PHYSICAL ACTIVITY AND 24-HOUR PROFILE OF BLOOD PRESSURE

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A b s t r a c t

The aim of the study was to compare 24-hour course of blood pressure immediately after the exercises with the values from the following day when the patient did no exercises. The set monitored consisted of 10 patients after myocardial infarction of the age of (63 ± 6.3) years and ejection fraction (43 ± 12.3) %. In the course of rehabilitation the patients were subjected to 7-day ambulatory blood pressure monitoring. During the blood pressure recording their pharmacotherapy was not interrupted.

The analysis shows that the exercises do not change 24-hour blood pressure profiles immediately after the exercises. The positive effect of the exercises must be explained by other mechanisms than by means of blood pressure changes on the day following after the exercises.

K e y w o r d s

Circadian fluctuation of blood pressure, Physical activity, Seven-day ambulatory blood pressure monitoring

INTRODUCTION

Sedentary life and excessive body mass contribute to the risk of hypertension development (*1–8*). It has been demonstrated that physical exercises decrease the risk of hypertension development. In our department we carry out 7-day ambulatory monitoring of blood pressure (*9–12*). It enables us to monitor blood pressure changes induced by exercises in the course of the following 24 hours if we compare them with the values in subsequent next 24 hours. This approach takes fully into consideration circadian fluctuation of blood pressure.

The aim of the study was to compare 24-hour course of blood pressure immediately after the exercises with the values from the following day when the patient did no exercises.

METHODS

The set monitored consisted of 10 patients after myocardial infarction of the age of (63 ± 6.3) years and ejection fraction (43 ± 12.3) %.

The patients were subjected to phase II of cardiovascular rehabilitation (controlled ambulatory rehabilitation program) lasting two to three months with the frequency of three times a week at the Department of Functional Diagnostics and Rehabilitation of St. Anne's Faculty Hospital. The duration of the training unit was 60 min and it consisted of a warm-up phase (10 min), an aerobic phase (25 min), a toning phase (15 min), and a relaxation phase (10 min).

In the course of rehabilitation they underwent 7-day ambulatory monitoring of blood pressure. During TK recording they did not interrupt pharmacotherapy.

Seven-day monitoring of blood pressure was made by means of the instrument TM – 2421 of the Japanese firm AD operating on the principle of oscillometric analysis. The instrument measured blood pressure for 7 days repeatedly every 30 min from 5 to 22 o'clock and once an hour from 22 to 5 o'clock. If a value not much probable from the point of view of the instrument setting was recorded, another check measurement was made (*11*).

The results were processed using Halberg cosinor analysis. The data were smoothed by a sinusoidal curve. The mean value of the sinusoid, designated MESOR, and the amplitude of circadian fluctuation were determined. The measured TK values of each patient from the set monitored were statistically processed in the form of arithmetic means for every hour after the completion of exercises for the time of 48 hours. This enabled us to compare the means in individual hours after the exercises with the hour means obtained 24 hours later, i.e. on the day when the patient did no exercises. We calculated therefore for every patient differences in individual hours between the day immediately after the exercises and the subsequent day without exercises. Statistical significance was tested by the Wilcoxon test.

The study was accepted by the ethical committee and the patients signed their informed consent.

RESULTS

The result was a comparison of two 24-hour profiles of blood pressure, the first one beginning immediately after the exercises, the second one shifted by 24 hours. In the second case the patient did no exercises. Halberg cosinor analysis demonstrated that there are no differences in 24-hour MESOR and circadian amplitude between both profiles both in systolic and in diastolic blood pressures (*Figs. 1, 2*).

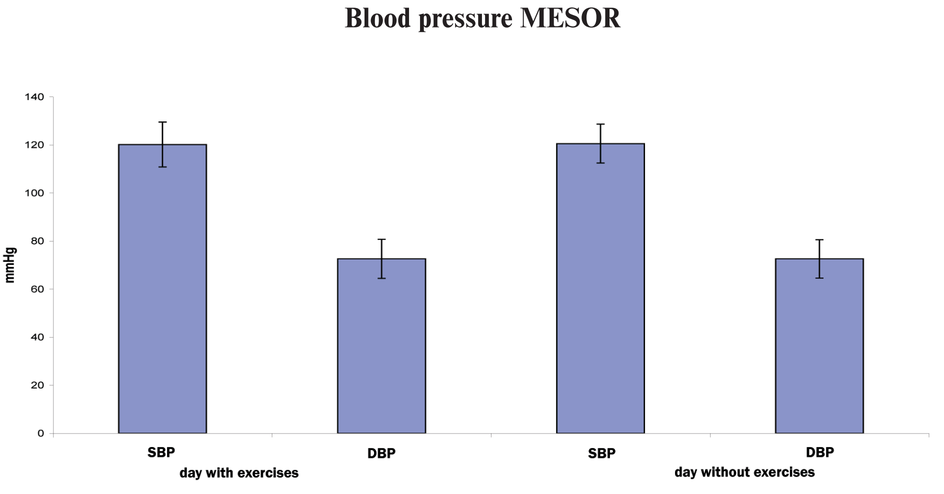

Fig. 1
MESOR of circadian fluctuation of systolic blood pressure and diastolic blood pressure on the day with exercises and on the day without exercises

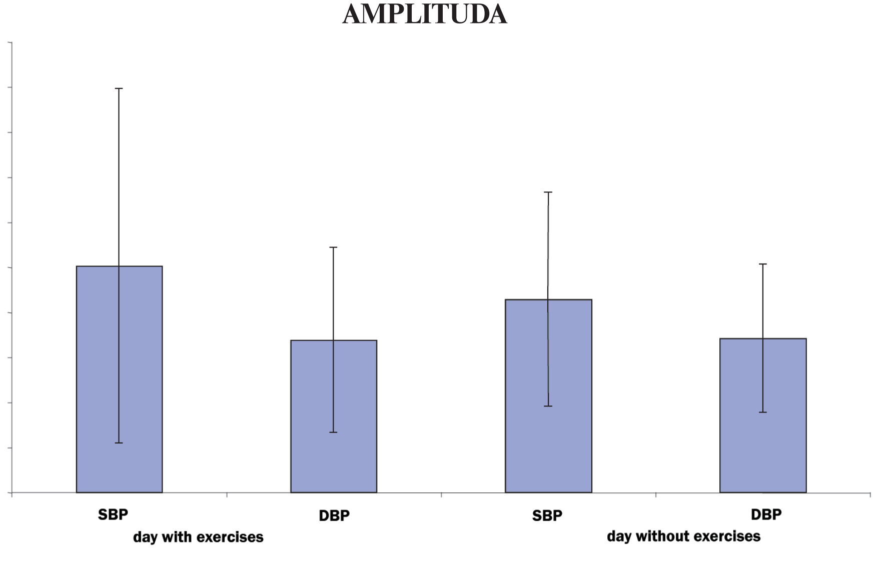

Fig. 2
Amplitude of circadian fluctuation of systolic blood pressure and diastolic blood pressure on the day with exercises and on the day without exercises

A comparison of hour differences indicated that only in the first hour after the exercises is systolic pressure lower than in the check course ($p<0.01$). Also, in the second hour after the exercises the value is lower; however, the difference is no longer statistically significant. In the other hours both profiles were not different (*Figs. 3, 4*). We have found no differences in diastolic pressure. The analysis of differences is in accordance with the finding of the same MESOR quantities and amplitudes.

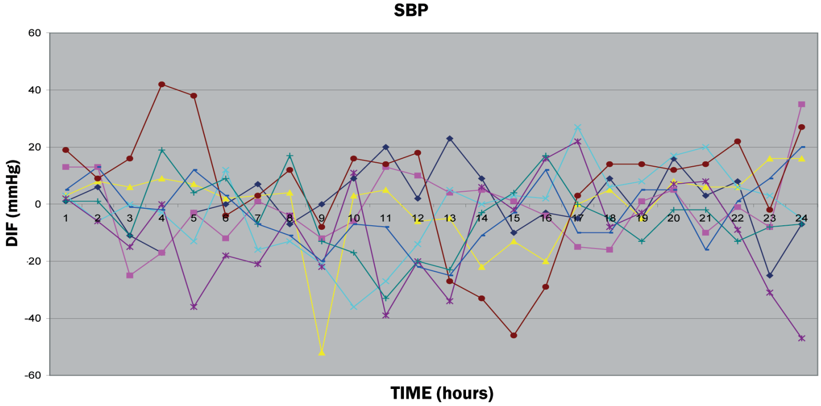

Fig. 3

Difference in systolic blood pressure between the day with exercises and the day without exercises in individual hours of the day

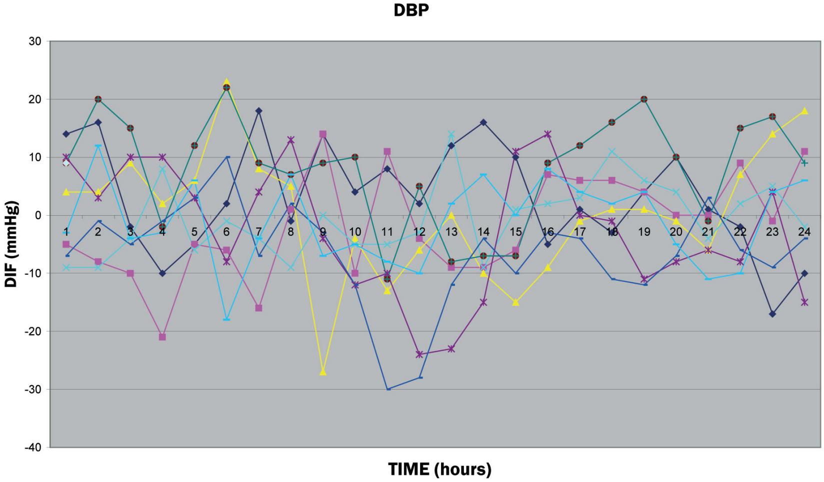

Fig. 4

Difference in diastolic blood pressure between the day with exercises and the day without exercises in individual hours of the day

The analysis shows that the exercises do not change profiles of 24-hour blood pressure immediately after the exercises. The positive effect of the exercises must be explained by other mechanisms than by means of blood pressure changes on the day following the exercises.

DISCUSSION

Meta-analysis of controlled studies demonstrated convincingly that aerobic exercises decrease systolic and diastolic blood pressure (13). We have shown that the exercises themselves do not decrease blood pressure in the subsequent hours. Other mechanisms must be therefore taken into consideration. The information found in the literature indicates that one of the possible explanations can be related to the decrease of body mass. A number of published data and a logical explanation exist. Adipose tissue produces leptin that increases sympathetic activity and thus blood pressure.

It seems, however, that physical activity is also positive when body mass is not decreased. One of the possible explanations can be affection of psychological stress. Psychological stress increases blood pressure even in young people (14). Physical activity and feeling of a better fitness in patients with cardiovascular diseases reduces their fear of further progression of the disease and stress connected with it, and exercising can therefore be beneficial even due to this mechanism.

Acknowledgement

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