Echocardiographic changes of the left ventricle in bronchial asthma

Munira Alisherovna Khusainova
Maxsuda Salhiddinovna Bekmuradova
Khanuza Davranovna Makhmudova
Jurabek Bakhtiyorovich Uzokov
Samarkand State Medical University

Abstract: In recent years, the attention of researchers has been increasingly attracted by the problem of multi- and comorbidity. The probability of developing combined diseases increases with an increase in life expectancy, which can be explained by both age-related changes and negative effects of the environment and living conditions for a long time. The increase in the number of diseases with age reflects, first of all, involutional processes, and the concept of comorbidity implies a deterministic the possibility of their combined flow, and the latter has been studied much less. And as a result, there is now an understanding that the problem the combination of diseases is difficult to overestimate, being one of the most difficult that doctors face. There are a number of well-known combinations, such as coronary heart disease (CHD) and diabetes mellitus, arterial hypertension (AH) and coronary heart disease, AH and obesity. But at the same time, there are increasingly indications of rarer combinations, for example, peptic ulcer and coronary heart disease, mitral stenosis and rheumatoid arthritis, peptic ulcer and bronchial asthma (BA). Bronchial asthma (BA) attracts the increased attention of specialists, which is associated with both a distinct increase in frequency, a heavier course of this disease, an increase in complications, and significant progress in its diagnosis and treatment. Epidemiological studies have shown that about 7 million people suffer from AD in the world, of which 1 million have a severe form of the disease. In recent years, more and more information has been accumulating that the study and evaluation of echocardiographic examination indicators can have an important diagnostic significance for understanding the pathogenesis of AD and predicting the development of complications from the cardiovascular system.

Keywords: bronchial asthma, left ventricular, systolic-diastolic dysfunction, isovolumetric contraction, isovolumetric relaxation

INTRODUCTION

The study of variants of combined pathology can contribute to a deeper understanding of the pathogenesis of diseases and the development of

pathogenetically based therapy. This is especially important in relation to widespread and socially significant diseases, which primarily include diseases of the cardiovascular system (AH, CHD) and bronchopulmonary system (BA).

The problem of comorbidity is becoming one of the main problems of modern medicine, and the combination of bronchial asthma and cardiovascular diseases is one of the most common combinations in the overall structure of comorbidity. This article summarizes and presents the currently existing information on the prevalence, structure, and features of the course of bronchial asthma and a number of cardiovascular diseases from the standpoint of mutual influence and mutual burden, as well as existing difficulties and possible prospects for the diagnosis and treatment of these comorbid conditions.

Comorbidity has a negative effect on the course of diseases, significantly increasing the likelihood of death, and the results of studies convincingly confirm this. It is noted that in patients with comorbidity, 3-year mortality is progressively increasing: with a combination of 2 or more diseases, it reaches 82%. The combination of diseases, their multifaceted and multifactorial mutual influence and mutual burden, together with age and drug interactions, lead to a change in the clinical picture of both the main and combined diseases, which causes differential diagnostic difficulties that are well known to practitioners. And the need for treatment several diseases often lead to polypragmasia, which, in turn, leads to an increased risk of side effects and a decrease in patients' adherence to therapy. In addition, we should not forget about the drug interaction of various groups of drugs in such patients.

The aim of the work was to evaluate the diastolic and systolic functions of the left ventricle in patients with moderate and severe persistent bronchial asthma.

MATERIAL AND METHODS

A total of 35 people were examined, including 25 patients with bronchial asthma and 10 somatically healthy individuals from the Samarkand region as a control group. Dynamic observation of patients with AD and their comprehensive examination were carried out in the conditions of the therapeutic department 1-SamMI clinics. The diagnosis of patients was made on the basis of GINA criteria using the materials of the "Global Strategy for the Treatment and Prevention of bronchial Asthma" edited by A.G.Chuchalin. The patients we selected for the study were registered at the dispensary with a pulmonologist for AD, the diagnosis was verified earlier. Persons with newly diagnosed BA were not included in the observation group. All patients with BA were divided into two groups. The first group consisted of 12 patients with moderate persistent BA. The second group consisted of 13 patients with severe persistent course diseases.

All the patients we selected for the study were diagnosed with bronchial asthma, mixed form (endo- and exogenous), moderate or severe persistent course, acute

phase. Exclusion criteria: concomitant respiratory diseases (cancer, tuberculosis, pneumonia), malignant neoplasms of any localization, systemic connective tissue diseases, endocrine pathology, severe renal or hepatic insufficiency, acute and chronic inflammatory diseases in the acute phase, coronary heart disease (both according to anamnesis and according to daily ECG monitoring), arterial hypertension (both according to anamnesis and according to daily monitoring of blood pressure), non-coronary myocardial diseases, anemia.

Therapy of acute asthma in the hospital included systemic glucocorticosteroids (prednisone orally at an average dose of 30 mg per day + prednisone intravenously starting at a dose of 90 mg) with a gradual dose reduction and transfer to an inhaled glucocorticosteroid based on beclomethasone dipropionate 1000-1500 mcg per day, intravenous infusions of 2.4% solution of eufillin - 10 ml, inhalation of β2 -short-acting agonists via a nebulizer in "on demand" mode. Outpatient patients with AD in the studied groups, combination therapy was received, including inhaled glucocorticosteroids (beclomethasone, budesonide, fluticasone) and prolonged β2-agonists (formoterol, salmeterol) in individually selected (according to the recommendations of GINA) fixed dosages, short-acting β2 -agonists in the "on demand" mode.

Ultrasound examination of the heart was carried out on scanners "ALOKA-5500 Prosaund" (Japan) and "G-60" by Siemens (Germany) with an electronic sector sensor with a frequency of 3.0 Mhz in one-dimensional (M), two-dimensional (B) modes and in Doppler echocardiography mode (using a pulsed and constantly wave spectral doppler, as well as color Doppler mapping of blood flow). The examination of patients was carried out according to the standard method of parasternal (along the long and short axes) and apical approaches. The following indicators were evaluated: Ve LV - the rate of early diastolic left ventricular filling, LV Va - the rate of late diastolic filling of the left ventricle. For a comprehensive assessment of the systolic-diastolic function of the left ventricle, we calculated the Doppler echocardiographic index (Tei index) according to the formula: Index Tei = (IVCT + IVRT) / ET, where IVCT is the time of isovolumetric contraction of the ventricle, IVRT is the time of isovolumetric relaxation of the ventricle, ET is the ejection time. Statistical data processing was carried out using the statistical program "STATISTICA 7.0, Stat Soft, Inc."

RESEARCH RESULTS AND THEIR DISCUSSION

Median rate of early diastolic filling of the left ventricle (LV Ve) in patients with moderate persistent BA , the following was 0.74 m/s [0.33 m/s; 1.28 m/s], which was statistically significant (p=0.037) less than in the control group. In patients with severe persistent BA, the median LV Ve was statistically significantly lower compared to the control group (p=0.013) and a group of patients with moderate

persistent BA (p=0.043). A decrease in the rate of early LV diastolic filling, expressed in a decrease in the amplitude of the peak E of the transmittal diastolic flow, indicates a slowdown in the phase of slow LV diastolic filling. According to literature data, this decrease is a consequence of an increase in diastolic pressure in the ventricular cavity and most often accompanies ventricular hypertrophy with the development of some rigidity of its walls.

The median rate of late diastolic filling of the left ventricle (LV Va) in patients with moderate persistent BA was 0.68 m/s [0.4 m/s; 1.05 m/s], which was statistically insignificant (p=0.203) more than in the control group. Median Va LV in patients with severe persistent BA it was statistically significantly higher compared to the control group (p=0.028) and the group of patients with moderate persistent AD (p=0.041). The increase in the rate of late diastolic filling in patients with AD reflects an increase in the aggravation of the disease of the contribution of the atrial systole to the diastolic blood flow to the left ventricle, which is an indirect sign of LV diastolic dysfunction.

The median value of the ratio of the rates of early and late filling of the left ventricle (LV Ve/Va) in patients with moderate persistent BA, it was 1.01 [0.6; 2.35], which was statistically significant (p=0.007) less than in the control group. Despite the fact that the value of the median LV Ve/Va in the group of patients with moderate persistent BA fit into the reference interval of the norm (1-1.5, according to the literature), the value of the 5th percentile of this indicator, equal to 0.6, indicates the development of diastolic dysfunction in some patients of this group. In patients with severe persistent BA, the median LV Ve/Va was statistically significantly lower compared to the control group (p=0.007) and the group of patients with moderate persistent BA (p=0.042). Thus, patients with AD have diastolic dysfunction of the left ventricle, which increases with increasing severity of the disease.

The median time of left ventricular isovolumetric relaxation (LV IVRT) in the group of patients with moderate persistent BA was 104 ms, which was statistically insignificant (p=0.263) more than in the control group, the value The 5th percentile was 72 ms, the 95th percentile was 163 ms. In patients with severe persistent BA, the median LV IVRT was 111.5 ms [[52 m s; 208 ms], which was statistically significantly higher compared to the control group (p=0.025). Thus, in patients with severe BA, there is prolongation of the period of pressure drop in the left ventricle and the return of myofibrils to rest, i.e. diastolic dysfunction. The median time of left ventricular isovolumetric contraction (LV IVCT) in the group of patients with moderate persistent BA was 79 ms [46 ms; 104 ms], which had no statistically significant differences (p=0.263) with the control group. In the group of patients with severe persistent BA, the median LV IVCT was statistically significantly higher than in the control group (p=0.044) and in the group of patients with moderate persistent

BA currents (p=0.035). The lengthening of the time of isovolumetric contraction of the left ventricle indirectly indicates a decrease in the contractile ability of left ventricular myofibrils in patients with severe persistent BA.

For a comprehensive assessment of systolic and diastolic LV functions, the Doppler echocardiographic index (Index Tei) was calculated. The median Index Tei in the group of patients with moderate persistent AD was statistically significantly (p=0.032) higher than in the control group and amounted to 0.45 [0.37; 0.93], i.e. in patients of this group there was a slight decrease in systolic and diastolic functions of the left ventricle. The median value of the Index Tei in patients with severe persistent BA was 0.67 [0.5; 1.2], which was statistically significantly more than in the control group (p=0.005) and in the group of patients with moderate persistent BA (p=0.047). That is, in the group of patients with severe persistent BA, there was a moderate decrease in systolic and diastolic LV functions.

Thus, in patients with AD, the presence of diastolic dysfunction of the left ventricle was revealed, expressed in a decrease in the rate of early LV diastolic filling, an increase in the rate of late diastolic filling, a decrease in the ratio of the rates of early and late filling of the left ventricle and an increase in the time of isovolumetric relaxation of the left ventricle, depending on the severity of the disease and increasing as weighting BA. In addition, in patients with severe persistent AD, there was not only a violation of the diastolic function of the left ventricle, but there was a moderate deterioration in his systolic function, as indicated by an elongation of the time of isovolumetric contraction of the left ventricle and an increase in the Doppler echocardiographic index - the Tei index.

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