

Secondary Prevention Program: Impact on Cardiovascular Risk

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The aims of this study were to determine the effect of a secondary prevention program on the treatment and control of coronary risk factors and to assess whether it improves functional capacity. The study involved 401 patients with coronary heart disease (mean age, 57.1 years; 89% men). Clinical and anthropometric data, including blood pressure, were recorded, and electrocardiography, laboratory analysis and exercise testing were performed before and after the program, which lasted 2-3 months. The therapeutic intervention comprised pharmacological treatment of coronary risk factors and the encouragement of life-style changes, including a recommended medically supervised physical exercise regime.

By the end of the program, lipid and lipoprotein levels had improved significantly ($P < .001$ for all). The proportion of smokers decreased from 37.4% to 3.6% ($P < .001$). Functional capacity increased by 26% ($P < .001$). In conclusion, patients who took part in the secondary prevention program experienced improvements in cardiovascular risk profile and functional capacity.

Key words: Secondary prevention program. Coronary heart disease. Cardiovascular risk factors.

Programa de prevención secundaria: influencia sobre el riesgo cardiovascular

Los objetivos de este estudio son evaluar los efectos de nuestro programa sobre el tratamiento y el control de los factores de riesgo y la mejoría de la capacidad funcional. Analizamos a 401 pacientes con cardiopatía isquémica (edad media, 57,1 años; 89%, varones). Se obtuvieron datos clínicos y antropométricos, así como los valores de la presión arterial, el electrocardiograma, la analítica y la ergometría, antes y después del programa, de 2-3 meses de duración. La intervención consistió en tratamiento farmacológico para el control de los factores de riesgo y la promoción de cambios terapéuticos del estilo de vida, e indicación de ejercicio físico programado con supervisión médica.

Al final del programa mejoraron significativamente las concentraciones de lípidos y lipoproteínas ($p < 0,001$ para todos ellos). Los fumadores se redujeron del 37,4 al 3,6% ($p < 0,001$). La capacidad funcional aumentó un 26% ($p < 0,001$). En conclusión, los enfermos incluidos en el programa mejoraron el perfil de riesgo cardiovascular y aumentaron la capacidad funcional.

Palabras clave: Programa de prevención secundaria. Cardiopatía isquémica. Factores de riesgo cardiovascular.

INTRODUCTION

Multifactorial secondary prevention programs (SPP) have significantly reduced coronary mortality and morbidity and improved quality of life.¹

The aim of this article is to present the results of our SPP on controlling coronary risk factors and improving functional capacity, which are basic factors determining cardiovascular risk.

METHODS

The SPP was run by a group of physicians made up of a cardiologist, who led the program, a rehabilitation physician, a psychologist, a physiotherapist, a nurse and a nursing auxiliary.

Patient Selection

Although the SPP was implemented in patients with various heart diseases, we only present the results from 401 patients with coronary heart disease (CHD). Data on 24 patients (6%) is omitted due to various events occurring during the program. The remaining 377 patients had a mean age 57.1 years. Some 89.4% were male and 71.4% had undergone recent revascularization.

Indications for the program were assessed by the respective cardiologists based on clinical criteria.

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No conditions were set for population selection, except for being able to engage in physical exercise and to visit the hospital to take the program. Low-, moderate-, and high-risk patients were included. Mean time from the acute event to program entry was 3-4 months; program duration was around 2-3 months.

Program Protocol

Medical Visit

These were overseen by the cardiologist. The medical record was reviewed during the first visit, a general examination given, and blood pressure (BP) and electrocardiography recorded. In the second, patients brought the results of exercise testing and laboratory analysis with them. A training program was provided if there were no contraindications. Initial heart rate was established as around 70% of the maximum reached in exercise testing, without symptoms or signs. Treatment was prescribed, or medication adjusted if necessary, for clinical control and cardiovascular risk factors. Oral and written advice was given on diet and avoiding stress. Smoking habits, alcohol consumption, and other factors were determined during the interview. Smokers were given advice and simple instructions in consultation with the cardiologist, nurse and psychologist, and at group meetings. Treatment compliance was excellent.

In case of psychological changes, a request to see the unit's psychologist was made via a referral form. If exercise was not contraindicated, the patient was sent to the unit's rehabilitation physician to assess the locomotive system.

At the end of the program, the cardiologist made a report covering the results obtained, dietary recommendations, pharmacological treatment, and reinsertion into the workplace.

Group Meetings

All members of the medical team, patients and family members attended the group meetings. These were held once a week and dealt with healthy lifestyles, exercise, substance abuse, stress, etc.

Cardiovascular Training

The exercise indicated was basically aerobic. This was done in the unit's gymnasium, directed by a physiotherapist, under medical supervision. The intensity and duration of training increased over the course of the program. The physiotherapist measured the patients' BP and heart rate (HR) at the beginning and end of the sessions and the data were recorded in the program registry.

Test Methodology

Blood pressure was taken using an Omron upper arm cuff while sitting. Electrocardiography was done using a Cardioline Delta 3 plus system.

Symptom-limited exercise testing was done on a Spacelab Quest 600 treadmill, following the Bruce protocol.

Blood analysis was done in the central laboratory, after fasting for 12 h or more. Analytical parameters in plasma were obtained automatically, using EDTA 1 mg/mL as the anticoagulant. Samples underwent ultracentrifugation following the Lipid Research Clinic criteria. Total cholesterol and triglycerides were determined by enzymatic methods and high-density lipoprotein cholesterol (HDL-C) by direct methods.

Statistical Analysis

The statistical analysis was done using SPSS statistical software 9.0 (SPSS Inc.). Qualitative data are presented as percentages and quantitative data as mean (standard deviation).

Pre- and post-program quantitative data were compared using the Student *t* test for paired data. Significant changes in qualitative data were analyzed using the McNemar symmetry test.

All the statistical tests were two-tailed and *P*-values less than .05 were considered significant.

RESULTS

Figure 1 shows the medication the patients received during the program and Figure 2, the patients who fulfilled the treatment aims.

Table 1 presents the patients' main variables at the beginning and end of the program. Table 2 presents the results of exercise testing; there was a 26% increase ($P < .001$) in functional capacity assessed in metabolic equivalents (MET), and a slight increase of 3% ($P < .024$) in the double product (systolic BP multiplied by HR).

DISCUSSION

The main limitation of the study lies in the lack of a control group and, thus, it is not known which part of the improvement in risk profile is attributable to being included in the SPP. Nevertheless, comparisons with registries of Spanish CHD patients who have not followed secondary prevention programs² and/or have been included in simpler programs—dietary advice at discharge and usual follow-up³—show that our SPP offers better control of cardiovascular risk factors with more patients fulfilling the therapeutic aims, especially in regard to lipids.

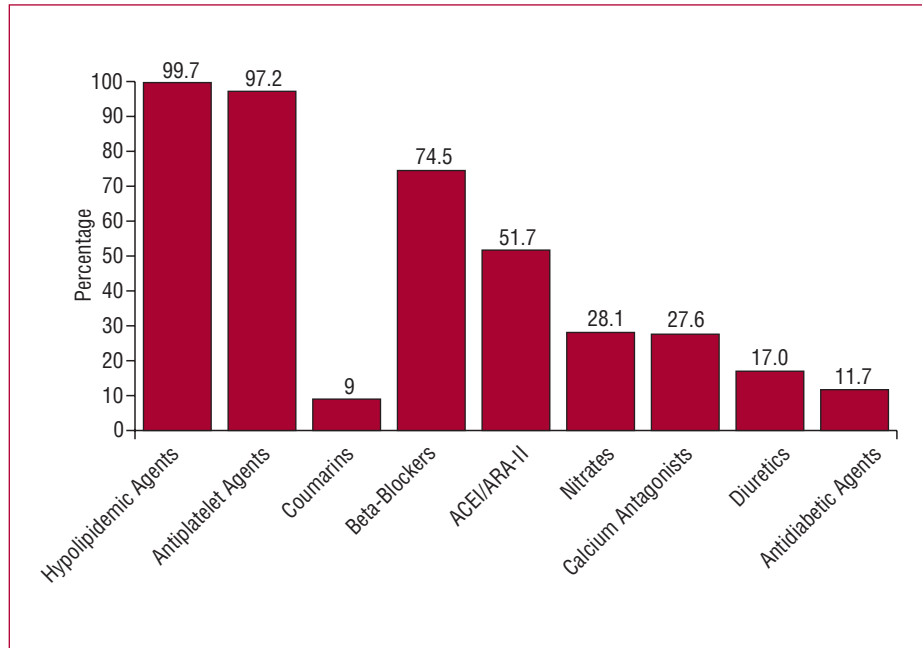


Figure 1. Patient medication during the secondary prevention program. ACE inhibitors indicates angiotensin-converting enzyme inhibitors; ARA-II, angiotensin-II receptor antagonists.

Effects of Modifying Lifestyle and Pharmacological Treatment on Controlling Cardiovascular Risk Factors

Our patients followed a traditional Mediterranean diet. Consumption of phytosterol-enriched food was recommended as a complementary treatment for moderate-severe hypercholesterolemia. Its impact on cholesterol was not analyzed in our study because it was

a general recommendation of the program, but it could have contributed to treating LDL-C, since significant decreases of this lipoprotein have been reported when intestinal absorption of dietary cholesterol has been blocked.⁴

Stopping smoking was achieved without having to prescribe pharmacological treatment, which could have had unknown or even potentially adverse effects in this stage of the disease. The strong motivation of being a

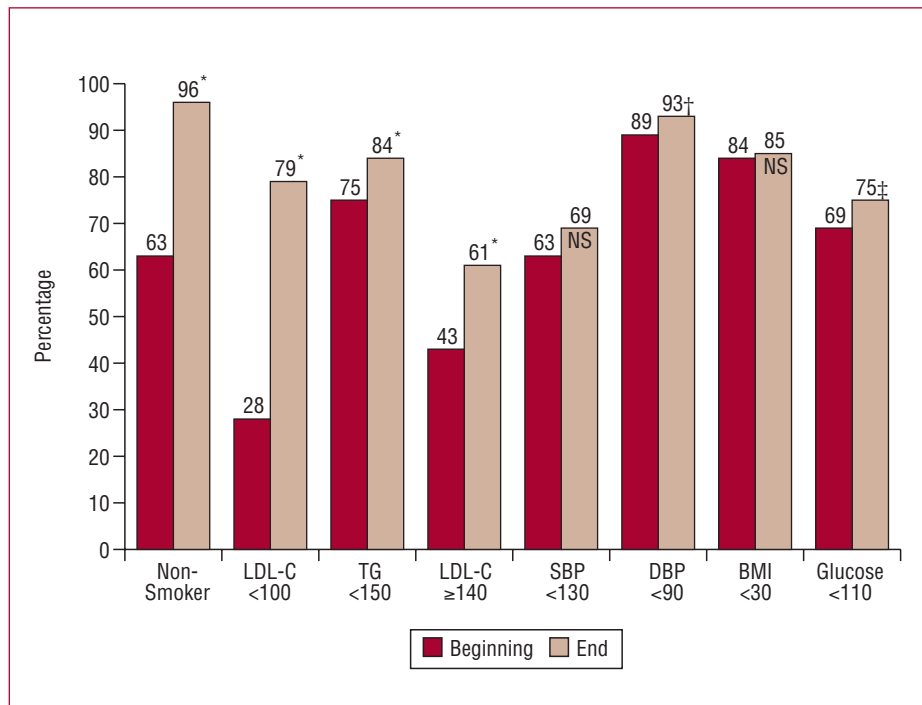


Figure 2. Patients fulfilling the treatment aims for risk factors at the beginning and end of the program. HDL-C indicates high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure; TG, triglycerides. **P*<.05. †*P*<.019. ‡*P*<.001.

TABLE 1. Description of the Quantitative Variables at the Beginning and End of the Program*

	Beginning Mean (SD)	End Mean (SD)	P
BMI	26.8 (3.2)	26.9 (3.1)	NS
SBP, mm Hg	127.7 (19.3)	126.4 (19.1)	NS
DBP, mm Hg	83.4 (11.9)	82.3 (10.5)	NS (.0896)
Glucose, mg/dL	108.4 (26.5)	107.1 (25.3)	NS
Cholesterol, mg/dL	186.2 (35.4)	164.9 (27.3)	<.001
TG, mg/dL	133.7 (72.9)	117.07 (49.2)	<.001
HDL-C, mg/dL	39.4 (10.3)	41.7 (10.2)	<.001
LDL-C, mg/dL	118.8 (29.6)	96.7 (21.0)	<.001
TC/HDL-C, mg/dL	4.9 (1.3)	4.1 (1.1)	<.001
LDL-C/HDL-C, mg/dL	3.1 (1.0)	2.4 (1.1)	<.001
Non-HDL cholesterol, mg/dL	145.9 (33.3)	122.9 (25.6)	<.001

*HDL-C indicates high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; non-HDL cholesterol, non-high-density lipoprotein cholesterol; TC, total cholesterol; SD, standard deviation; BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure; TG, triglycerides.

convalescent patient with a serious life-threatening disease, medical advice, and the other program measures led to a reduction in the habit from 37.4% at the beginning to 3.6% by the end of the program. Russel et al⁵ also found a 95% reduction in smoking in patients convalescing from infarction and coronary surgery.

A high percentage of the patients enrolled in the SPP took beta-blockers and, especially, hypolipidemic agents. Nearly all the patients were being treated with statins and, in 12.7% of cases, with another hypolipidemic agent, either fibrates or agents which inhibit the absorption of cholesterol in the intestine.

The treatment aims indicated in the clinical guidelines^{6,7} were achieved in a high percentage of patients due to this intense pharmacological treatment.

Effects of the Secondary Prevention Program on Functional Capacity

Cardiovascular training and improvements in clinical and cardiovascular risk factors led to an increase in efficiency in cardiac work capacity. Thus, functional

TABLE 2. Results of Exercise Testing at the Beginning and End of the Program*

	Beginning (Mean [SD])	End (Mean [SD])	P
MET	7.33 (2.43)	9.23 (2.30)	<.001
Double product	19 702.87 (5629.64)	20 298.82 (5806.69)	.024

*SD indicates standard deviation; ME, metabolic equivalent.

capacity increased by 26%, with only a 3% increase in the double product. That is, the heart is capable of more work with only slightly higher oxygen needs (BP and HF are the main determinants of myocardial oxygen consumption). These results are in agreement with those of other authors.⁸

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