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## Acute Infectious Factor in the Formation of Cardiac Arrhythmia and Contractility

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**Abstract** The aim of the study is to study the acute infectious factor and the role of respiratory viral infections in the formation of left atrial stanning, myocardial contractility and rhythm disorders, and its early diagnosis. Patients showed early signs of left ventricular diastolic dysfunction, changes in valvular apparatus, valvulitis, and carditis. in patients after infectious respiratory disease, diastolic dysfunction is mainly represented by hemodynamic disorders and early stanning of the left atrium (67%). Changes in contractility and rhythm disturbances on the electrocardiogram.

**Keywords** influenza viruses, respiratory infections, cardiovascular diseases, valvulitis, myocarditis, complications, rhythm disorders, electrocardiography

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### Introduction

The main causes of viral respiratory infections are rhinoviruses, influenza viruses (during annual winter epidemics), parainfluenza viruses, respiratory syncytial virus, enteroviruses, corona viruses, and some strains of adenovirus.

Most often, viral infections of the respiratory tract are spread by contact with nasal secretions of an infected person. These secretions contain viruses. When children touch their nose or eyes, viruses enter the body and cause a new infection. Less commonly, infections are spread when children inhale air containing droplets that enter the air when an infected person coughs or sneezes. Influenza and SARS account for 95% of all infectious diseases in the world. Influenza epidemics affect between 7% and 15% of the world's population every year. About 50 million people are registered in the Russian Federation. Cases of infectious diseases, among which the main part (from 90-95%) is accounted for by influenza and acute respiratory infections [2, 3, 4, 5, 13, 21]. In the Central Asian republics, the incidence of influenza and SARS is about 26.7%.

According to WHO, influenza is also the leading cause of death from viral infections. Thus, in 2005, the number of deaths from influenza and pneumonia was 3.87 million cases [World Health Report, 2005]. At the same time, the proportion of deaths from respiratory viral infections caused by myocarditis is growing in 8.73 million cases. Adverse outcomes are most often observed in individuals with concomitant chronic diseases such as diseases of the cardiovascular and respiratory systems, kidney diseases, diabetes, etc. [15]. Despite a pronounced downward trend in overall mortality from influenza and other respiratory viral infections in recent years, especially among people of middle and working age, it remains quite high and shows signs of increasing. Every year, tens of thousands of people die in different countries, mainly children of the first years of life (up to 2 years) and the elderly (over 60 years). Mortality among persons aged 5-19 years is 0.9 per 100 thousand, persons of average



working age 62 per 100 thousand, among persons older than 65 years-103.5 per 100 thousand of the population [11, 21, 22, 24].

For a long time, information about the prevalence of myocarditis was obtained only from autopsy studies. In particular, using the results of 40 thousand autopsies, I. Gore and O. Shaphir demonstrated that myocarditis can cause 3.5% of deaths associated with infectious and toxic diseases [1]. Further pathoanatomical studies conducted at Bellevue hospital (USA) confirmed that inflammatory myocardial damage in infectious diseases can occur in 3.3-7.8% of cases [2]. Analysis of data from pathomorphological studies of those who died from cardiovascular diseases, performed by L. V. Ivleva et al., revealed non-rheumatic myocarditis in 4-9% of cases [9]. Inflammatory diseases of the myocardium in 8.5% of cases are the cause of sudden death, and in the population under 35 years of age, this figure can reach 15% [15, 18, 22]. However, autopsy studies do not provide a true picture of the incidence of myocarditis. And only thanks to the implementation in vivo morphological diagnostics proved that recent heart failure (HF) in 49.6% of cases has an inflammatory nature [19].

Variety of adenovirus serotypes (more than 40), special the biological properties of the pathogen, stability in the external environment, and the ability to persist in the human body determine the wide distribution, polymorphism of clinical manifestations, and a tendency to a long and recurrent course [5]. There are data on the involvement of adenoviruses in the development of lower respiratory tract infections-bronchitis, pneumonia, myocarditis and pericarditis [16]. E. E. Tselipanova et al. (2013) established an adenovirus etiology in community-acquired pneumonia in 41% of cases [13]. The increase in the number of community-acquired "virus-induced" and "virus-associated" pneumonias, myocarditis and severe pericarditis in the centers of such outbreaks is particularly alarming. A.V. Grischuk (2009) showed that in the study of biological material such as sputum, pharyngeal culture, nasal flushing, and genetic material, adenoviruses were detected in 36.8% of cases [7, 3].

In the medical literature, hibernating myocardium is understood as a condition of the heart, which characterizes the inhibition of pumping function at rest without cytolysis of cardiomyocytes, the cause of which is a decrease in the volume velocity of blood flow through the coronary arteries [19, 20]. The state of the hibernating myocardium is the result of a protective reaction aimed at reducing the high ratio between the contraction force of the hypoxic section of the heart muscle and its blood supply. Thus, the hibernation delay cytolysis of the cells of the heart due to georgesmum. Stanning (eng. stunning-stunning) of the left atrial myocardium-as a condition in hypoxic segments of the heart chamber walls after an infectious respiratory disease [17, 18].

Increased migration, physical activity, meteorological conditions, psycho-emotional stress, changes in the nature of food and accommodation affect the premorbid state of people of middle and working age, which can lead to a severe course of diseases [8]. The lack of common ideas about clinical and laboratory diagnostics, the relative inefficiency of traditional methods of non-specific and lack of specific prevention tools, the low effectiveness of modern treatment regimens for acute respiratory infections of adenovirus etiology and adenovirus diseases and their complications on the cardiovascular system determine the need for additional research and early diagnosis of complications.

## Objective

To analyze the role of respiratory viral infections in the formation of left atrial stunning and its early diagnosis.

## Materials and Methods

121 patients were examined, the average age was  $39.5 \pm 4.8$  years, men-76 people (63%), women - 45 people (37%). all subjects were divided into 3 groups: in group 1 – 44 people, in group 2-62, in group 3-15 people.

A standard examination was performed for risk stratification: risk factors affecting the prognosis were analyzed (burdened heredity, dyslipidemia, smoking, obesity, diabetes mellitus, glycemia), echocardiography, 12-lead ECG, ultrasound examination of the carotid arteries. In addition, the following parameters were analyzed by ECG: duration of the P - wave, height of the P-wave shape and type of the P - wave, intra-atrial pulse delay, rhythm disturbances-atrial and ventricular extrasystoles, P-Q interval, width of the Q-wave, depth of the Q-wave, height of the R-wave, depth of the S-wave, localization of the transition zone, width of the QRS complex, presence of AV



block, SA block, presence of violations of the Gis bundle legs, period of internal deviation (QR), signs of dysfunction sinus node, blinking syndrome - Edems-Stokes, Qt interval duration, t wave amplitude, St segment localization and its deviations (depression, shape, early repolarization). Standard ECHOCARDIOGRAPHIC study with determination of the index of left ventricular mass and relative thickness of the posterior wall of the left ventricle and the interventricular septum allows to characterize the geometry of the left ventricle, diffuse wall thickening of the myocardium - caused by interstitial edema, the size of the left atrium, the left atrial volume, peak velocity of early and late diastolic flows. When assessing the geometric structure of the LV in B-mode, the thickness of the anterior, septum, posterior and lateral walls of the LV was measured in diastole from the parasternal access along the short axis at the level of the MC valves and papillary muscles. The anterior-posterior size of the papillary muscles was determined from the position of the short LV axis in the parasternal projection. In the M-mode, the thickness of the LVL and the posterior wall of the LV was measured in diastole, CDR and CSR of the LV, anterior-posterior size of the LP, in 4 projections, 2 projections.

Results: ECG Changes were diagnosed in the first group 40.13% of cases, in group 2 47.71% of cases and in group 3 12.14% of cases, risk distribution: risk 1-35 people (42.35%), risk 2 - 34 people (29.24%), risk 3 - 33 people (17.16%), risk 4 - 19 people (11.25%). Total changes in the analyzed ECG parameters were detected in 48.01% of cases. The following was most often detected: transition zone displacement (transition zone-V4-5-13 people (8.2%), V2-14 people (8.9%), V5 - 7 people.(4.5%), incomplete blockage of the right leg of the GIS bundle - 19 people (12.2%), violation of intraventricular conduction-25 people. (15.9%), ventricular extrasystoles - 16 people (up 10.3%), early repolarization ST segment 48 people (30,5%), a-FIB atrial - 12 people (7.6%), syndrome the Blink of Edems-Stokes - 3 persons (1.9%).In the study of ECHOCARDIOGRAPHY frequently observed cardiac hypertrophy in the interventricular septum median from 1.09-1.12 cm - 49 employees (34.4%), basal of 1.12-1.14 cm in 28 people (18.3%), anterior - apical divisions from 1.14-1.21 sm - 62 people (36.3%), 1.21-1.3 cm in the interventricular septum and posterior wall in 18 people (11.9%) (Table 1)

Table 1

Indicator	Group 1 patients	Group 2 patients (LVH, normal LV pressure)	Patients 3 group (LVH+ increase in the pressure of the LV)
Age, years	29,50±6,28	38,95±7,15	41,95±6,15
Men/women.	44(21/23)	62(33/29)	15(6/8)
Office systolic blood pressure, mmHg	130,21±4,21	141,42±4,40	150,42±5,40
Office diastolic blood PRESSURE, mmHg .	80,86±3,12	90,12±4,24	92,12±4,24
Terms of myocarditis complications	2,89±2,21	3,82±3,21	4,42±2,21
MWP, mm	11,074±1,224	12,2400±3,033	14,2400±3,033
ZS LJ, mm	10,348±2,330	12,029±2,785	13,029±2,785
DAC, mm	34,142±4,400	35,152±5,340	37,152±5,340
CDR, mm	53,202±3,340	54,432±4,286	59,432±4,286
K3, 0 (Simpson), ml	118,020±32,730	146,226±10,643	158,226±10,643
KCO (Simpson), ml	31,711±16,786	62,786±18,412	62,786±18,412
The amount of LP	33.32±2.32	41.97±3.54	54.20±3.12
Dimensions LP (mm)	42.6±3.3	45.2±3.6	49.2±3.2
LVEF, %	55,256±5,372	51,468±5,282	49,468±5,282
M <sup>ML</sup> K(b-mode), g	206,136±106,467	265,115±105,128	299,115±105,128
Lvmwi, g/m <sup>2</sup>	98,297±9,088	145,125±7,550	178,125±7,550

Lvmi - left ventricular mass index.

LA - left atrium.

FS/DS - final systolic / diastolic size.

FS / DV - final systolic / diastolic volume. LVEF - left ventricular ejection fraction.

\* time of treatment of patients from the beginning of the disease in months).LV CS - the posterior wall of the left ventricle.



According to our study, myocardial hypertrophy in group 1 patients was observed in 7 people (10%). No changes were observed in the myocardium. For the median division in 18 people (29%), basal division in 28 people (45%), and anterior-apical division in 10 people (16%), respectively. And in patients of group 2, the ratios were distributed as follows: median 21 people (28%), basal 30 people (39%), anterior - apical 11 people (15%), hypertrophy of the interventricular septum and posterior wall (concentric type) in 13 people (18%).

In patients of group 3, the median part of the MVP was in 5 people (26%), basal in 3 (16%), Antero-apical in 4 (21%), and the MVP and posterior wall in 7 people (37%). An increase in the size of the heart was observed in all study groups. Early diagnosis of the study of temporary "deafness" -in other words, the stunning left atrium of the left atrium of the 2nd and 4th chamber projections, and the size determined by the length of the heart axis.

It is known that concentric LV hypertrophy (LVH) is more dangerous in the risk of sudden death, and eccentric - in the probability of developing CHF. Therefore, to determine the risk of disease, it is necessary to accurately determine the geometric model of hypertrophied LV. With the advent of the theory of the cardiovascular continuum, the approach to classification of echocardiographic geometric types of LV has changed. A natural consequence is the formation of left ventricular hypertrophy (LVH), which leads to an increase in the rigidity of the left ventricle (LV) and a deterioration in its diastolic relaxation, which leads to stunned (English stunning - stunning) of the left atrial myocardium. The values of the thickness of the MVP and the posterior wall in patients of group 1 and group 2 significantly exceeded, in the area of the median and basal sections, and also exceeded the signs of papillary muscle hypertrophy. The study obtained data where, in patients of group 1, 35% of cases were determined to exceed the thickness of the IVF more than 10.9-11.4 mm. In 45% of the subjects, changes were observed in both the posterior and interventricular septum. In 20% of cases, the LVM and the posterior wall of the left ventricle remained unchanged. In group 2 patients, in 42% of cases, the thickness of the IVF exceeded the norm in 12%. In group 3, 49% of changes were observed in the LVMH and the posterior wall of the LV.

In the first group-hypertrophy of the median part of the MVP (29%), - basal part of the MVP (45%), -Antero-apical part of the MVP (16%).

In the second group-hypertrophy of the median part of the MVP (28%), - basal part of the MVP (39%), -Antero - apical part of the MVP (15%), 4-for the MVP and zslzh (18%).

In the third group-hypertrophy of the median part of the IVF (26%), - basal part of the IVF (16%), -Antero - apical part of the IVF (21%), 4-for the IVF and zslf (37%).

Thus, in young patients, the electrocardiogram in 34.1% reveals changes associated with stunning of the left atrium, leading to a violation of intraventricular conduction, early repolarization syndrome and cardiac arrhythmia (tachycardia, extrasystoles). There is a frequent remodeling that leads to hypertrophy of certain areas of the myocardium, and in 30.5% 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.

The examined patients showed early signs of left ventricular diastolic dysfunction, while in patients with normal and latent diastolic dysfunction is mainly represented by hemodynamic disorders and early stunning of the left atrium (67%).

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