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# ARTERIAL HYPERTENSION AND ARRHYTHMIA

Khaydarova Zarrina Erkinovna
Khusainova Munira Alisherovna
Makhmudova Khanuza Davranovna
Samarkand State Medical University, Samarkand, Uzbekistan

**Abstract**
According to the Framingham study, predictors of atrial remodeling may be an increase in the maximum duration and dispersion of the P wave measured on a standard ECG.
Material and methods: A prospective case—control study included 41 patients (mean age 58.4 = 8.6 years). Retrospectively, according to the clinical and instrumental examination, stage I-II hypertension and the recurrent form of AF were verified. The control group consisted of 21 patients without hypertension and fp. Depending on the type of myocardial remodeling, 3 comparison groups were formed from patients with hypertension: the 1st group consisted of 18 patients with concentric LV remodeling (CLVR), the 2nd — 13 men and women with concentric LV hypertrophy (CLVH), the 3rd — 10 examined with eccentric LV hypertrophy (ELVH).
**Results and discussion:** At the same time, attacks of AF and ventricular tachycardia persisted, were accompanied by calls from ambulance crews and, in 32.1% of cases, hospitalizations. However, subsequently, the appointment and constant intake of these drugs (the second year) allowed to reduce the number of arrhythmic complications, and after 2 years, patients noted a decrease in arrhythmia attacks, their better tolerability.
Conclusions: In patients with arterial hypertension, long-term administration of β-blockers, angiotensin converting enzyme inhibitors, angiotensin receptor blockers and preductal reduces the risk of atrial fibrillation and ventricular arrhythmias.

**Keywords**: risk of arrhythmic complications, arterial hypertension.

## Introduction

Remodeling of the left ventricular myocardium (LV) in patients with arterial hypertension (AH) has been well studied. The main components of this process are hypertrophy and violation of the geometric characteristics of the ventricles, the development of their systolic and diastolic dysfunction are considered. In the clinic, this is associated with the occurrence of heart failure, deterioration in the quality of life of patients and the risk of sudden death. In the last decade, the emphasis has been on learning the remodeling of the heart has moved from the organ to the tissue, cellular and molecular level. It has been shown that the progression of hypertension is accompanied by structural as well as electromechanical restructuring not only of the ventricles, but also of the atria. According to the Framingham study, predictors of atrial remodeling may be an increase in the maximum duration and dispersion of the P wave measured on a standard ECG. There is anisotropy of the atrial myocardium and heterogeneity of atrial conduction. Conditions are created for the emergence of the re-entry mechanism and recurrence of atrial fibrillation (AF). LV hypertrophy (LVH) increases the risk of AF by 3-4 times. The results of studies of the

independent prognostic significance of QT interval prolongation, its dispersion in relation to ventricular arrhythmias such as torsade de pointes and ventricular fibrillation are presented. Despite the apparent study of the problem, the authors emphasize the multifactorial nature of the pathogenesis of arrhythmias and conclude that it is necessary to study the precursors of these processes depending on the ongoing
therapy. The literature data are not always unambiguous and, apparently, the issues of treatment and risk of arrhythmic complications in patients with hypertension need additional study. The aim of the study was to study the risk of arrhythmic complications depending on the cardiovascular drugs used in patients with hypertension.

**MATERIALS AND METHODS OF RESEARCH**

A prospective case—control study included 41 patients (mean age 58.4 ± 8.6 years). Retrospectively, according to the clinical and instrumental examination, stage I-II hypertension and the recurrent form of AF were verified. The control group consisted of 21 patients without hypertension and AF. Depending on the type of myocardial remodeling, 3 comparison groups were formed from patients with hypertension: the 1st group consisted of 18 patients with concentric LV remodeling (CRLH), the 2nd - 13 men and women with concentric LV hypertrophy (CLVH), the 3rd - 10 examined with eccentric hypertrophy LV (EHLV). Patients with permanent AF, heart defects, ischemic heart disease, thyrotoxicosis, diabetes mellitus, WPW syndrome, and cerebral vascular disorders were excluded from the study. AF attacks during the follow-up period (24 months) were recorded on an electrocardiogram when the ambulance team called at home (on average from 2 to 6 times a month). The duration of recurrent arrhythmias ranged from 2 to 12 hours. According to prescribed antiarrhythmic drugs of class III group of patients with hypertension in the initial and in a prospective study, they did not differ. To control blood pressure, patients were recommended to take beta blockers, angiotensin-converting enzyme inhibitors (ACE) and angiotensin receptor blockers (AR). Additionally, preductal was prescribed 20 mg 3 times a day for 30 days 2 times a year (in spring and autumn). The combined endpoint of the onset of arrhythmic complications in prospective follow-up was considered to be the calls of an ambulance team and registration on an electrocardiogram of paroxysms of AF, paired and group ventricular extrasystoles, tachyarrhythmias and ventricular tachycardia. In 67.9% of patients, AF attacks were stopped on an outpatient basis, 32.1% of patients needed hospitalization due to the inability to stop rhythm disturbances at home. Based on the criteria used in the work, patients with LVH were identified. In accordance with the recommendations of A. Ganau et al., the 2nd comparison group with LVH was formed from patients with LVH based on the criterion of myocardial walls (OTC greater than 0.45) and the 3rd group with EGLJ (FROM the walls of the myocardium less than 0.45). The indices of the atrial complex were studied: Pmax and Pmin — the maximum and minimum duration waves P (in milliseconds) measured in all responses with the visualized P wave; Pdis is the dispersion of the wave (in milliseconds) calculated by the formula: Pdis = Pmax - Pmin. The QT interval was calculated similarly: from the earliest point of the QRS complex [the junction of the isoelectric line of the P - Q(R) segment] to the tooth Q(R) to the latest point of the tooth T at the point of its transition to the isoelectric line T—P). The maximum (QTmax) and minimum (QTmin) values of the interval duration (in milliseconds) were found. The Q—T variance (QTdis) (in milliseconds) was calculated by The formula is: QTdis = QTmax - QTmin. The following indicators were determined: mean (M) and standard deviation (SD)]. Using

Wilcoxon's T-test of paired comparisons, the indicators in the initial and prospective (after 12 and 24 months) examinations were compared. The differences were considered statistically significant at $p < 0.05$. The analysis of the frequencies of the discrete parameters was carried out using the correlation tables, Pearson's $\chi^2$ and McNemar's $\chi^2$. The risk of arrhythmic complications in patients with different variants of myocardial remodeling was compared according to the odds ratio (OR).

**THE RESULTS AND THEIR DISCUSSION**

Patients initially and prospectively took medications, the characteristics of which are shown in the figure. As can be seen from the data presented in the figure, initially (the first year of follow-up) concor, enalapril and preduktal were regularly taken by a small number of patients (16.6, 12.8 and 33.3%). At the same time, attacks of AF and ventricular tachycardia persisted, were accompanied by calls from ambulance crews and, in 32.1% of cases, hospitalizations. However, in the future, the appointment and permanent admission of these drugs (the second year) allowed to reduce the number of arrhythmic complications, and after 2 years, patients noted a decrease in arrhythmia attacks, their better tolerability. At the same time, the analysis of the parameters of the P wave and the interval QT in the initial and prospective (after 12 months) studies revealed some features.

As follows from the data patients of groups 2 and 3 in prospective follow -up showed an increase in Pmax compared with the baseline by 7.2 and 8.7% ($p < 0.05$), and Pdis in groups 1, 2 and 3 — in 1,9, 1,3 and 1.6 times, respectively ($p < 0.01$). In addition to the parameters of the P wave, in groups 1 and 2, the QTdis values increased prospectively by 2.2 and 1.2 times, respectively ($p < 0.01$). As follows from the data, a significant decrease in the incidence of arrhythmic complications in the prospective (after 24 months) study compared with the baseline was noted: for Pmax — in groups 2 and 3, Pdis and QTdis - in groups 1 and 2 ($p < 0.05$). Currently active The role of ACE inhibitors, AR blockers, β-blockers and precursors in the treatment of arrhythmic complications in patients with hypertension is discussed, however, the data of different authors are not always unambiguous. Some authors note the effectiveness of cilazapril and preductal, others — only nebivolol and atenolol, others point to a combination of irbe- sartan and quinapril, others — valsartan and ramipril. It is known that myocardial remodeling in hypertension is accompanied by a change in its bioelectric activity. The authors note that Pmax and Pdis indicators can be used as non-invasive markers. LVH and LV diastolic dysfunction. The importance of these conditions in the development of disorders is indicated heart rhythm. On the one hand, there are a number of clinical studies proving the role of LVH in the development of ventricular arrhythmias and sudden death in patients with essential hypertension, on the other hand, the results of the Framingham study show that with an increase in LV wall thickness by 4 mm, the risk of AF increases by 28%. The authors note that normalization of blood pressure in a hypertensive crisis reduces the risk of AF, and ACE inhibitors not only improve the electromechanical properties of the myocardium, but also reduce the values of Rm, Pdis. The effectiveness of ACE inhibitors is associated with reverse electrical remodeling

of the atrial and ventricular myocardium, and a decrease in Pmax, Pdis, QTmax and QTdis values is associated with a decrease in the risk of arrhythmic complications. At the same time, the development of AF in patients with hypertension with the progression of electromechanical remodeling of the atria and ventricles correlates with an increase in the frequency of ventricular arrhythmias. Prognostically prolongation of the QT interval is considered unfavorable. With a QTmax of more than 450 ms, paroxysms of the same- ventricular tachycardia of the pirouette type

(torsade de pointes) may occur, in some cases transforming into fibrillation of the same- ventricles. The variance of the QT interval reflects local
differences in ventricular repolarization time. We believe that effective blood pressure control, the profile of electromechanical remodeling of the myocardium
not only of the ventricles, but also of the atria will reduce the risk of arrhythmic complications in patients with hypertension.

**CONCLUSIONS**

1. In patients with arterial hypertension, long-term administration of β-blockers, angiotensin converting enzyme inhibitors, angiotensin receptor blockers and preductal reduces the risk of atrial fibrillation and ventricular arrhythmias.
2. A low probability of arrhythmic complications in patients with arterial hypertension and with concentric remodeling of the left ventricle may be indicated by a decrease in the values of Pdis and QTdis to 26.8 and 24.5 ms, respectively, in patients with concentric hypertrophy of the left ventricle - 38.4 and 27.5 ms, with eccentric hypertrophy of the left ventricle - 24.8 and 41.6 ms.
3. More preventive action beta-blockers, angiotensin converting enzyme inhibitors, angiotensin receptor blockers and preductal are expressed in patients with concentric remodeling and concentric left ventricular hypertrophy, to a lesser extent in patients with eccentric left ventricular hypertrophy.

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