

BLOOD PRESSURE RESPONSE TO EXERCISE TEST AND SERUM LIPIDS IN NORMOTENSIVE MEN WITH POSITIVE FAMILY HISTORY OF HYPERTENSION

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SUMMARY

The aim of the study was to follow the arterial blood pressure response to exercise test and serum lipids in middle-aged normotensive men with family history (FH) of arterial hypertension. 152 normotensive men, divided into two groups: I group – 92 men without FH for arterial hypertension and II group – 60 men with family history for arterial hypertension were investigated. The response of blood pressure to exercise test on bicycle ergometer with progressively increasing workload up to 100 W was followed up. Five minute recovery period was followed, too. The total cholesterol (TC), high-density and low-density lipoprotein cholesterol (HDL-C and LDL-C) and triglycerides were assessed and TC/HDL-C ratio was calculated. Significant difference in the arterial blood pressure at a level of 100 W between the I and II group was found: $177 \pm 19.0/89 \pm 12.0$ mmHg versus $189 \pm 17^{**}/96 \pm 11^{*}$ mmHg (* $p < 0.01$, ** $p < 0.001$). Subjects with positive FH for arterial hypertension showed higher elevation of arterial blood pressure during and after exercise: OR = 2.3 (95% CI 1.1 – 4.8). The systolic blood pressure during the recovery period and TC/HDL-C ratio were significantly higher with the II group. In conclusion, our data show significantly higher reaction of blood pressure to exercise, retarded recovery of blood pressure and significantly higher TC/HDL-C ratio with the individuals with positive FH for arterial hypertension.

Key words: hypertension, family history, exercise test, blood pressure response, serum lipids

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INTRODUCTION

The arterial hypertension (AH) is recognized as a key risk factor for cardiovascular disease mortality and morbidity. The development of hypertension is preceded by a prehypertensive state that may be manifested by abnormal blood pressure to environmental and behavioral challenges. Dosed physical provocation can be a valuable method for prognosis of arterial hypertension years before its establishment (1, 2, 3, 4).

The arterial hypertension is a multifactorial disease with a definite role of genetic predisposition in its etiopathogenesis. Several studies (5, 6, 7) show exaggerated blood pressure response to exercise tests in subjects with presence of family history (FH) for arterial hypertension, but the association between the FH for arterial hypertension and blood pressure reactivity has not yet been well studied. There are no data on blood pressure post-exercise response in subjects with FH for arterial hypertension, valuable prognostic parameter for both development of AH (8, 9, 10) and myocardial infarction in middle-aged men (11). The unfavorable changes in the serum lipids as cardiovascular disease risk factor are well defined and higher levels of total cholesterol (TC), low-density lipoprotein cholesterol and TC/high density lipoprotein cholesterol (HDL-C) are characteristic for hypertensives (12, 13).

The aim of the study was to follow the arterial blood pressure response to exercise test and serum lipids in normotensive middle-aged men with FH for arterial hypertension.

SUBJECTS AND METHODS

Hundred and fifty two normotensive men, after measurement of arterial blood pressure two times in triplicates during a period of a month after 5 min of rest in sitting position, were investigated. The measurements were carried with mercury sphygmomanometers. The studied subjects were considered as normotensive when all the blood pressure measurements were $<140/90$ mmHg (14) and there was no preliminary physicians' diagnosis. The studied subjects were divided into two groups as follows: group I – 92 men, aged 39 ± 11.6 years without FH for arterial hypertension and group II – 60 men, aged 43 ± 11.1 years with FH for arterial hypertension. Positive FH for arterial hypertension was defined as at least one parent's having hypertension documented in their medical records of antihypertensive treatment or by direct measurement of parents blood pressure. Negative FH of arterial hypertension was defined as both parents being normotensive. All the investigated subjects have signed informed consent.

A graded exercise test was performed on bicycle ergometer. The workload, beginning at a level of 50 W, was increased in steps of 25 W every 2 minutes up to 100 W. The systolic and diastolic blood pressure were recorded noninvasively with automated blood pressure monitor before and 2 minutes after reaching 100 W. The recovery phase was followed up to the 5th minute, too.

Weight and height of the studied subjects were recorded and body mass index (BMI) was calculated.

Table 1. Age, BMI and blood pressure in normotensive men with positive and negative FH for arterial hypertension (AH)

Indices/ Groups	FH for AH	Age (years)	BMI (kg/m ²)	SBP (mmHg)	DBP (mmHg)
Ist group (n=92)	- (negative)	39 ± 11.6	25.5 ± 3.1	122 ± 9.0	79 ± 8.0
IInd group (n=60)	+ (positive)	43 ± 11.1	25.4 ± 3.1	124 ± 10.0	81 ± 9.0

During the primary screening blood for analysis of serum lipids was obtained after an overnight fast. Lipid profile included the following indices: TC, HDL-C, LDL-C, triglycerides and TC/HDL-C ratio. The cholesterol and triglycerides were assessed with enzymatic tests. The HDL-C was isolated with precipitation of LDL and VLDL and the cholesterol in the fraction was determined. The LDL-C was calculated with the formula of Friedewald in condition of triglyceride concentration <4.6 mmol/l. The ratio TC/HDL-C as an atherogenic index was calculated, too.

The statistical processing is performed by ANOVA of odds ratio and 95% CI of the reaction of arterial blood pressure to exercise in persons with FH for arterial hypertension in comparison to the individuals without FH for arterial hypertension were calculated.

RESULTS

The initial values of arterial blood pressure and BMI of both groups did not differ significantly (Table 1). At a level of 100 W the men with positive FH for arterial hypertension showed significantly higher values of systolic blood pressure (SBP) and diastolic blood pressure (DBP) in comparison to the persons with negative FH for arterial hypertension (Fig. 1) as follows: 189±17**/96±11* mmHg versus 177±19.0/89±12.0 mmHg (* p < 0.01, **p < 0.001). They showed 52.4% increase of SBP, while in the group with negative FH the elevation was 45 % [$\chi^2 = 5.6$ (p < 0.05)]. The risk from abnormally elevated reac-

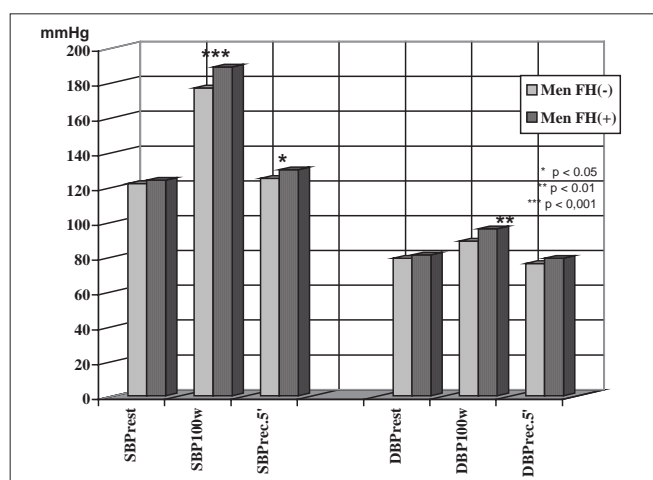
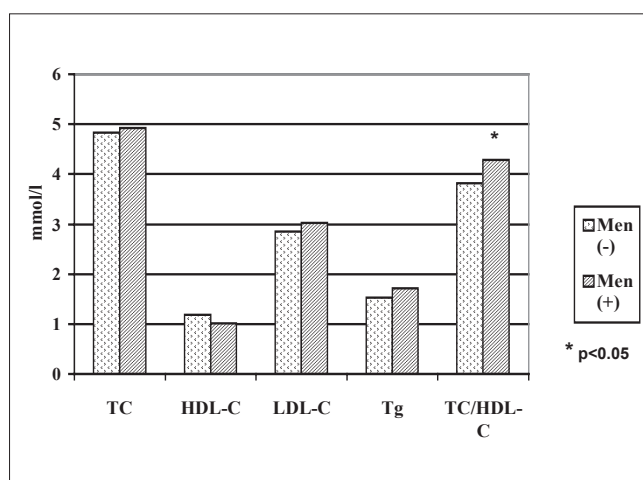
tion of blood pressure to exercise was greater with the subjects with positive FH for arterial hypertension [OR (95% CI) = 2.3 (1.1 – 4.8)].

At the 5th minute of the recovery period the SBP was significantly higher with the men with positive FH for arterial hypertension, while the difference in the DBP did not reach significance (130±13*/79±7.0 mmHg versus 125±11.0/76±8.0 mmHg, * p < 0.05).

Concerning the lipid indices no significant differences between the studied groups were found except for the TC/HDL-C ratio (Fig. 2), significantly higher in the men with positive FH for arterial hypertension. The interrelations between the studied lipid indices were well expressed.

DISCUSSION

Our data confirmed the findings of Bond et al. (5) and Rodriguez and Penneni (7) for higher reaction of blood pressure to exercise in normotensive men with positive FH for arterial hypertension. We found 52.4% increase of SBP in the studied normotensive men with positive FH, while in the group with negative family history the elevation was 45% [$\chi^2 = 5.6$ (p < 0.05)]. As a whole, the DBP showed lower response, but was also significantly higher in the studied men with FH for arterial hypertension in comparison to men with negative family history. The elevation from the initial values was 18.5% in the group with FH for arterial hypertension versus 12.6% in the other group [$\chi^2 = 5.1$ (p < 0.05)]. The atten-

**Fig. 1.** Blood pressure response to exercise test in normotensive men with positive and negative FH for arterial hypertension.**Fig. 2.** Serum lipid concentrations in normotensive men with positive and negative FH for arterial hypertension.

tion in most of the studies (8, 9) was focused on the SBP mainly because the physical exertion leads to an increase of cardiac output, where the rise in SBP is a natural consequence of dynamic exercise, while in contrast the DBP remains unchanged or shows only a slight increase. However, there are data (2, 5, 14) documenting significant rise in DBP in normotensive subjects, suggesting an increased resting peripheral vascular resistance and impaired capacity for exercise-induced vasodilation, consequently both the DBP and SBP are considered important criteria for development of arterial hypertension (4).

The differences in the recovery of SBP between the two groups were significant, in the subjects with positive FH for arterial hypertension the recovery of SPB was slowed down in comparison to the ones with negative FH. At the 5th minute of the recovery in both groups the DBP was lower, which is normal physiological reaction to physical load.

Besides the differences in the levels of serum lipids between the two groups did not reach significance, the TC/HDL-C ratio was significantly higher in the subjects with FH for arterial hypertension. The TC/HDL-C ratio is a widely used atherogenic index and can contribute to better risk assessment of arterial hypertension together with blood pressure response to exercise test.

CONCLUSION

Our data show significantly higher arterial blood pressure response in normotensive men with positive FH for arterial hypertension in comparison to the normotensives with negative FH for arterial hypertension. The odds ratio show higher chance for abnormally elevated blood pressure reaction to exercise in normotensive men with positive FH for arterial hypertension. The recovery of SBP in normotensive men with FH for arterial hypertension is significantly slower and the TC/HDL-C ratio significantly higher than in other normotensive men. The exercise test may unmask subtle pathophysiological features in the preclinical stage of hypertension and thus the data may provide additional information about traditional cardiovascular risk factors in apparently healthy persons.

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