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ALGORITHM AND ULTRASONIC INDICATORS OF STANNING OF THE LEFT ATRIAL IN DIASTOLIC DYSFUNCTION OF THE LEFT VENTRICULAR

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Abstract:

The increase blood pressure leads to develop remodeling of the left ventricle (LV) including hypertrophic and dilatation processes, the change of geometry as well it affects to systolic and diastolic functions. Structural modifications of the LV is accompanied by overloading of the la also it's dilatation , what leads to the stunnig LA LA and is a factor predisposing to the development of arrhythmias such as ventricular extrasystoles (PVCs), atrial fibrillation (AF). On the other hand an irregular heartbeat to develop dilatation of the LA. However last investigations indicate that more accurate marker of the left atrium's structural remodeling is index volume of the (ILA).

Keywords: Remodeling of LV, stunning of left atrium, disturbance of heart rhythm, AF, VE, high arterial pressure

Arterial hypertension (AH) is one of the significant medical and social problem. By 2025, it is predicted that the number of hypertensive patients will increase by more than 1.5 times and will amount to 1.5 billion patients in the world [1, 12, 17, 18]. Changes in blood pressure, starting as a functional disorder, consistently lead to specific organ damage and, in the absence of timely and adequate therapy, to severe cardiovascular complications. Such as disability and premature mortality from the development of complications such as atrial fibrillation, thrombosis of the heart cavities, cerebrovascular accident, myocardial infarction, circulatory failure, etc. Heart changes that occur with arterial hypertension are the cause of the development of heart rhythm disturbances ventricular extrasystoles (PVC), tachycardia, atrial fibrillation (AF). Atrial dilatation plays an important role in the development of AF.

Structural changes in the atria such as "stunnedness" or stunning myocardium are of particular importance for the development of tachycardia, PVC, AF [5]. A natural consequence of arterial hypertension (AH) is the formation of left ventricular hypertrophy (LVH), which leads to an increase in left ventricular (LV) rigidity and worsening of its diastolic relaxation, which leads to LV diastolic dysfunction [3,6,9].

The preload value is of great importance in the diastolic function of the ventricles. The compliant ventricle is easily filled with blood, which contributes to adequate stretching and subsequent contraction of muscle fibers according to the Frank-Starling law. The "hard" ventricle is unable to receive the required volume of blood. In order to achieve stretching of the muscle fibers and provide the necessary preload, an increased filling pressure is required. As a result, the end-diastolic pressure (EDP) in the ventricle increases, which contributes to the preservation of the normal EDV and cardiac output for the time being [1,37]. The consequence of a violation of the extensibility of the ventricular myocardium is also a compensatory increase in atrial contractility, which intensively ejects at the end of the diastola the last volume of blood filling the ventricle, increasing the preload and maintaining the normal stroke volume (SV) and cardiac output. With atrial fibrillation, in the absence of a single atrial contraction, a significant decrease in preload, stroke volume and cardiac output occurs [4].

LV diastolic dysfunction contributes to the hemodynamic overload of the left atrium, its stretching, the manifestation of arrhythmic activity in the form of supraventricular rhythm disturbances - extrasystole, atrial fibrillation [14,29]. Back in 1964, a number of authors came to the conclusion that any increase in the size of the left atrium increases the likelihood of developing atrial fibrillation [30,36].

And in 1986 M.S. Kushakovsky described dilatation of the left atrium as a prerequisite for the inevitability of atrial fibrillation [10,11]. It is known that atrial myocardial dystrophy with their subsequent "primary" and "secondary" (retrograde) expansion create a substrate for sinus rhythm disturbances (SR). However, earlier, in 1949, E. Phillip and S. Levin reported on the possibility of developing paroxysms of tachycardia, atrial fibrillation (AF) in people who do not have any heart disease, except for the tachyarrhythmia itself. Diagnosis of disorders of diastolic function is based mainly on the use of instrumental methods [20.21,25,26,33,34]. Two approaches are used to assess diastolic function in a clinical setting: a) assessment of active and passive characteristics of relaxation; b) analysis of the structure of diastolic filling.

It is known that in hypertension, left ventricular (LV) remodeling develops, which includes the processes of hypertrophy and dilatation, changes in geometry and impairment of its systolic and diastolic functions [13,26].

Structural changes in the LV are accompanied by LA overload and its dilatation, which, in turn, is a factor predisposing to the development of rhythm disturbances. On the other hand, this rhythm disturbance itself causes LA dilation [15,17,22,28]. However, recent research data indicate that a more accurate marker of LA structural remodeling is the LA volume index (LPI) [7,8,21, 31].

The majority of patients with persistent AF after restoration of sinus rhythm experienced a phenomenon of temporary mechanical LA dysfunction, characterized by the authors as the phenomenon of "stunning" or "stunning" [24]. And in subsequent studies by other authors, the phenomenon of inhibition of the function of the LA and its ear was confirmed [16, 14, 19, 21]. The combined index is the ratio of the velocities of the peaks E and A of the transmitral blood flow [35]. In violation of the relaxation of the left ventricle, the decrease in pressure in it during diastole slows down, which in turn leads to a decrease in the early filling rate (peak E). As a result, there is an increase in the filling volume and the rate of contraction of the left atrium (peak A). In the mosaic lesion of the myocardium, there are areas without signs of mechanical activity, but with preserved basic physiological functions. Deviation from this ideal geometry dictates the need for early application of diagnostic methods for the "dormant", "stunned" left atrial myocardium [2].

Thus, the diagnosis of stanning LP of arterial hypertension with normal and latent diastolic dysfunction in the analysis of literature data, allows us to conclude that currently insufficiently studied.

THE AIM OF THE STUDY

Was to diagnose left atrial stunning in patients with arterial hypertension with normal and latent left ventricular diastolic dysfunction.

The research results were processed using the statistical processing packages Statistica, version 6.0. The research used the methods of mathematical statistics: methods of variation statistics, frequency, variance and correlation analyzes. The significance of differences in the groups was determined using the t-test (Student's test).

MATERIALS AND RESEARCH METHODS.

On the basis of the regional cardiological dispensary, a retrospective study of 73 outpatient records of patients with essential hypertension and rhythm disturbances at the age of 30 to 56 years (mean age 40.2 ± 2.7 years) was carried out. The observation period was 6 months. Patients complained of palpitations, recurrent discomfort behind the sternum, feeling short of breath, and destabilizing blood pressure. A Holter ECG and an ultrasound examination (ECHOKG) were performed. To diagnose left ventricular (LV) remodeling, the myocardium mass, myocardial mass index, and relative wall thickness index were determined. To assess the geometric model of the LV, we used the classification (normal LV geometry, concentric left ventricular remodeling - LV, concentric LV hypertrophy - eccentric hypertrophy (LV).

The patients were divided into 1groups: group 1 (n = 32) with hypertension without heart rhythm disturbances. The duration of AH was 4.894 ± 2.21 years, in group 2 (n = 41) with hypertension and heart rhythm disturbances - tachycardia, PVC, impaired repolarization of the ventricles. The duration of hypertension in this group was 5.820 ± 3.21 years. In the presented group, during the study, we identified the following variants of cardiac arrhythmias: tachycardia - 10 (24%), frequent ventricular monotopicextrasystole - 18 (44%), polytopic - 6 (33%), atrial fibrillation - 13 (32%)...

The diagnosis was established on the basis of anamnestic, clinical, laboratory data, as well as the results of a functional diagnostic study, echo cardiographic examination and examination of the fundus, if necessary - consultation of a neuropathologist. Symptomatic arterial hypertension was ruled out based on the results of the study of general blood and urine tests, biochemical parameters, and ultrasound examination of the kidneys. Among the studied patients, there were also no patients with ischemic heart disease, with signs of heart and renal failure, anemia, lung disease, diseases of the thyroid gland. diabetes mellitus.

All subjects were measured systolic and diastolic blood pressure, echocardiographic examination of the size of the left atrium along the long axis and 2-chamber position was determined by the transmitral flow, the thickness of the intravascular and posterior wall of the left ventricle.The primary study and the decision to be included in the study were carried out within the first 2-3 days after going to the clinic. During this period of time, patients did not receive drugs that could affect hemodynamics.

The studies were carried out in a polyclinic on an ultrasound machine "SANOMED-500". During echocardiography along the long axis, the end diastolic (EDV) and end systolic (ESV) volumes of the left ventricle were determined, along the long axis and in the apical 2-chamber position, the systolic volumes of the left ventricle (LAV), and LA dimensions. Using pulse-wave Doppler, the degree of mitral regurgitation was specified. To assess the systolic function of the left ventricle, the ejection fraction (LVEF) was calculated. Impaired left ventricular diastolic function was diagnosed if people under the age of 50 had less than 55 cm/s.

Statistical processing of the results was carried out using the statistical package "Statisticav.6.0". The arithmetic mean (M) and the error of the mean (m) were calculated. The normality of the sample distribution was assessed by the Kolmogorov - Smirnov test. The reliability of the differences between the values was determined using the Student's t-test with a normal distribution of the trait, with the distribution of a trait other than normal - using the nonparametric Mann-Whitney method. For the analysis of qualitative features, Fisher's exact test and $\chi 2$ were used. Differences were considered significant at $p \leq 0.05$.

SELECTION OF STUDY PATIENTS

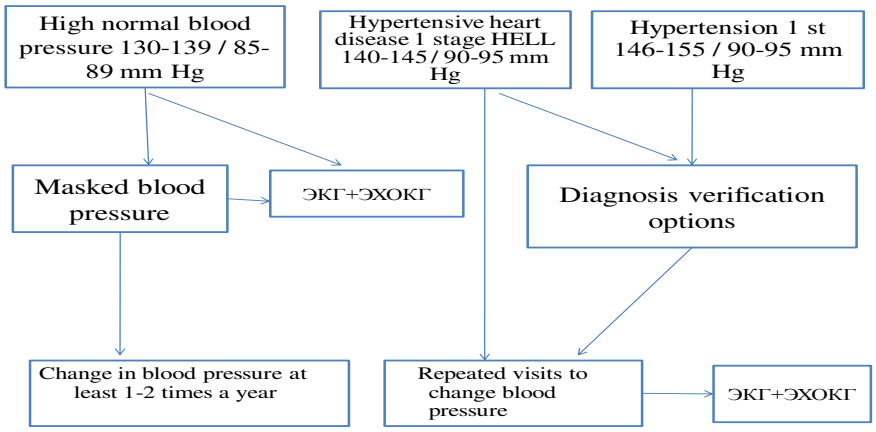
Criteria for inclusion in a clinical trial:

1-data of the anamnesis of the present disease (the frequency of occurrence more than 2 times a year of increased blood pressure and atrial fibrillation and other heart rhythm disturbances);
2-regular attendance;
3-availability of reliable criteria for making a diagnosis based on informed consent for the patient to participate in the examination and treatment and prophylactic measures;
4-joint diagnosis and treatment by other specialists.
Patient exclusion criteria from the study:
5-data of the anamnesis of the present disease (the incidence of the disease is less than 2 times a year);
6-the absence of pronounced clinical manifestations that allow for a diagnosis;
7-lack of reliable criteria for making a diagnosis;
8-non-compliance with the prescription and prescription of the doctor;
9-non-compliance with the research protocol, refusal to conduct research.

RESULTS OF THE STUDY:

Changes in the ECG were diagnosed in the first group in 40.13% of cases, in group 2 in 47.71% of cases and in group 3 in 12.14% of cases, risk distribution: risk 1 - 53 people. (35.58%), risk 2 - 50 people. (33.50%), risk 3 - in 39 people. (26.17%), risk 4 - in 7 people. (4.75%). In total, changes in the analyzed ECG parameters were detected in 48.99% of cases.

Research algorithm:



The most frequently revealed ECG changes: incomplete blockade of the right bundle branch - 4 people. (6%), violation of intraventricular conduction - 5 people.(7%), supraventricular extrasystoles - 35 people. 47%, ventricular premature beats - 15 people. (21%), early repolarization of the ST segment - 5 people (7%), atrial fibrillation - 9 people (12%).

In the study of echocardiography, myocardial hypertrophy was often observed along the interventricular septum of the median from 1.09-1.12 cm - in 46 people (30.89%), basal 1.12-1.14 cm - in 28 people (18.79%), anterior-apical sections from 1.14-1.21 cm - in 58 people (38.92%), 1.21-1.3 cm along the interventricular septum and posterior wall - in 17 people. (11.41%).

The size and deformation of the LA closely depends on the state of the LV, the stiffness and extensibility of which during filling, as well as contractility during systole, affect the atrial parameters (Table 1).

Indicators of hemodynamics and changes in the size of the left atrium intheexaminedpersons

№	Studygroups	1-group n = 32	2-group n = 41
1	Interventricularseptum, mm	11,074±1,224	12,2400±1,033
2	Posterior wall of the left ventricle	10,348±1,330	12,029±1,785
3	Left atrium(LA) volume (ml)	41,711±3,454	46,786±3,621
4	LA long axis	4,161±3,340	4,712±3,230
5	Leftventricularejectionfraction, %	61,256±2,372	57,468±2,282*
6	Left ventricular myocardial mass index LVMMI, gr/m^2	98,297±4,088	138,125±4,550**
7	SBP	124,210±6,210	134,424±6,400*
8	DBP	83,860±4,420	94,125±4,240*

Note: * p <0.05, ** p <0.05 significance of differences between groups.

Early diagnosis of the study of temporary "stunnedness" - in other words, stuninig left atrium of the left atrium of the 2nd and 4th chamber positions, and the size determined by the length of the heart axis.

Myocardial hypertrophy leads to an increase in the rigidity of the left ventricle (LV) and a deterioration in its diastolic relaxation, which leads to stunning (stunning) of the left atrial myocardium. Contraction of the atria and their relation to transmitral blood flow in LV hypertrophy leads to partial atrial systole (peak A) as well as a decrease in the speed of atrial systolic blood flow less than 0.5 m / s. A decrease in the atrial blood flow velocity leads to left atrial instability and the occurrence of temporary LA stanning and its duration may be associated with the duration of the current episode of atrial fibrillation, with the size of the atria.

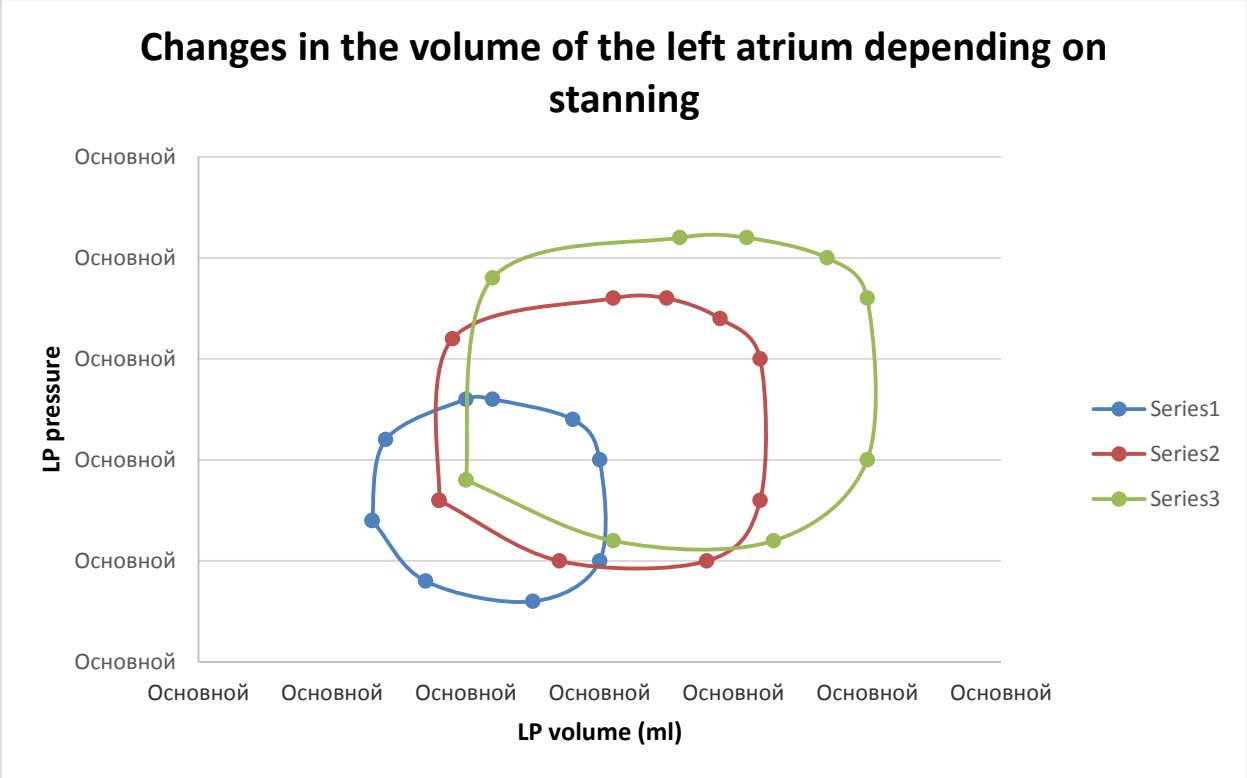


Fig. 3. The figure shows changes in the LP volume: 1. Normal LP volume from 25-30 ml (pink color) 2. LP volume increase insignificant stunning from 35-42 ml (red color) 3. LP stanning the volume increased from 45-54 ml (purple Colour).

CONCLUSIONS:

1. In 39.5% of patients, the electrocardiogram revealed changes associated with stanning of the left atrium, leading to impaired intraventricular conduction, early repolarization syndrome and cardiac arrhythmias (tachycardia, extrasystoles).
2. It is noted that a frequently occurring remodeling leading to hypertrophy of certain parts of the myocardium, and in 31.5% of cases, there is a concentric type of hypertrophy, which is considered the most unfavorable in prognostic terms, which requires more careful monitoring of this category of patients.
3. The examined patients showed early signs of left ventricular diastolic dysfunction, diastolic dysfunction is mainly represented by hemodynamic disturbances and early stanning of the left atrium (67%).

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