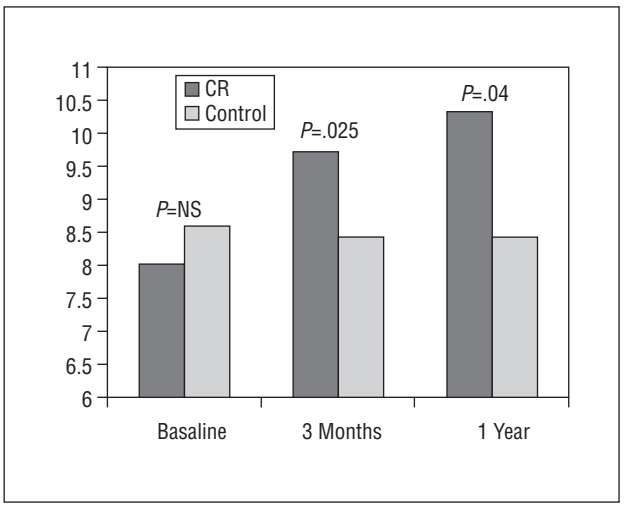

Fig. 3. Capacity for exercise measured in metabolic equivalents (MET). This parameter already improves at 3 months in the group following the program and is steady after 1 year. CR indicates cardiac rehabilitation; NS, non-significant.

The percentage of cardiac events (angina, reinfarction, hospitalization, cardiac insufficiency and/or death) in the active group was 2.8% at 3 months and 6.7% after 1 year. In the control group this was 4.6% at 3 months and 6.7% after 1 year (*P*=NS). These results make sense given that we are dealing with a low-risk group.

The psychological results showed a high anxiety-depression index. Sixty percent of the patients presented a type A behavior pattern and a high index of response to stress.[12]

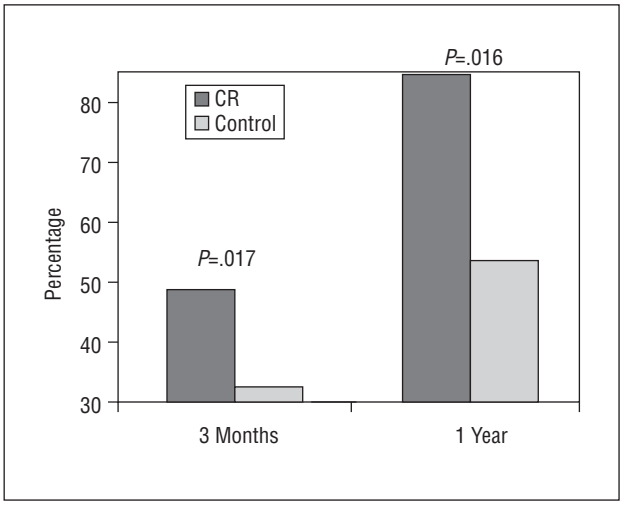

Fig. 4. Return to work tends to be better at 3 months in the group following the program, and becomes significant after 1 year. CR indicates cardiac rehabilitation.

DISCUSSION

Cardiac rehabilitation is a multidisciplinary strategy which has shown clear benefits for postinfarction patients. Due to the limited number of heart care units in Spain and the fact that most infarctions are low-risk, we designed a post-infarction program to rehabilitate patients using the materials and human resources of primary care centers to increase the number of people who could benefit from these programs.[8]

There were very few women in our group, a normal situation in these kinds of rehabilitation programs,[13] which means that we cannot draw conclusions regarding them. Although several studies have reported that CR decreases cardiac events,[2,3] our study cannot confirm this, probably due to the fact that we dealt with low-risk patients and low numbers of participants.

There were no differences at baseline with regard to risk factors, and both groups were similar. The low percentage of patients with diabetes mellitus or hypertension and the greater incidence of smoking, dyslipidemia and a family background of ischemic heart disease may seem curious. This is because our sample was made up of younger patients than in other studies.[14,15] Follow-up data (Table 3) showed that the lipid levels were within normal parameters in both groups, with a tendency to improvement in the active group. The values of cholesterol linked to low-density lipoproteins were close to 125 mg/dL, somewhat high for current trends. However, most patients received statins, although not at high doses. At the time of their prescription we did not have data on recent tests or on their protective effect below such values.[16-18] Blood glucose tended to be higher in the control group and blood pressure was similar in both groups.

It is not surprising that all patients had similar RF

levels regarding dyslipidemia, blood pressure and blood glucose given that the same doctor monitored both groups in the CR center.

However, we observed significant differences in BMI in favor of the active group (Figure 1). We believe physical exercise, the health education talks and the psychological support for dietary advice were the key to these results.

The percentage of people from the active group who quit smoking was higher (Table 3). We think that a session based on an antismoking program, which in our case was provided by the pulmonology department of our hospital, played a key role in this regard. Those patients in the CR program who showed a real motivation to quit smoking were sent to the pulmonology department for assessment.

The global quality of life improved in patients following the program (Figure 2). This was evaluated with the Velasco-del Barrio test for post-infarction patients. This is the only validated test in Spanish which has been specifically designed for these types of patients. It consists of 40 items with 5 possible answers to each item which are scored from 1 to 5. A low score indicates better quality of life. At 3 months there was a trend towards improvement in participants which was significant by the end of the first year.

Exercise capacity, calculated in MET, clearly increased in patients from the active group (Figure 3). This is a normal observation in all CR programs[19] and is due to physical training. Nevertheless, this is the first time this kind of training was carried out exclusively in primary care centers.

Return to work is a complex issue because many variables are involved (self-employed/employee, age of the patient, kind of work, etc.). Supervised CR hospital programs, like our program, have demonstrated their efficacy in this regard given that the number of people returning to work was greater in the active group (Figure 4).

The results of the psychometric tests were characteristic of post-infarction patients.[20]

One of the limitations of this study was that patients were not randomized, and thus data could have been positively biased towards the effect of the intervention on the active group. Another limitation refers to the low number of women, which makes it difficult to draw conclusions regarding this population. In addition, stage II did not start 2 weeks prior to hospital discharge in all instances, because in some cases it began 2-12 weeks post-event. This might have had a negative effect on the results of the intervention at 3 months. Finally, losses to follow-up might have also had an effect on the results, although these were similar in both groups.

CONCLUSIONS

The results from low-risk postinfarction patients who enrolled in a program for cardiac rehabilitation coordinated by cardiology specialists and primary care centers show an improvement in quality of life, greater tolerance to exercise, increased rates of return to work, a greater number giving up smoking and a reduction in Body Mass Index at 1 year follow-up. Thus, it would be useful to conduct random studies to further evaluate their actual efficacy in Spain and encourage similar programs.

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