SCRIPTA MEDICA (BRO) – 80 (5): 211–218, *November 2007*

FITNESS IN OBESE PATIENTS WITH CHRONIC ISCHAEMIC HEART DISEASE

POCHMONOVÁ J., MÍFKOVÁ L., CHLUDILOVÁ V., SVAČINOVÁ H., VANK P., POHANKA M., AL-MAHMODI N. A. I., HASHIM M. K. A., AL FADHLI A. K., ANBAIS F. H., ERAJHI A. A., POSPÍŠIL P., LUMÍR KONEČNÝ L., SIEGELOVÁ J.

Department of Functional Diagnostics and Rehabilitation, Faculty of Medicine, Masaryk University, Brno, Czech Republic

Received after revision November 2007

A b s t r a c t

The paper deals with evaluation of the impact of a 12-week combined exercise training on the quality of life, physical performance, and capacity of the transport system of patients with chronic ischaemic heart disease (n = 88) depending on the body mass of the patients.

On the basis of the input spiroergometric examination and of the same examination carried out after the termination of the training we have proved that a 12-week combined exercise training in patients with chronic ischaemic heart disease results in increasing their physical performance and capacity of the transport system, particularly in patients with a body mass index lower than 30. Concerning patients with a body mass index higher than 30, we have not observed any increase of physical performance. We have found, however, that all groups of patients subjectively experienced improvement of their quality of life. We have thus shown that even if the rehabilitation training does not lead to improved physical performance, it can bring about subjectively experienced improvement of the quality of life.

K e y w o r d s

Quality of life, Combined training, Cardiovascular rehabilitation, Chronic ischaemic heart disease, Obesity

INTRODUCTION

Physiotherapy in patients with chronic ischaemic heart disease is an essential part of the treatment (*1–5*). Some patients, in addition to ischaemic heart disease, are also obese and their habitual exercise activity can be lower than in patients without obesity. To indicate properly the exercise treatment in patients with ischaemic heart disease with obesity, we have studied the physical performance at the maximum symptom-limited load in patients with chronic ischaemic heart disease and obesity.

PURPOSE

The study was aimed at evaluation of the effect of a twelve-week combined training on physical performance (expressed as maximal achieved performance and performance converted to 1 kg of body mass), on indicators of capacity of the transport system (expressed as maximal oxygen intake), and on the quality of life in patients with ischaemic heart disease with regard to their body mass and possible obesity.

METHODS

The set of 88 examined patients with chronic ischaemic heart disease was divided into three groups according to the value of BMI. The first group included patients with BMI up to 25, the second group contained patients with BMI 25.1 – 30, and in the third group were patients with BMI over 30; the basic characteristics of the set are given in *Tables 1–3*.

Table 1
Basic characteristics of the group of patients with BMI up to 25

Number (n)	16
Age (years)	60.9±8.9
EF (%)	47.7±12.6
BMI (kg.m^2)	23.9±1.2

Table 2
Basic characteristics of the group of patients with BMI 25.1 – 30

Number (n)	50
Age (years)	63.0±9.6
EF (%)	49.0±9.5
BMI (kg.m^2)	27.3±1.6

Table 3
Basic characteristics of the group of patients with BMI over 30

Number (n)	22
Age (years)	62.4±10.8
EF (%)	48.9±9.7
BMI (kg.m^2)	31.9±2.6

The patients undergoing exercise therapy for ischaemic heart disease had to comply with the following criteria: they did not suffer acute myocardial infarction or attack of unstable angina pectoris in the period of three months before starting the exercises, no patient had any valvular defect or heart failure, or was treated for hypertension.

Patients with serious dysrhythmia, with signs of haemodynamic instability, with severe ischaemia of the left ventricle at rest or under load were excluded. Patients with uncontrolled hypertension and diseases ruling out exercise therapy were not included into the set, either.

Examinations made within the framework of this study. Before starting exercise therapy all patients were submitted to an entrance examination of symptom-limited spiroergometry. In addition to the basic clinical examination (to exclude contraindications of the load examination), their ejection fraction of the left ventricle was determined by Doppler echocardiography with the instrument SONOS 5500 (Hewlett Packard).

Evaluation of the transport system function was realised by means of a spiroergometric load test on a bicycle ergometer. The twelve-lead electrocardiogram was recorded by the instrument Cardiovit CS 100 – Schiller. Ventilation-respiration values were determined by a gas analyser Pulmonary Function System 1 070 – MedGraphics CPX/D, USA, equipped with software for their analysis and evaluation.

The examination was carried out in the morning hours and the patients were noticed in advance that they should take the morning dose of their usual medication. Each patient was given the reason of examination and expected results. From the beginning of the load test twelve-lead EKG at rest was monitored. In the course of the 2- to 5-minute phase of adaptation sitting on the ergometer for stabilising the parameters, the rest values of the heart rate (HR) and blood pressure (BP) were read.

The protocol with progressive load without interruptions up to the symptom-limited maximum was determined for the examination (*6*). The ECG record was taken and the patients examined assessed their subjective perception of the load intensity (rating of perceived exertion – RPE) and their blood pressure (BP) values were measured by the auscultation method by means of a mercury manometer. The respiratory parameters in the exhaled air were determined by means of a breath gas analyser in real time breath-to-breath. On the basis of the measured values the arithmetic mean was calculated for every 30 seconds of load.

Seattle Angina Questionnaire. At the beginning and after the completion of the rehabilitation program the patients were given a Seattle Angina Questionnaire (SAQ) to be filled out for finding out their subjective perception of health state and the quality of life. The questionnaire is divided into five sections (further and in the results SAQ 1–5) and contains nineteen items altogether (*7–10*).

Section 1 (SAQ 1) The patient indicates how the chest pain or anginous pain during the last four weeks restricted him in performing the activities given in the section. The activities are arranged according to their physical strenuousness.

Section 2 (SAQ 2) It deals with comparison of the present health state with the period four weeks ago as to the frequency of anginous troubles in performing routine daily activities.
Section 3 (SAQ 3) The patient indicates how many times a day or a week they had anginous troubles in the last month in comparison with the same period four weeks ago and how many times they had to take nitroglycerin due to the troubles.
Section 4 (SAQ 4) It concerns subjective perception of the treatment and satisfaction of the patient with it.
Section 5 (SAQ 5) The last part should convey how the patients perceive the quality of their life with the disease and its possible fatal end.
The study was approved by the local ethical committee and the patients signed their informed consent.
The results were presented as average ± standard deviation, statistical evaluation was made by using the Student t-test and the Wilcoxon test.

RESULTS

In patients with chronic ischaemic heart disease with BMI up to 25 we have found a **statistically significant increase** of the maximal symptom-limited performance (Wmax), a statistically significant increase of the maximal heart rate (HRmax), maximal oxygen consumption (VO_2max), MET, the questionnaire of the quality of life with regard to usage of nitroglycerin for anginous pain (SAQ 3), as given in *Tables 4, 5, 6*.

Table 4
Results of symptom-limited spiroergometry before exercise therapy in individual groups of patients with chronic ischaemic heart disease divided according to BMI

	BMI to 25 (1st group)	**BMI 25.1 – 30 (2nd group)**	**BMI over 30 (3rd group)**	**Statistical significance**
HR maximal	121.0±13.6	113.5±16.8	109.1±19.1	NS
W maximal (W)	114.7±34.9	109.5±29.6	121.4±39.3	NS
SBPmax mmHg	204.7±35.5	193.7±25.2	198.8±29.2	NS
DBPmax mmHg	101.7±10.3	106.2±13.2	121.4±39.3	NS
VO_2max (ml/min)	1649±389	1643±373	1833±493	NS
VO_2 max/kg	22.4±5.3	19.5±4.4	19.1±4.9	*
SAQ 1	85.8±16.8	78.1±20.2	78.6±15.7	NS
SAQ 2	77.1±19.0	77.5±22.1	83.0±22.7	NS
SAQ 3	83.3±17.2	82.8±16.0	84.5±16.3	NS
SAQ 4	91.6±17.1	85.9±17.4	90.5±11.3	NS
SAQ 5	70.0±19.6	63.7±17.8	71.1±14.5	NS

In the column statistical significance *, +, o – p< 0.05, **, ++, oo – p< 0.01;
BMI: up to 25 versus 25.1 -30: *; up to 25 versus over 30: +, 25.1 30 versus over 30: o.
Statistical significance of the difference before rehabilitation and after it is given next to the relevant value (* p< 0.05, ** p< 0.01).

Table 5
Results of symptom-limited spiroergometry after rehabilitation in individual groups of patients with chronic ischaemic heart disease

	BMI to 25 (1st group)	BMI 25.1 – 30 (2nd group)	BMI over 30 (3rd group)	Statistical significance
HR maximal	133.9±17.6*	114.1±19.5	109.4±21.5	NS
W maximal (W)	133.9±39.0*	118.3±32.8*	126.2±39.0	NS
SBP max mmHg	209.0±30.2	198.2±26.2	211.4±25.2*	NS
DBP max mmHg	106.0±15.7	106.0±15.1	126.2±39.0	NS
VO2 max (ml/min)	1964±470**	1756±424	1921±457	**
VO2 max/kg	26.5±6.4*	20.8±5.2*	20±4.4	NS
SAQ 1	88.8±15.3	83.0±16.6*	85.8±14.2**	NS
SAQ 2	85.3±16.0	85.0±16.2*	89.0±16.5	NS
SAQ 3	88.3±14.7*	87.7±15.4**	89.2±12.4*	NS
SAQ 4	93.3±12.3	92.7±10.9**	93.3±8.1	NS
SAQ 5	72.9±18.0	71.2±18.5**	80.0±14.0**	NS

In the column statistical significance *, +, o – p< 0.05, **, ++, oo – p< 0.01;
BMI: up to 25 versus 25.1 -30: *; up to 25 versus over 30: +, 25.1 30 versus over 30: o.
Statistical significance of the difference before rehabilitation and after it is given next to the relevant value (* p< 0.05, ** p< 0.01).

We have achieved considerably different results in the groups studied. From what was given above follows that the patients with a normal body mass attained significant improvement in the maximal achieved physical performance, in the maximal achieved heart rate, and the maximal oxygen intake. In patients with overweight we demonstrated a significant increase of the maximal achieved physical performance and the maximal oxygen intake related to kilogram of body mass. In patients with obesity we achieved a significant decrease of systolic pressure and heart rate at rest.

By evaluation of the individual items of the SAQ questionnaire we have found out that in the group of patients with BMI up to 25 a significant improvement was achieved in the frequency of anginous pain and the necessity of taking nitroglycerin. In the overweight group the patients indicated a significant improvement in all items of the SAQ questionnaire. In the group of obese patients an improvement was indicated in the questionnaire items concerning the occurrence of anginous pain (SAQ 1), the general perception of the quality of life (SAQ 5), and also SAQ 3.

DISCUSSION

Regular combined exercise training of a suitable intensity results in adaptation of the organism to the load, in increase of physical performance and the capacity of the transport system, and in the quality of life.

In the present study we were dealing with the role of obesity in this process of rehabilitation. The individual groups differed only in the body mass index before the beginning of the rehabilitation process. An exception was the maximal transport capacity for oxygen, which was lower in the group of obese patients; this can be easily explained by a lower proportion of muscular mass and a bigger proportion of adipose tissue mass. A comparison of the individual groups after the completion of the exercise therapy brought the same results. This fact demonstrates that in all body mass groups there are considerable interindividual differences. We did not find out any differences in subjective evaluation of the quality of life before exercise therapy and after its completion, either.

A comparison of individual objective indicators and of subjective evaluation before physiotherapy and after it gives a different view. A substantial increase of the quality of life along with an improvement of the maximal physical performance and the maximal capacity of the oxygen transport system occurs in the group of patients with overweight. In the patients with normal body mass and those with obesity we can observe a less noticeable, but statistically significant improvement of subjectively evaluated indicators. Only in the patients with normal body mass this subjectively perceived condition is accompanied by an increase of the maximal physical performance. This was not found in obese patients.

Our results show that body mass influences considerably the subjectively perceived degree of disablement influenced by training. The reality that in obese patients their physical performance has not been improved is probably due to the fact that their overweight represents such a strain on the organism that probably their ischaemic heart has not enough additional reserves which would appear with increased maximal physical performance. The conclusions following from our study are not pessimistic in the case of obese patients, however. Even if their physical performance has not been improved, an improvement of the subjectively experienced quality of life turned out, which is more important for the therapy. It seems that an intensive pressure on decreasing the body mass could bring about still more favourable results of exercise training for the patient.

CONCLUSION

The paper aims at evaluation of the impact of a twelve-week combined training on the quality of life, physical performance, and the capacity of the transport system in patients depending on their body mass.

On the basis of the input symptom-limited spiroergometry and of the same examination carried out after the termination of the training we have proved that

a twelve-week combined exercise training in patients with chronic ischaemic heart disease results in increasing their physical performance and the capacity of the transport system, particularly in the patients with a body mass index lower than 30. Concerning patients with a body mass index higher than 30, we have not observed any increase of physical performance. We have found, however, that all groups of patients subjectively experienced an improvement of their quality of life. We have thus shown that even if the rehabilitation training does not lead to improved physical performance, it can still bring about a subjectively experienced improvement of the quality of life.

Acknowledgements

The research was supported by MSM 0021622402.

REFERENCES

1. *Chaloupka V, Siegelová J, Špinarová L, et al.* Rehabilitace u nemocných s kardiovaskulárním onemocněním [Rehabilitation in patients with cardiovascular disease]. *Cor Vasa* 2006; 48: K 127–45.
2. *Jančík J, Dobšák P, Svačinová H, Siegelová J, Placheta Z.* Zátěžová vyšetření u nemocných s chronickým srdečním selháním [Stress examinations in patients with chronic heart failure]. *Kardiol Revue* 2002; 3: 175–179.
3. *Jančík J, Vank P, Mífková L, et al.* Aerobní trénink kombinovaný se silovými prvky u nemocných s chronickou ischemickou chorobou srdeční: vliv na variabilitu srdeční frekvence [Aerobic training combined with resistance training in patients with chronic ischaemic heart disease: effect on heart rate variability]. In: *Optimální působení tělesné zátěže a výživy.* Hradec Králové: Gaudeamus, 2004: pp. 213–216, ISBN 80-7041-666-1.
4. *Martinik K.* Individuální výběr nemocných pro silový trénink u nemocných po akutním infarktu myokardu se sníženou ejekční frakcí levé komory – editorial [Individual selection of patients for resistance training in patients after acute myocardial infarction with decreased left ventricular ejection fraction – editorial]. *Vnitřní lékařství* 2005; 51: 13–16.
5. *Niederle P.* Rehabilitace a trénink u kardiaků [Rehabilitation and training in cardiacs]. In: Aschermann M., et al. *Kardiologie.* Praha: Galén, 2004: pp. 1421–1424.
6. *Placheta Z, Siegelová J, Štejfa M, et al. Zátěžová diagnostika v ambulantní a klinické praxi* [Stress diagnostics in outpatient and clinical practice]. Praha: Grada Publishing, 1999: pp. 51–178, ISBN 80-7169-271-9.
7. *Dragomirecká E, Škoda C.* Kvalita života. Vymezení, definice a historický vývoj pojmu v sociální psychiatrii [The quality of life. Specification, definition, and historical development of the concept in social psychiatry]. *Cs Psychiatrie* 1997; 93: 102–108.
8. *Slováček L, Slováčková B, Jebavý L, Blažek M, Kučerovský J.* Kvalita života nemocných – jeden z důležitých parametrů komplexního hodnocení léčby [The quality of patient life – one of the important parameters of complex therapy assessment]. *Vojenské zdravotnické listy* 2004; 73: 6–9.
9. *Slováček L.* Kvalita života a ischemická choroba dolních končetin [The quality of life and ischaemic disease of lower extremities]. *Interv Akut Kardiol* 2006; 5: 207–210.
10. *Payne J, et al. Zdraví: hodnota a cíl moderní medicíny* [Health: the value and goal of modern medicine]. Praha: Triton, 2002: 9–12, 54–64, ISBN 80-7254-293-1.