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EXERCISE TRAINING IN PATIENTS WITH CHRONIC CORONARY DISEASE

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A b s t r a c t

The aim of the study was to evaluate the effect of an 8-week training programme, involving both low and high intensity exercise, on the cardiorespiratory parameters in patients with chronic coronary disease (CCD). Thirty two patients with CCD (stenosis of more than 50 % lumen diameter determined by coronarography; NYHA I-II; mean age±SD, 63±8 years) were examined before and after the training (20 minutes three times a week) by symptom-limited spiroergometry. The patients were randomised for low and high intensity training. It is concluded that, in patients with chronic coronary disease, 8 weeks of high intensity training increased the maximum-attained workload and contributed to an improvement of patients' fitness; training at either intensity level resulted in improvement of transport system parameters.

K e y w o r d s

Chronic coronary disease, Spiroergometry, Exercise, Cardiorespiratory parameters

INTRODUCTION

Regular aerobic exercise can initiate a number of positive adaptation changes in patients with chronic ischaemic heart disease (*1,2*) and reduce morbidity and mortality of these patients (*3–5*). According to a majority of authors, however, only an intensive aerobic load can initiate these changes. A few papers dealing with exercise training at a low load intensity have been published. If an exercise training at a low intensity initiated changes comparable with those initiated at a high intensity, the possibility of rehabilitation at low levels of the load would remove risks of potential negative consequences of high intensity exercises feared by both doctors and patients, and treatment by exercise would be more accessible.

This study was aimed at evaluating the influence of 8 weeks of exercise training at different load intensities on the aerobic exercise capacity of patients with chronic ischaemic heart disease and reversible ischaemia of the myocardium appearing during physical exercise.

MATERIALS AND METHODS

Thirty two patients (NYHA I-II; mean age ±SD: 63±8 years) with a stable chronic ischaemic heart disease were included in the study. The disease was considered to be stable when there were no manifestations of haemodynamic, ischaemic and electrical instability in patients who had no haemodynamically significant valve defect. We did not include patients who had contraindications for exercise treatment. Reversible ischaemia was established in all patients by positive perfusion scintigraphy of the myocardium (SPECT). The diagnosis of ischaemic disease, verified by coronarography, was established when at least one haemodynamically significant coronary stenosis was found (stenosis of more than 50 % lumen diameter). All the patients were under conservative therapy and this was not changed in the course of this study.

Aerobic exercise capacity was examined before the patients started the programme and after 8 weeks of aerobic training.

All patients were subjected to initial bicycle spiroergometry (gas analyser MedGraphics) to assess their functional fitness, to diagnose ischaemic heart disease, if present, and to determine the limit of safe intensity of exercise. We chose a protocol with an intensified workload up to the symptom-limited maximum (basic load of 40 W, intensification at 20 W, 2-minute duration of each workload step). The patients were randomised for treatment by either low or high intensity exercise.

We determined the anaerobic threshold value (ANP) for prescribing a suitable load intensity. The patients under low intensity training were subjected to a load of 60 % of the anaerobic threshold; those under high intensity training were subjected to a load of the full anaerobic threshold. This was expressed in Watts, in the corresponding value of heart rate, and by degrees of the Borg scale of subjective perception of load intensity. During the whole spiroergometry, monitoring by a 12-lead electrocardiogram (Schiller CS 100) was carried out. The exercise capacity was assessed on the basis of maximum load levels expressed in watts (W_{max}), maximum peak oxygen uptake (VO_{2max}) and metabolic equivalents (MET).

Before entry to the programme, the patients were randomised into two groups. Group A exercised at a high intensity load, i.e., at the ANP level, group B performed at the level of 60 % ANP (low intensity training).

The training was carried out in the Department of Functional Diagnostics and Rehabilitation of St. Anne's Teaching Hospital in Brno. The patients came three times a week and the training consisted of a 15-minute, warming-up phase followed by 20-minute aerobic exercise on an ergometer; then a 15-minute cooling phase followed. The programme was carried out for 8 weeks.

Statistical evaluation of the results was carried out by both parametrical and non-parametrical tests. The total evaluation was made using the statistical method ANOVA, Wilcoxon.

RESULTS

The results of spiroergometry (mean ±SD) in groups A and B are given in *Tables 1* and *2*.

After the 8-week training programme, the patients with chronic ischaemic heart disease showed an increase in exercise load (W_{max}) and maximum oxygen uptake (VO_{2max}) regardless of whether they had been allocated to group A or B.

DISCUSSION

Physical training is currently used in the rehabilitation of cardiac patients as an important part of treatment. It leads to improvement of physical fitness (*6,7*), psychosocial functions (*8*), a decrease in sympathetic activity and positive

Table 1.

Training with load intensity at the anaerobic threshold level in group A subjects
(EF = 51.56%, n=14)

	W_{max} (W)	VO_{2max} (ml O_2STPD)	MET_{max}
1	144±32	1886±321	6,3±1,6
2	160±38*	2001±359*	6,8±1,4*

1, before training; 2, after training; * $P < 0.05$.

Table 2.

Training with load intensity at 60 % of the anaerobic threshold in group B subjects
(EF = 48±13%, n=18)

	W_{max} (W)	VO_{2max} (ml O_2STPD)	METmax
1	110±34	1461±316	4,9±0,8
2	118±36*	1585±377*	5,3±1

1, before training; 2, after training; * $P < 0.05$.

adaptation changes in the metabolism and skeletal musculature (*9*). Many of the studies have been based on the assumption that only a high intensity load is sufficient to initiate these changes. Only a few studies compare the effect of training at different load intensities. *Belardinelli et al*. described an increase in maximum oxygen uptake and anaerobic threshold levels after 8 weeks of training with a load intensity corresponding to 40 % of the maximum oxygen uptake level in patients with stable chronic heart failure (*10*). *Blumenthal et al.* (*11*) found that, in patients after myocardial infarction, training at low load intensity produced changes in maximum oxygen uptake similar to those achieved at high intensity training. *Worcester et al.* (*12*) described a favourable effect of training with varying load intensity on the quality of life after acute myocardial infarction. In our study, we evaluated the effect of 8-week aerobic training, at both high and low load intensity, in the patients with stable forms of chronic ischaemic heart disease. In accordance with the results mentioned above, we found a statistically significant increase in the maximum workload and an improvement in transport system parameters in both randomised groups. We can assume, therefore, that

even a low load intensity could be effective in rehabilitation of these patients. Further research and patient groups of larger sizes are necessary in order to evaluate the involvement of low load intensity training in long-term rehabilitation of cardiac patients.

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POHYBOVÁ LÉČBA U PACIENTŮ S CHRONICKOU ISCHEMICKOU CHOROBOU

S o u h r n

Cílem studie je posouzení vlivu 8-týdenní pohybové léčby s nízkou intenzitou (na úrovni 60 % anaerobního prahu) a vysokou intenzitou (na úrovni anaerobního prahu) na kardiorespirační parametry u pacientů s chronickou ischemickou chorobou (CCD). Třicet dva pacienti s CCD (koronarografie, NYHA I-II, věk±SD: 63±8 roků) bylo vyšetřeno před 8 týdnů dlouhou pohybovou léčbou s nízkou a vysokou intenzitou a po ní (20 minut třikrát týdně). Před pohybovou léčbou a po ní byla provedena symptomy limitovaná spiroergometrie. Pro pohybovou léčbu s nízkou a vysokou intenzitou byli pacienti vybráni náhodně. Dospělo se k závěru, že 8 týdnů pohybové léčby s vysokou intenzitou zvýšilo maximální dosazené pracovní zatížení a přispělo ke zlepšení zdatnosti. U pacientů s chronickou ischemickou chorobou zlepšila pohybová léčba s oběma úrovněmi intenzity parametry transportního systému.

A c k n o w l e d g e m e n t s

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