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ПОВЫШЕНИЕ АРТЕРИАЛЬНОГО ДАВЛЕНИЯ В ОТВЕТ НА ФИЗИЧЕСКУЮ НАГРУЗКУ КАК ПРОГНОСТИЧЕСКИЙ ФАКТОР РАЗВИТИЯ АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИИ У БОДИБИЛДЕРОВ

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HIGH BLOOD PRESSURE RESPONSE TO EXERCISE AS A PREDICTOR OF FUTURE HYPERTENSION DEVELOPMENT IN YOUNG BODYBUILDERS

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Резюме. Данная статья посвящена изучению характера влияния интенсивной физической нагрузки на состояние сердечно-сосудистой системы и оценке значимости повышения артериального давления на пике физической нагрузки как прогностического фактора развития артериальной гипертензии у молодых спортсменов.

Ключевые слова: гипертензия, бодибилдер, артериальное давление, адаптация, физическая нагрузка.

Resume. This article is aimed to establish how intense physical activity affects the cardiovascular system and estimate a value of high blood pressure response to exercise as a predictor of future hypertension development in young bodybuilders.

Keywords: hypertension, bodybuilder, blood pressure, adaptation, exercise.

Introduction. Exercise testing is widely used in sportsmen to get information regarding cardiovascular adaptations to effort and to detect subclinical conditions such as arrhythmogenic diseases and coronary artery anomalies [1]. Assessment of blood pressure level during exercise is an integral part of the test and provides important haemodynamic data with relevant clinical value, such as hypotensive response in patients with obstructive hypertrophic cardiomyopathy or valvular heart diseases. Besides, high blood pressure level has been reported as a prognostic factor for incident hypertension or cardiovascular disease in the general population [2, 3]. Bodybuilders are capable of a superior exercise performance compared with sedentary subjects and the blood pressure achieved at maximal exercise has been reported to be higher compared with the general population [4, 5]. However, it is not clear whether an exaggerated blood pressure response to exercise in highly trained bodybuilders should be considered a simple adaptation to superior exercise performance, or may represent a mismatch of cardiac output and peripheral vascular resistance, and expression of subclinical impairment of vascular relaxation with potential adverse clinical implications. The present study is planned to evaluate the level of blood pressure in young bodybuilders as a predictor of hypertension development in future. This research is inspired by the previous study that was conducted at the Institute of Sports Medicine and Science in Rome. During a 4-year period 1937 athletes were evaluated. The mean age of participants was 26±6 years and 66% were male. As a result two groups of athletes were identified: a group of 141

normotensive athletes with high blood pressure response to exercise testing (>220 mmHg for peak systolic blood pressure and > 85 mmHg for peak diastolic blood pressure) and a control group consisting of 141 normotensive athletes with normal blood pressure response to exercise [6].

A meta-analysis by Shults et al., including 12 studies and >46000 subjects followed-up for 15 ± 4 years, reported that exaggerated blood pressure response at moderate exercise intensity was associated with a 36% increase in cardiovascular events and mortality, independently of age, gender, resting blood pressure, and cardiac risk factors [7, 8].

A recent study by Berger et al. on > 7000 normotensive subjects reported that over a follow-up period of 5 ± 3 years, almost 15% developed hypertension [9, 10].

Aim: due to superior exercise performance, bodybuilders show higher blood pressure at peak exercise compared to untrained individuals. However the prognostic significance of high blood pressure response to exercise has not yet been clarified in this population.

Objectives:

1. To establish how intense physical activity affects the cardiovascular system of bodybuilders (mainly blood pressure and heart rate) on the peak of exercise and after the rest.
2. To evaluate the results and clarify their prognostic significance for predicting the development of incident hypertension or cardiovascular disease in this group of sportsmen in future.

Methods and materials. The level of blood pressure and heart rate were measured in 45 sportsmen at peak exercise (after 50 squats) and 3 minutes later. The mean age of the overall group was 22 ± 6 years and all of them were male. All the participants answered the questions of a special questionnaire aimed to get anamnesis information. 30 normotensive bodybuilders with high blood pressure response to exercise were compared to 15 normotensive bodybuilders with normal blood pressure response to exercise. Blood pressure was measured in the sitting position on peak of exercise and after at least 3 minutes of rest. To measure the blood pressure in reliable and consistent fashion over the test, the patient was asked to put the left arm in an extended and relaxed position with the hand over the doctor's shoulder. Both systolic and diastolic blood pressures were manually measured at rest, during the peak exercise and recovery.

Results and discussion. As a standard for evaluation we took the following blood pressure values: high blood pressure response to exercise testing defined as >180 mmHg for peak systolic and/or > 85 mmHg for diastolic blood pressure. All the participants were divided into 2 groups: bodybuilders with high blood pressure response to physical exercise and bodybuilders with normal blood pressure response. There was no significant difference in terms of family history of hypertension or smoking habit between high blood pressure response and normal blood pressure response groups. Both resting and exercise blood pressure were higher in the high blood pressure response group – the mean level – $183/96$ mmHg, heart rate – 136 beats per minute (bpm) on the peak of exercise and $154/91$ mmHg, heart rate – 124 bpm while resting (table 1). An abnormal high systolic and diastolic blood pressure response to exercise can be an independent and significant predictor of incident hypertension [10].

Tabl. 1. Results of blood pressure measurements in high blood pressure response group of bodybuilders

(average values)

Parameters	High blood pressure response group
Max systolic blood pressure, mmHg	183
Max diastolic blood pressure, mmHg	96
Max heart rate, bpm	136
Resting systolic blood pressure, mmHg	154
Resting diastolic blood pressure, mmHg	91
Resting heart rate, bpm	124

In young normotensive bodybuilders the following results were got: 165/86 mmHg, heart rate – 110 bpm on the peak of exercise and 120/78 mmHg, heart rate 99 bpm after a 3-minutes rest (table 2).

Tabl. 2. Results of blood pressure measurements in normal blood pressure response group of bodybuilders (average values)

Parameters	Normal blood pressure response group
Max systolic blood pressure, mmHg	165
Max diastolic blood pressure, mmHg	86
Max heart rate, bpm	110
Resting systolic blood pressure, mmHg	120
Resting diastolic blood pressure, mmHg	78
Resting heart rate, bpm	99

Several mechanisms have been proposed to explain the excessive increase in blood pressure during exercise, including high sympathetic tone, decreased aortic distensibility, endothelial dysfunction, and increased activation of the renin-angiotensin-aldosterone system [9].

Conclusions:

1 While making a research all the participants were divided into two groups: bodybuilders with normal blood pressure response and high blood pressure response.

2 According to the data of previous studies we may suggest that an exaggerated blood pressure response to exercise increases the risk for incident hypertension in highly trained and normotensive athletes over a middle-term period.

3 The research should be continued in order to follow up all the participants for a long-term period (5 years at least) and check if any cardiac events occur in high blood pressure response group.

4 The overall cardiovascular risk profile should be assessed, and lifestyle modification advised including weight control, reduced intake of salt, supplements, alcohol, and anti-inflammatory drugs; these recommendations are frequently sufficient to achieve an optimal blood pressure control in athletes.

5 The identification of bodybuilders with high blood pressure response to exercise should not raise concerns in terms of sport participation. We believe it appropriate for these individuals to enter a periodical follow-up programme with controls every 1-2 years.

6 Additionally, the timely identification and correction of risk factors in the early phase of sport participation plays an important role in the context of the cardiovascular prevention.

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