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## **OUTCOMES OF ARTERIAL HYPERTENSION IN PATIENTS WITH DIFFERENT TYPES OF SYSTOLIC BLOOD PRESSURE ORTHOSTATIC REACTIONS**

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Peculiarities of currency and outcomes in arterial hypertension (AH) patients with hypotensive, isotensive and hypertensive orthostatic reactions (OR) of systolic arterial blood pressure (SBP) were studied in the follow up of 113 AH patients, age  $64,73 \pm 6,42$  years (44 males and 69 females). According to the SBP in orthostatic test patients were divided into 3 groups: group 1 – hypotensive OR, group 2 – isotensive OR and group 3 – hypertensive OR. AH grades and stages frequencies, HF functional class after 4 years of treatment, and the severity and frequency of adverse cardiovascular events and outcomes were identified. Data was processed by the variation statistics methods. It was found that the less severe currency of AH is seen in hypertensive type, more severe in hypotensive type, and the most severe in isotensive type of SBP orthostatic reactions. In general quantity of adverse events and outcomes is more frequently seen in isotensive type of SBP OR – 46 %, is less frequently seen in hypertensive type – 18 %. In AH patients it is necessary to pay special attention not only to the BP control, but also to the optimization of SBP orthostatic reactions.

**KEY WORDS:** systolic blood pressure, orthostatic reactions, arterial hypertension

## **НАСЛІДКИ АРТЕРІАЛЬНОЇ ГІПЕРТЕНЗІЇ У ПАЦІЄНТІВ З РІЗНИМИ ТИПАМИ ОРТОСТАТИЧНИХ РЕАКЦІЙ СИСТОЛІЧНОГО АРТЕРІАЛЬНОГО ТИСКУ**

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Вивчено особливості перебігу та наслідки артеріальної гіпертензії (АГ) у пацієнтів із гіпотензивними, ізотензивними і гіпертензивними ортостатичними реакціями (ОР) систолічного артеріального тиску (САТ) за результатами спостереження за 113 пацієнтами з АГ у віці  $64,73 \pm 6,42$  років (44 чоловіка і 69 жінок). По змінам САТ в ортостатичній пробі пацієнти поділені на 3 групи: група 1 - гіпотензивна ОР, група 2 - ізотензивна ОР і група 3 - гіпертензивна ОР. Визначали частоти ступеня та стадії АГ, функціонального класу СН через 4 роки від початку лікування, а також ступінь та частоту несприятливих серцево-судинних випадків. Дані оброблені методами варіаційної статистики. Встановлено, що більш сприятливий перебіг АГ спостерігається при гіпертензивних і менш сприятливий при гіпотензивних типах ортостатичних реакцій САТ, несприятливий - при ізотензивном. Загальна кількість несприятливих результатів переважає при ізотензивном типі ОР САТ – 46 %, найменша їхня кількість при гіпертензивних – 18 %. У пацієнтів з АГ необхідно приділяти увагу не тільки контролю артеріального тиску, а й оптимізації ортостатичних реакцій САТ.

**КЛЮЧОВІ СЛОВА:** систолічний артеріальний тиск, ортостатичні реакції, артеріальна гіпертензія

## **ИСХОДЫ АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИИ У ПАЦИЕНТОВ С РАЗНЫМИ ТИПАМИ ОРТОСТАТИЧЕСКИХ РЕАКЦИЙ СИСТОЛИЧЕСКОГО АРТЕРИАЛЬНОГО ДАВЛЕНИЯ**

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Изучены особенности течения и исходы артериальной гипертензии (АГ) у пациентов с гипотензивными, изотензивными и гипертензивными ортостатическими реакциями (ОР) систолического артериального давления (САД) по результатам наблюдения за 113 пациентами с АГ в возрасте  $64,73 \pm 6,42$  лет (44 мужчины и 69 женщин). По изменениям САД в ортостатической пробе пациенты разделены на 3 группы: группа 1 – гипотензивная ОР, группа 2 - изотензивная ОР и группа 3 – гипертензивная ОР. Определяли частоту степени и стадии АГ, функционального класса СН спустя 4 года от начала лечения, а также степень и частоту неблагоприятных сердечно-сосудистых исходов. Данные обработаны методами вариационной статистики. Установлено, что более благоприятное

течение АГ наблюдается при гипертензивном и менее благоприятное при гипотензивном типах ортостатических реакций САД, неблагоприятное - при изотензивном. Общее число неблагоприятных исходов преобладает при изотензивном типе ОР САД – 46 %, наименьшее их количество при гипертензивном – 18 %. У пациентов с АГ необходимо уделять внимание не только контролю АД, но и оптимизации ортостатических реакций САД.

**КЛЮЧЕВЫЕ СЛОВА:** систолическое артериальное давление, ортостатические реакции, артериальная гипертензия

## INTRODUCTION

The problem of systolic blood pressure (SBP) orthostatic reactions (OR) clinical significance in patients with arterial hypertension (AH) is not thoroughly studied.

There are three main types of SBP OR (increase, no changes, decrease) [1, 2, 3, 4, 5], but the literature is mainly focused on hypotensive SBP OR, which is considered to be a cardiovascular mortality predictor [2, 3, 6].

Mentioned just above prompted us to perform the following study.

Study was performed as part of scientific-research work «Studies of nonlinear dynamic effects in autonomic regulation of cardiac biomechanics» № state registration 0103U004222 MoH of Ukraine.

## OBJECTIVE

The aim of research - to study the peculiarities of AH course in patients with different types of SBP OR.

## MATERIALS AND METHODS

A retrospective cohort study with 133 AH patients (age  $64,73 \pm 6,42$  years, 44 males, 69 females) was done at polyclinics #6 of Moscow rayon of Kharkov. Average duration of disease was  $13,9 \pm 6, 2$  years. Study excluded patients with myocardial infarction, acute stroke, heart failure IV functional class (fc), obesity degree III-IV, secondary hypertension.

Degree and stage of AH, heart failure (HF) functional class, were evaluated before the study and after 4 years of follow up. Also such outcomes as death, stroke, acute myocardial infarction were assessed by the end of the study.

Blood pressure was measured with Korotkov's method, tonometer Microlife BP AG1-20 in clinostasis after 5 minutes rest and in 3 minutes after entering orthostasis in the morning, fasting. Coffee, alcohol, medications

were limited for 24 hours, and physical activity for 30 minutes before the test.

Patients follow up started in 2004, all were given standard recommendations for lifestyle modification and diet, motivated for long-term use of drugs according to Ukrainian Society of Cardiologists recommendations [7]. Patients received  $\beta$ -blockers, angiotensin converting enzyme (ACE) inhibitors, calcium antagonists (CA). When insufficient BP control a diuretic (hydrochlorothiazide) was added. Patients voluntarily stopped taking medications were excluded from the study.

Prior to treatment, all patients were divided into 3 groups according to SBP OR. Group 1, hypotensive SBP OR (SBP decrease for more than 5 mmHg) included 20 patients (15 % of sample). Group 2, isotensive SBP OR (SBP changes ranged -5/+5 mmHg), included 31 patient (23 % of sample). Group 3, hypertensive SBP OR (SBP increase for more than 5 mmHg), included 82 patients (62 % of sample).

Frequencies of AH stages and degrees, HF functional classes were assessed in these groups during the study. Frequencies of cardiovascular outcomes were evaluated at the end of the study.

For the statistical evaluation of the results - parametric criteria were used (mean -M, standard deviation -sd). The significance of differences between groups was determined with Pearson criteria, calculations done using SPSS 10.0 for Windows.

## RESULTS AND DISCUSSION

Table shows the ratio of basic clinical syndromes in AH patients with hypo-, iso- and hypertensive SBP OR types before and 4 after therapy start. Patients' redistribution towards disease progression was observed in all types of SBP OR. More intensive AH progression was seen in patients with isotensive SBP OR type. E.g., the frequency of severe AH in hypertensive type of SBP OR increased by 12 %, in hypotensive by 16 %, while in

isotensive type it increased by 23 %. The frequency of AH stage III in hypertensive SBP OR increased by 4 %, in hypotensive type by

10% and in isotensive by 13 %. HF II and III functional class frequency increase appeared at the same level in all three types of SBP OR.

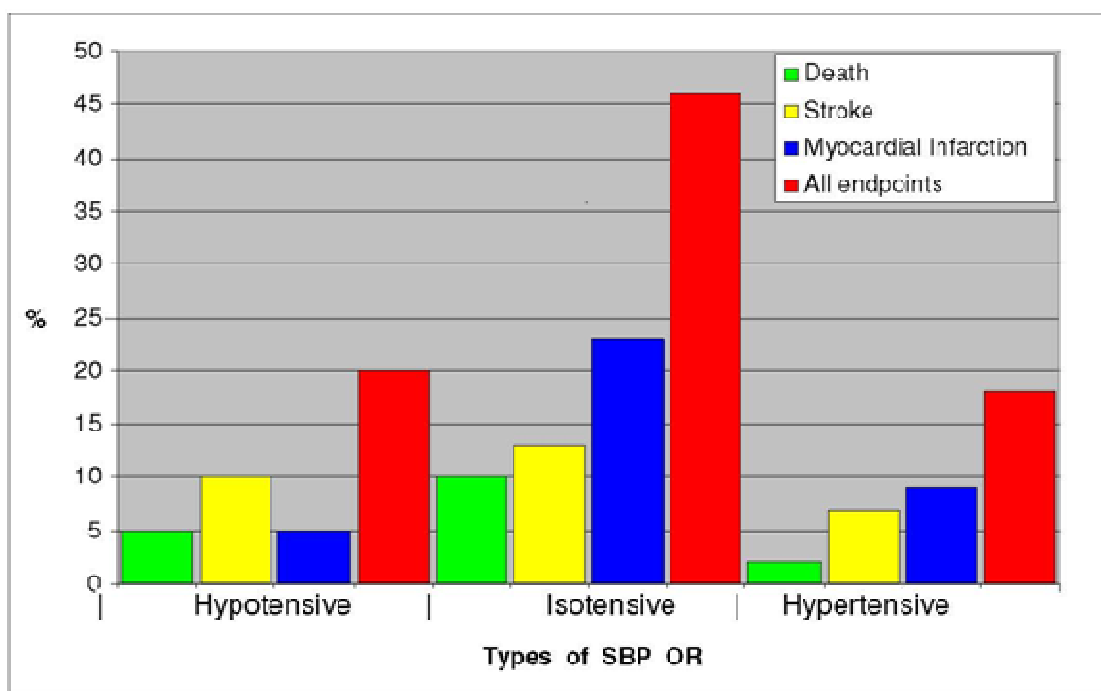
Table

**Frequency of major clinical syndromes in AH patients with different types of SBP OR before and in 4 years after the treatment start (n, %)**

Index		Type of SBP OR					
		Hypotensive		Isotensive		Hypertensive	
		2004	2008	2004	2008	2004	2008
degree	Mild AH	2 (10)	1 (5)	19 (59)	7 (22)	57 (67)	30 (36)
	Moder AH	15 (71)	12 (60)	8 (25)	12 (39)	13 (15)	28 (34)
	Severe AH	4 (19)	7 (35)	5 (16)	12 (39)	15 (18)	24 (30)
stage	I	1 (5)	0	2 (7)	1 (4)	2 (3)	0
	II	18 (85)	16 (80)	27 (84)	23 (74)	76 (89)	72 (88)
	III	2 (10)	4 (20)	3 (9)	7 (22)	7 (8)	10 (12)
HF	I FC	8 (38)	4 (20)	6 (19)	3 (10)	22 (26)	15 (18)
	II FC	12 (57)	9 (45)	17 (53)	19 (61)	43 (51)	48 (58)
	III FC	1 (5)	4 (20)	3 (9)	6 (19)	6 (7)	14 (17)

Figure shows the frequency of cardiovascular endpoints in AH patients with hypo-, iso- and hypertensive types of SBP OR in 4 years after treatment start. The total number of adverse outcomes prevails at isotensive SBP OR type. In hypertensive SBP OR type it – 18 %, in hypotensive – 20 % and in isotensive – 46 %. Of those, the death rate in the hypertensive SBP OR type was lower if compared with hypo- and isotensive SBP OR

types (2 %, 5 % and 10 % respectively). Myocardial Infarction frequency in hypertensive SBP OR type was also lower than in isotensive SBP OR type (9 % and 23 % respectively) but was also higher than in hypotensive type (5 %). As for the stroke, its frequency in hypertensive SBP OR type was 3 % lower than that for hypotensive SBP OR type and 6 % lower than in isotensive SBP OR type.



**Fig. Frequency of adverse outcomes in AH patients with different types of SBP OR in 4 years after treatment start**

In the issue of AH current with regards of SBP OR the attention is paid mainly to hypotensive SBP OR type [6, 8, 9, 10], whereas hypertensive and isotensive SBP OR types are almost not studied, while from physiological response to orthostasis point of view mentioned reactions can be also meaningful [11, 12]. As suggested by [9], hypertensive SBP OR type in elderly AH patients is a risk factor of «silent» strokes.

Obtained data demonstrates that SBP OR has an important role in AH long currency and outcomes. More severe currency and higher likelihood of adverse outcomes were observed in patients with isotensive SBP OR type when compared to hypo- and hypertensive SBP OR types.

Therefore, in AH patients, it is reasonable to pay attention not only to BP control, but also to take into account the SBP ORs.

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## CONCLUSIONS

1. SBP OR type is important in AH clinical course and outcomes.
2. More favorable course and outcomes of AH are seen in hypertensive, less favorable in hypotensive, and adverse in isotensive SBP OR type.
3. AH patients' management should control not only the BP figures, but also SBP OR type.

## PROSPECTS FOR FUTURE STUDIES

AH course and outcomes study in patients with different diastolic blood pressure (DBP) OR types can be reasonable.