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THE PROPORTION OF PATIENTS WITH HYPERTENSION IN THE GROUPS OF TERMS PROLONGED QTc INTERVALS PER DAY DATA OF AMBULATORY ECG MONITORING IN DEPENDENCE FROM CLINICAL SIGNS

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The study of the proportion of patients in 82 patients with hypertension in groups of different periods of prolonged QTc per day was performed based on the data of the AM of the ECG, depending on the clinical signs. Depending on the duration of prolonged QTc per day, the patients were assigned to one of three groups: group 1 – the term extended by day of the interval QTc from 0 to 33.3 %, group 2 – from 33.4 to 66.6 %, group 3 – from 66.6 to 100 %. The proportion of patients with hypertension was determined in the groups of the prolonged QTc interval depending on age, sex, weight of patients, type of circadian heart rate index, stage, degree and prescription of EH, presence of coronary heart disease, FC and stage of CHF and diabetes mellitus. According to the AM ECG, an prolonged QTc interval occurs in each patient with hypertension, with an increase of 0 to 33.3 % per day, it is detected in 76 %, from 33.4 to 66.6 % – in 16 % and with 66.7 to 100 % – in 8 % of patients. The existence of a prolonged QTc interval in each patient indicates that in its analysis it is necessary to base on the data of the AM of the ECG taking into account, except for the elongation and lengthening for a day.

KEY WORDS: hypertension, prolonged QTc interval, outpatient monitoring of ECG, types of daily blood pressure profile

ПИТОМА ВАГА ПАЦІЄНТІВ ІЗ АРТЕРІАЛЬНОЮ ГІПЕРТЕНЗІЄЮ В ГРУПАХ ТЕРМІНУ ПОДОВЖЕНОГО ЗА ДОБУ ІНТЕРВАЛУ QTc ЗА ДАНИМИ АМБУЛАТОРНОГО МОНІТОРУВАННЯ ЕКГ В ЗАЛЕЖНОСТІ ВІД КЛІНІЧНИХ ОЗНАК

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Проведено вивчення питомої ваги у 82 пацієнтів з АГ в групах різного терміну подовженого за добу інтервалу QTc за даними АМ ЕКГ в залежності від клінічних ознак. В залежності від терміну подовженого QTc за добу пацієнтів відносили до однієї з трьох груп: група 1 – термін подовженого за добу інтервалу QTc від 0 до 33,3 %, група 2 – від 33,4 до 66,6 %, група 3 – від 66,6 до 100 %. Визначалася питома вага пацієнтів з АГ в групах терміну подовженого інтервалу QTc в залежності від віку, статі, ваги пацієнтів, типу циркадного індексу ЧСС, стадії, ступеню та давності ГХ, наявності ішемічної хвороби серця, ФК і стадії ХСН та цукрового діабету. За даними АМ ЕКГ подовжений інтервал QTc має місце у кожного пацієнта з АГ, при цьому з рівнем підвищення від 0 до 33,3 % від доби він виявляється у 76 %, з 33,4 до 66,6 % – у 16% і з 66,7 до 100 % – у 8 % пацієнтів. Існування подовженого інтервалу QTc у кожного пацієнта свідчить, що в його аналізі необхідно ґрунтуватися на даних АМ ЕКГ з урахуванням, окрім самого подовження, його терміну за добу.

КЛЮЧОВІ СЛОВА: артеріальна гіпертензія, подовжений інтервалу QTc, амбулаторне моніторування ЕКГ, типи добового профілю артеріального тиск

УДЕЛЬНЫЙ ВЕС ПАЦИЕНТОВ С АРТЕРИАЛЬНОЙ ГИПЕРТЕНЗИЕЙ В ГРУППАХ УДЛИНЕННОГО ЗА СУТКИ ИНТЕРВАЛА QTc ПО ДАННЫМ АМБУЛАТОРНОГО МОНИТОРИРОВАНИЯ ЭКГ В ЗАВИСИМОСТИ ОТ КЛИНИЧЕСКИХ ПРИЗНАКОВ

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Проведено изучение удельного веса у 82 пациентов с АГ в группах разного срока удлиненого за сутки интервала QTc по данным АМ ЭКГ в зависимости от клинических признаков. В зависимости от

срока удлиненного QTc за сутки пациентов относили к одной из трех групп: группа 1 – срок удлиненного за сутки интервала QTc от 0 до 33,3 %, группа 2 – от 33,4 до 66,6 %, группа 3 – от 66,6 до 100 %. Определялся удельный вес пациентов с АГ в группах удлиненного интервала QTc в зависимости от возраста, пола, веса пациентов, типа циркадного индекса ЧСС, стадии, степени и давности АГ, наличии ишемической болезни сердца, ФК и стадии ХСН и сахарного диабета. По данным АМ ЭКГ удлиненный интервал QTc имеет место у каждого пациента с АГ, при этом с уровнем повышения от 0 до 33,3 % за суток он выявляется в 76 %, с 33,4 до 66,6 % – в 16 % и с 66,7 до 100 % – у 8 % пациентов. Существование удлиненного интервала QTc у каждого пациента свидетельствует о том, что в его анализе необходимо основываться на данных АМ ЭКГ с учетом, кроме самого удлинения и на его срок удлинения за сутки.

КЛЮЧЕВЫЕ СЛОВА: артериальная гипертензия, удлиненный интервал QTc, амбулаторное мониторирование ЭКГ, типы суточного профиля артериального давления

INTRODUCTION

Hypertension significantly increases the risk of cardiovascular complications and premature death [1–2]. Attention is drawn to the estimation of daily fluctuations of the interval QTc, since even with its short-term growth, the duration of the «vulnerable» period of the cardiac cycle and the propensity to develop paroxysms «pirouette-tachycardia» [3] may increase. A study on АМ EKG of the electrophysiological phenomenon of the prolonged interval QTc, as an independent predictor of fatal rhythm disturbances leading to premature death [4–7], allowed not only to determine the minimum, average and maximum QTc interval, but also to establish the length of the interval QTc per day [8].

At the same time, no studies have yet been conducted to study the effects of different levels of prolonged QTc in АМ of ECG in patients with hypertension due to its clinical features.

OBJECTIVE

The aim of the work is to study the proportion of patients with hypertension in groups of varying duration of QTc prolonged per day according to the АМ of the ECG, depending on the clinical signs.

The study was conducted as a part of research work «Pharmacological and interventional approaches to the treatment of patients with heart rate disorders and arterial hypertension», state registration 0116U000973.

MATERIALS AND METHODS

82 patients were examined in the outpatient clinic No. 24 in Kharkiv (28 male and 54 female, age 33–76 years old, with duration of EH from first identified till 30 years lasting.

The main group of patients with hypertension consisted of patients with stage II

– 72 %, with stage I – 15 %, with the third – 13 %. The mild degree of hypertension occurred in 51 % of patients, moderate – 29 %, severe – at 20 %. Of the total number of registered patients with hypertension, the proportion of coronary heart disease (CHD) was 73 %, of which: diffuse cardiosclerosis (DC) – 52 %, stable angina pectoris – 18 %, focal cardiosclerosis – 2 %. Patients with EH without coronary artery disease – 27 %. The second functional class of CHF (FC CHF) is registered in 40 %, I – in 28 %, III – in 5 %. Chronic heart failure (CHF) stage I is registered in 43 %, and IIIA – at 30 %.

The study did not include people with acute cardiovascular disease, with stable angina pectoris IV FC, CHF IIB – III stages and IV FC CHF, thyroid diseases, with chronic diseases in the stage of exacerbation.

The QT interval (QTc) was corrected using the Bazzet formula [9–10] with the use of the combined Holter ECG monitor ECG and BP - «Cardio Sens AT». Calculation of indicators was carried out with the help of the program «Cardio Sens».

Depending on the duration of prolonged QTc per day, the patients were assigned to one of three groups: group 1 – the term extended by day of the interval QTc from 0 to 33.3 %, group 2 – from 33.4 to 66.6 %, group 3 – from 66.6 to 100 %.

The proportion of patients with hypertension in the groups of the prolonged QTc interval depending on age, sex, weight of patients, type of circadian heart rate index, stage, degree and prescription of hypertension, presence of ischemic heart disease, FC and stage of CHF and diabetes mellitus were determined.

To determine the frequency of occurrence of clinical signs of hypertension, depending on the proportion of prolonged QTc, the frequency relation (P) and its error (p %) were estimated.

The calculations were performed on a personal computer using program «Microsoft Office Excel 2010».

RESULTS AND DISCUSSION

The results of the study of the proportion of patients with hypertension in the groups of the prolonged QTc interval per day at the AM of the ECG as a whole and depending on age, sex,

body mass index and circadian heart rate index are presented in Table 1. According to all the clinical signs, the group 1 was the largest, which accounted for 76 % of all patients. With an increase in the number of patients, the proportion of patients progressively decreased, making up for the group 2 – 16 % and for the group 3–8 %.

Table 1

The proportion of patients with hypertension in QTc-prolonged group (P (%), p %) for the outpatient monitoring of the ECG as a whole and depending on age and sex, body mass index and circadian heart rate index

Clinical manifestation	Graduation of clinical features	The proportion of patients in QTc-prolonged groups (P (%), p %)					
		Group 1 0–33,3, N = 62		Group 2 33,4–66,6, N = 13		Group 3 66,7–100, N = 7	
		P	p %	P	p %	P	p %
Age, years	Adulthood	45	5,5	31	13,3	43	20,2
	Old age	55	5,5	69	13,3	57	20,2
Gender	Female	60	5,5	77	12,2	100	0,0
	Male	40	5,5	23	12,2	0	0,0
BMI, kg/m ²	Normalweight	13	3,7	0	0,0	14	14,3
	Overweight	34	5,3	38	14,0	14	14,3
	Obesity I	29	5,0	46	14,4	43	20,2
	Obesity II	18	4,2	15	10,4	14	14,3
	Obesity III	6	2,7	0	0,0	14	14,3
Circadian index	Normal	56	5,5	8	7,7	57	20,2
	Low	39	5,4	85	10,4	43	20,2
	High	5	2,4	8	7,7	0	0,0

Note: N – number of surveys; P – specific gravity; QTc – corrected QT.

In the study of age-related features, group 1 is the largest. The proportion of elderly patients is highest in all three groups.

Group 1 was the highest among both male and female patients, but an increase in the proportion of patients with prolonged QTc occurred only among female patients. The work in which the proportion of prolonged QTc was studied based on the data of outpatient ECG monitoring, we were not found in domestic or foreign literature, but our results are mediated but confirm the facts of prolongation of the interval QTc among the female [4].

In the BMI analysis, group 1 was also the largest. The proportion of patients with overweight and obesity grade I was significantly superior to group 1 and group 2.

As the number of the group increased, the proportion of patients with obesity I and III degrees corresponded to the literature [11–13].

In the study of the circadian heart rate index, group 1 was the largest. On the background of an increase in the serial number of the group there was a progressive increase in the proportion of patients with normal and reduced circadian heart rate index.

The proportion of patients with hypertension in prolonged QTc groups depending on the stage and degree of EH and the age of the disease are presented in Table 2.

In analyzing the stages and degrees of EH, group 1 was the largest. On the background of a decrease in the proportion of patients with stage I and mild to moderate degree of EH in groups

2 and 3, there was a progressive increase in the proportion of patients with stage II and severe EH in the same groups.

With the increase in the number of the group in the background of a gradual decrease in the proportion of patients with a history of the disease from 1 to 5 years and the unchanged

level of patients with a disease aged 6 to 10 years, there was a progressive increase in the proportion of the disease more than 10 years.

The proportion of patients with hypertension with AM ECG depending on the CHD, the stages of CHF and FC CHF, the presence of diabetes mellitus are presented in Table 3.

Table 2

The proportion of patients with hypertension in QTc-prolonged group (P (%), p %) for the outpatient monitoring of the ECG depending on the stage and degree of hypertension, the prescription of the disease

Clinical manifestation	Graduation of clinical features	The proportion of patients in QTc-prolonged groups (P (%), p %)					
		Group 1 0–33,3, N = 62		Group 2 33,4–66,6, N = 13		Group 3 66,7–100, N = 7	
		P	p %	P	p %	P	p %
Stages of EH	I	18	4,2	8	7,7	0	0,0
	II	68	5,2	85	10,4	86	14,3
	III	15	3,9	8	7,7	14	14,3
Degrees of EH	Mild	55	5,5	46	14,4	29	18,4
	Moderate	27	5,0	46	14,4	14	14,3
	Severe	18	4,2	8	7,7	57	20,2
Duration, years	For the first time	9	3,3	8	7,7	0	0,0
	1–5	37	5,4	46	14,4	29	18,4
	6–10	29	5,0	23	12,2	29	18,4
	> 10	24	4,8	23	12,2	43	20,2

Note: N - number of surveys; P- specific gravity; QTc – corrected QT.

Table 3

The proportion of patients with hypertension in QTc-prolonged group (P (%), p %) for the outpatient monitoring of the ECG depending on CHD, CHF and FC CHF, and the presence of diabetes mellitus

Clinical manifestation	Graduation of clinical features	The proportion of patients in QTc-prolonged groups (P (%), p %)						
		Group 1 0–33,3, n = 62		Group 2 33,4–66,6, n = 13		Group 3 66,7–100, n = 7		
		P	p %	P	p %	P	p %	
IHD	In total	71	5,0	77	12,2	86	14,3	
	Stable angina	19	4,4	15	10,4	14	14,3	
	Diffuse atherosclerosis	48	5,6	62	14,0	71	18,4	
	Focal atherosclerosis	3	2,0	0	0,0	0	0,0	
	Absence of IHD	29	5,0	23	12,2	14	14,3	
CHF	Total	71	5,0	77	12,2	86	14,3	
CHF	FC	I	24	4,8	38	14,0	43	20,2
		II	42	5,5	38	14,0	29	18,4
		III	5	2,4	0	0,0	14	14,3
	Stage	I	39	5,4	54	14,4	57	20,2
		II A	32	5,2	23	12,2	29	18,4
	Without CHF	29	5,0	23	12,2	14	14,3	
Diabetes mellitus	DM 2 type	13	3,7	15	10,4	14	14,3	
	Absence of DM	87	3,7	85	10,4	86	14,3	

Note: N – number of surveys; P – specific gravity; QTc – corrected QT.

In the analysis of the proportion of patients in groups of prolonged QTc, a decrease in the number of patients without coronary artery disease and an increase in CHD were observed in the group with an increase in the number of the group due to an increase in patients with DC in groups 2 and 3. In the study of the proportion of patients without CHF and its presence in the groups 2 and 3, there was a decrease in the proportion of patients without CHF and an increase in the proportion of CHF, due to FC I, III and, most of all, CHF stage I. This is most likely due to the small number of patients in group 3 [14–15].

The increase in the number of the group indicated an increase in the proportion of patients with diabetes and a decrease in the proportion of patients without diabetes.

The results are new. The fact that every patient with hypertension recorded long QTc interval requires in clinical practice, taking into account its effects on possible risks of emergency, it is mandatory to conduct AM of the ECG. In this case, it is important to take into account not only the elongation of the interval, but also the specific weight of its lengthening for a day.

The data obtained explain the increase in the risk of life-threatening arrhythmias in patients with hypertension and prolonged QTc intervals, even in cases where long-term QTc were not detected based on the results of a standard ECG [11].

CONCLUSIONS

1. According to the AM ECG, the prolonged QTc interval occurred in each patient with hypertension, with an increase from 0 to 33.3 % of the day it was 76 %, from 33.4 to 66.6 % -

16 % and from 66.7 % to 100 % – in 8 % of patients.

2. The term of the prolonged interval QTc from 0 to 33.3 % of the day was most commonly found in elderly, female, overweight, normal circadian index of heart rate, stage II and mild degree of hypertension, with the duration of EH from 1 to 5 years, in the presence of CHD and CHF and in patients without diabetes.

3. The term of the prolonged interval QTc from 33.4 to 66.6 % of the day was most commonly found in elderly, female, obese, I-grade, lowered circadian heart rate index, stage II, and mild to moderate hypertension, with a long history of the disease 1 to 5 years, in the presence of coronary heart disease, due to DC and CHF and in patients without diabetes.

4. The term of the prolonged interval QTc from 66.7 to 100 % of the day was most commonly found in elderly, female, obese, and normal, and lowered circadian heart rate index, stage II and severe EH, with a disease history of more than 10 years, in the presence of coronary heart disease, due to DC and CHF and in patients without diabetes.

5. The existence of the prolonged QTc interval in each patient indicates that in its analysis it is necessary to base itself on the data of the AM of the ECG taking into account, apart from the extension itself, its term for a day.

PROSPECTS FOR FUTURE STUDIES

The prospect of further research is the study of the effect of medical treatment of antihypertensive drugs for the prolonged QTc interval.

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