

Medicina Sportiva

The Journal of Romanian Sport Medicine Society

Vol. IX, No. 4 – 2013

12.12.2013

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ISSN 1841-0162

Publisher “Universitaria”, Brestei 156, 200177, Craiova, Romania

Editorial Office Address: University of Craiova, Physical Education and Sports Faculty,
Brestei 156, 200177, Craiova, Romania

Site adress:

<http://www.medicinasportiva.ro>

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Coronary flow and physical activity

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Abstract. Inactivity is one of the major risk factors for heart disease. However, exercise helps improve heart health, and can even reverse some heart disease risk factors.

A sedentary (inactive) lifestyle is one of the top risk factors for heart disease. Fortunately, it's a risk factor that you can do something about. Regular exercise, especially aerobic exercise, has many benefits. Regular aerobic physical activity increases exercise capacity and plays a role in both primary and secondary prevention of cardiovascular disease.

Like all muscles, the heart becomes stronger as a result of exercise, so it can pump more blood through the body with every beat and continue working at maximum level, if needed, with less strain. The resting heart rate of those who exercise is also slower, because less effort is needed to pump blood.

A person who exercises often and vigorously has the lowest risk for heart disease, but any amount of exercise is beneficial. Studies consistently find that light-to-moderate exercise is even beneficial in people with existing heart disease. Moreover, anyone with heart disease or cardiac risk factors should seek medical advice before beginning a workout program.

Exercise has a number of effects that benefit the heart and circulation. These benefits include improving cholesterol and fat levels, reducing inflammation in the arteries, helping weight loss programs, and helping to keep blood vessels flexible and open.

The known benefits of regular aerobic exercise and current recommendations for implementation of exercise programs are described in this revised report.

Key words: *physical exercise, rehabilitation, cardiovascular disease, coronary flow.*

Introduction

Morfo-functional fluctuations of coronary vessels and coronary illness constitute the principal causes of death and invalidity in industrialized countries (1,2).

Full cardiac rehabilitation comprises training, counseling, appropriate medical and surgical treatment, suitable nutrition, abstention from smoking, maximum check of hematic lipids and blood pressure and a physical exercise program (3,4). These items all constitute a vital part of the therapy to be adopted in the case of patients who are post-infarct or have undergone a coronary bypass.

Over the past 30 years, physical training has become the most effective part of rehabilitation and it has been the target studied by researchers (5). In the beginning, the principles of this cognitive behavioral therapy were greatly guided by a traditional school of thought: they were based on behavioral models and less attention was given to cognitive processes.

By contrast, the modern approach concentrates

more on social cognitive and environmental factors. Contributions made by Multiple Risk Intervention Trial, and by the *Lipid Research Clinic Coronary Primary Prevention Trial* and by *STA Ford Five-City Project* (6), who have urged people to effect long-term changes over the years, have been inspired by theories of social learning.

Epidemiology

The physical activity described involves energy consumption of the skeletal musculature. Physical-fitness is a combination of essential practices when doing physical exercises and these involve the metabolic, hemostatic, cardiovascular, lung and neuromuscular systems (7,8). The amount of physical activity performed influences the patient's health, the quality of life and longevity.

In the past, when people performed more physical activities, epidemiological studies were carried out in order to establish the muscular power required for different types of jobs (9).

Numerous random clinical trials have been carried out on the effects of physical education programs and on modification of risk factors regarding survival of post-myocardium patients (8). Obviously, physical education programs and modification of risk factors in treating coronary pathologic patients is of vital importance. It has been proved that these programs can have a positive effect on future morbidity and mortality subsequent to the first myocardial infarction. These trials suggest that exercise and modification of risk factors can have an important role in treating patients who are undergoing myocardial revascularization (10).

Optimal Physical Exercise

Taken strictly from a physical point of view, rehabilitation is initiated at the end of hospitalization and takes up physical activity from where it was left prior to cardiac disease or in cases where patients have led sedentary lifestyles (10,11). Such activity is slow and the intensity is established on the basis of stress tests to be effected within the first two months of the event. Generally, if a patient has recuperated satisfactorily at the start, his rehabilitation program can be agreed upon with the cardiologist during check-up and it therefore unnecessary to attend a rehabilitation centre.

However, prolonged hospitalization or an out-patients' centre is prescribed quite frequently to patients who are at risk in order to guarantee better results from the "Physical Reconditioning Program" (12).

In order to guarantee safe and efficient rehabilitation, as well as to ensure compliance, it is necessary to know the patient's health risks. In practice by taking into consideration myocardial ischemia, the functioning of the left ventricle of heart, the clinical course of the illness during hospitalization and the result on stress tests (limited to symptoms) (10,11), it becomes possible to categorize patients according to risk factors (13).

1 Low-risk patients: patients with uncomplicated clinical-hospital course history; patients without signs of myocardial ischemia; patients with functional capacity greater than 7 METS; patients with normal left ventricular function (ejection fraction >50%) and without significant premature ventricular contraction.

- 2 Intermediate Risk Patients: patients with ST segment depression > 2 mm; patients with reversible uptake of thallium defect at myocardial scintigraphy; patients with moderate/good left ventricular function (ejection fraction 35-49%); patients with recent-onset angina or angina has changed its properties.
- 3 High-Risk Patients: post-infarction patients with left ventricular involvement of 35% or more; patients with left ventricular function >35%; patients with systolic blood pressure decrease or its failure to increase during stress test; patients with recurrent or persistent angina; patients with functional capacity <5 METS and hypotensive blood pressure response or ST segment depression > 1 mm; patients with heart failure episode during hospitalization; patients with ST segment depression of 2mm to medium-low average load; patients with significant premature ventricular contraction.

On the basis of the patient's history, laboratory and instrumental tests, functional capacity, and also the patient's risk probabilities (low, intermediate and high) as well as the patient's personal expectations, it is possible to prescribe one of the following rehabilitation programs which also includes a physical exercise plan: hospitalization; out-patients; a mixture of both; hospitalization (at the end of stress tests during therapy); out-patients (at the end of stress tests in pharmacological wash-out); personalized (varying according to degree of complication).

In the past, cardiological rehabilitation is treated in three phases: 1st phase (acute stage of illness) - early mobilisation and rehabilitation program planning; 2nd phase (post-acute) - intensive program lasting several weeks; 3rd phase (maintenance) - long-life intervention.

At the moment, distinction is made on the basis of risk conditions of the patient and the degree of illness, the type and duration of treatment: *intensive rehabilitation, intermediate rehabilitation, extensive rehabilitation.*

Intensive Rehabilitation (Tab I). Treatment applied to patients at intermediate-high risk levels in acute and post-acute phases of the illness and periodic reassessment on a long-term basis for patients at high risk (10,13). This type of rehabilitation is mainly carried out as hospital stay.

Table I. Intensive rehabilitation

INTENSIVE REHABILITATION		
Days	Mobilization	Other activities
1st day	Supine to 30°-45° Breathing Exercises Passive exercises	
2nd day	Free exercises	Washing yourself partially Eating by yourself
3rd day	Active exercises (5-10 reps twice daily) Chair 15'	Washing to the sink while seated
4th day	Active exercises Chair 30' Walking around bed	Washing to the sink
5th day	Active sitting exercises	Eating at the table
6th day	Active standing exercises Walking in the room	Eating at the table
7th day	Active standing exercises Walking in the room + 6 steps	Going to the bathroom with supervision

Intermediate Rehabilitation (Tab. II). Treatment applied to patients at intermediate-low risk levels in post-acute phase of the illness and periodic reassessment on a long-term basis for patients at intermediate and high risk (10,13). This type of rehabilitation is carried out either at home or in out-patients rehabilitation centers. The intensive and intermediate phases correspond to the first

and second traditional phases. To obtain maximum benefit from a training program patients must carry out exercises which involve the muscles of the entire body and are repeated on a regular basis: maximum attendance should be three times a week, alternate days, to allow full recovery (6). Physical training must be controlled via Telemetry.

Table II. Intermediate rehabilitation

INTERMEDIATE REHABILITATION		
1st Week	Warm-up	Breathing Exercises: 5 minutes
	Exercise	Free standing exercises, 1 st level: 10 minutes
2nd - 3rd Weeks	Warming down	Stretching Cyclette: 10 minutes
		Cooling down: 5 minutes
	Warm-up	Breathing Exercises: 5 minutes
	Conditioning	Free standing exercises, 1 st level: 10 minutes Stretching Cyclette 25 watt: 20 minutes or treadmill 2.7 Km/h
	Cool-down	Cool-down: 5 minutes

Extensive Rehabilitation (Tab. III): The main aim of this phase is to allow the patient to improve his physical condition. Patients enter this phase once their health is resumed from a medical point of view and the objectives of the therapy by means of physical exercise have been accomplished (10,13).

After 2-6 weeks of convalescence at home, the patient can then begin the real phase which is

maintaining the rehabilitation treatment. The training program is planned bearing in mind the patient's individual requirements and the sessions are usually organized three times a week at the Rehabilitation Centre.

Patients should be guaranteed constant medical supervision which includes registration of electrocardiogram and the presence of specialized personnel (11).