

Clinical Course Features of Bronchial Asthma Combined With Pathology of Cardiovascular System

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ABSTRACT

Background: Patients suffering from bronchial asthma often have concomitant functional disorders of the cardiovascular system. The combined course of pathology of the lungs and cardiovascular system significantly aggravates the condition of patients.

Aim: To study the features of clinical course and functional changes in cardiovascular system and their prognostic significance in BA patients.

Methods: To achieve the objectives and goals were examined 99 patients with a diagnosis of BA. All patients underwent clinical examination, spirometry, chest X-ray examination, Holter ECG monitoring, echocardiography, pulse oximetry.

Results: In the group of patients with bronchial asthma with functional changes in the cardiovascular system were recorded clinical symptoms of heartbeat - 15 (15%), cardiac pain in the heart - 4 (4%), headache - 20 (20%), dizziness - 5 (5%). In BA of moderate severity, these symptoms amounted to 22%, and in severe 27%. Based on the results obtained, it can be concluded that in the presence of functional changes in the cardiovascular system in BA, there is a tendency to deterioration in lung ventilation. We have established that the dynamic indicator of changes in electrocardiography in patients with BA depends not only on the degree of respiratory failure, but also on hypertension in the small circle of blood circulation and the severity of the pathology.

Conclusion: It was found that the more severe bronchial asthma, the more pronounced the clinical symptoms of the cardiovascular system. Asthma is more severe in patients with BA in combination with functional changes in the cardiovascular system. It was revealed that the pathology of cardiovascular system is more often diagnosed against the background of existing BA.

Keywords: Bronchial asthma, cardiovascular pathology, severity.

INTRODUCTION

Over the past five years, there has been a tendency to increase the proportion of cardiovascular disorders in patients with bronchial asthma. Lung diseases should be considered in close connection with the state of the cardiovascular system. As for the clinical features of BA with functional changes in cardiovascular system, there are only a few reports in the literature that are contradictory. In this regard, it is important to study the clinical features of BA and functional changes in cardiovascular system in this category of patients. The aim of our research was to study the features of clinical course and functional changes in the cardiovascular system and their prognostic significance in patients with BA. The article presents the results of our research. It was revealed that the pathology of the cardiovascular system is most often diagnosed against the background of existing bronchial asthma. Concomitant pathology of the cardiovascular system in patients with bronchial asthma was 83%. It was found that the more severe bronchial asthma, the more pronounced the clinical symptoms of the cardiovascular system. Changes in intracardiac hemodynamics in patients with bronchial asthma with functional changes in the cardiovascular system were: in the formation of left ventricular hypertrophy, increase in the left atrium, increase in the size of the right ventricle and decrease in the ejection fraction.

Asthma is a global health problem - there are about 300 million patients with asthma¹. Despite the achievements, many aspects of modern clinical medicine, devoted to the study of the clinical course of bronchial

asthma (BA) with functional changes in the cardiovascular system, remain insufficiently studied.

Disorders of respiratory function, hypoxia and hypercapnia, observed in patients with BA, lead to functional overstrain of cardiovascular system. Most often BA sick people of working age. This pathology is of great medical, social and economic importance due to the wide prevalence among the population (according to Russian statistics, 5% - 7% among adults), occurs most often in people of working age, has a progressive nature of the course with frequent exacerbations and hospitalizations, disability and mortality². There is evidence that in some countries the prevalence of BA has increased, while in others it has increased in the recent past, but has now stabilized [3]. In many cases, BA as a serious pathology of the respiratory system tends to progress, with frequent attacks of suffocation, which, in turn, can lead to the development of pulmonary heart failure^{4,5,6}. In recent years, there has been an increase in the number of BA patients in combination with cardiovascular diseases, which contribute to the increase in BA severity [7, 8]. As for the clinical features of BA with functional changes in cardiovascular system, there are only a few reports in the literature that are contradictory^{9,10,11,12}. In this regard, it is important to study the clinical features of BA and functional changes in cardiovascular system in this category of patients.

The goal of our research was to study the features of clinical course and functional changes in cardiovascular system and their prognostic significance in BA patients.

METHODS

To achieve the objectives and goals were examined 99 patients with a diagnosis of BA in the department of pulmonology. The diagnosis of BA was established on the basis of the classification proposed by the world health organization "Bronchial asthma. Global strategy, treatment and prevention of BA" (1996), which took into account the form of BA and the severity of the disease^{13,14}.

Among the examined patients there were 52 men, 47 women aged 20 to 70 years, an average of 48.3 years. All patients underwent clinical examination, spirometry, chest X-ray examination, Holter ECG monitoring, echocardiography, pulse oximetry. Stats Direct Version 2.7.8 was used to perform statistical analysis.

RESULTS

Patients were divided into 2 groups: 1 group - BA patients with functional changes in the cardiovascular system, 83 patients; 2 group - patients with BA without functional changes in the cardiovascular system, 17 patients. The control group included 20 healthy individuals matched for age and sex. All patients were sent for medical care in the period of the attack. In 90% of patients there were parallel diseases in the acute stage.

Of all the comorbidities, atherosclerosis of the aorta is most common in BA (16 cases) and hypertension was noted in the third place (16 cases). The percentage of background pathology occurrence from the respiratory system as a whole is suitable for 73 examined BA patients. Deviations from the gastrointestinal tract were observed in 23 patients. Pathology of the cardiovascular system was observed in 83 patients. A combination of coronary artery disease and hypertension was observed in 3 patients with BA. In 9 examined comorbidity is not revealed.

In 16 (19.3%) patients with BA hypertension was established (stage I - in 1 (1.2%) patient, stage II - in 13 (15.7%) patients and stage III - in 2 (2.4%) patients; in 4 (4.8%) patients with BA - symptomatic hypertension. Coronary artery disease was observed in 5 (6%) examined patients with BA; atherosclerosis of the aorta - in 17 (20.5%); cardiosclerosis - in 5 (6%); arrhythmias - in 36 (26.4%) patients with BA.

Consequently, the concomitant pathology of the cardiovascular system is one of the important components that affect the course of BA.

When comparing clinical symptoms in patients with BA and functional changes in the cardiovascular system and patients with BA without functional changes in the cardiovascular system, more pronounced symptoms were found in patients with functional changes in the cardiovascular system (Table I). The presence of clinical symptoms of heartbeat - 15 (15%), cardiac pain in the heart - 4 (4%), headache - 20 (20%), dizziness - 5 (5%). In BA of moderate severity, these symptoms amounted to 22%, and in severe 27%.

Based on the obtained data of clinical examination of patients with BA in combination with functional changes in cardiovascular system, it is possible to conclude that the more severe BA, the more pronounced the changes in the cardiovascular system.

One of the important methods in patients with BA is to study the function of external respiration in dynamics.

In the analysis of respiratory function (Table II), according to our results, it was found that VC in BA without functional changes in the cardiovascular system tends to increase than in BA with functional changes in the cardiovascular system (61.75 ± 3.97 , against 54.34 ± 2.17). However, MVL has a tendency to decrease in patients with BA without functional changes in the cardiovascular system than with BA and functional changes in the cardiovascular system (of 53.75 ± 5.54 against 56.97 ± 3.28). FEV1 is prevalent in asthma without functional changes in the cardiovascular system over the group of patients with BA and functional changes in the cardiovascular system (61.13 ± 4.75 against 59.40 ± 2.35). RR tends to increase in patients with BA and functional changes in the cardiovascular system than BA without functional changes in the cardiovascular system (22.06 ± 0.53 against 21.75 ± 1.00).

As can be seen from table I, the indicators of respiratory function in the control group significantly exceed those of patients with BA.

Based on the results obtained, it can be concluded that in the presence of functional changes in the cardiovascular system in BA, there is a tendency to deterioration in lung ventilation.

During the x-ray examination, we excluded a number of diseases that could give the manifestation of bronchial obstruction, that is, exogenous allergic forms of alveolitis and pulmonary tumors. Chronic bronchitis was diagnosed in 72 cases.

All patients in both groups underwent ECG study. No abnormalities were found in patients with mild BA. The most common signs of ECG changes were in patients with moderate and severe BA. Most of the arrhythmias were noted by type: sinus tachycardia - 40 cases, sinus arrhythmia - 8 cases, sinus bradyarrhythmia - 2 cases, sinus bradycardia - 2 cases, supraventricular extrasystole - 5 cases and paroxysmal tachycardia - 4 cases. Arrhythmias occurred both independently (36 cases) and in combination with other pathology of cardiovascular system (31 cases). In the origin of arrhythmias in patients with BA are different mechanisms. Basically, it can be attributed to the right ventricular hypertrophy. The primacy of supraventricular extrasystoles is obviously associated with parasympathicotonia in BA, which prevents the development of ventricular ectopic arrhythmias, and stimulation of β -adrenergic receptors leads to a local increase in the concentration of adrenaline in the sinus node, and possibly to the speed of impulses through the atrioventricular node, thereby affecting the risk of supraventricular arrhythmias. Signs of pulmonary hypertension-load on the right heart - 62 cases and the presence of P-pulmonale in 2 cases. Reduction of repolarization processes - 22 cases, moderate - 20 cases and diffuse reduction of repolarization processes - 27 cases, reduction of wave voltage - 14 cases. All presented violations by ECG were typical for BA.

Long-term hypoxemia, characteristic of BA, is accompanied by pulmonary hypertension and disruption of compensatory myocardial capabilities with a negative shift in energy balance, which is the metabolic basis for the

development of myocardiodystrophy. Increased electrical activity of the left ventricle (40 cases), signs of hemodynamic overload of the left ventricle (20 cases) and left ventricular hypertrophy (10 cases), indicate the presence of hypertension in patients with BA, as well as concomitant hypertension.

We have established that the dynamic indicator of changes in electrocardiography in patients with BA depends not only on the degree of respiratory failure, but

also on hypertension in the small circle of blood circulation and the severity of the pathology.

Our data are consistent with the data of Abusuev and others (1996), Belova et al. (2000), who were diagnosed with hemodynamic disorders in patients with BA and received a decrease in the pulmonary pressure. They proved that the type of hemodynamics correlated with the degree of bronchial obstruction^{14,15}.

Table I. General characteristics of clinical symptoms in patients with BA

Clinical symptoms	mild BA (n=1)		BA moderate severity (n=60)		severe BA (n=38)		in total
	without functional changes in CVS (n=0)	with functional changes in CVS (n=1)	without functional changes in CVS (n=11)	with functional changes in CVS (n=50)	without functional changes in CVS (n=6)	with functional changes in CVS (n=32)	
attacks of suffocation	-	1	12	36	1	32	82
cough	-	1	14	44	2	35	96
dyspnea	-	1	11	34	1	28	75
feeling of lack of air	-	1	2	9	1	1	14
pain in the chest	-	-	1	-	-	1	2
headache	-	-	3	7	-	10	20
dizziness	-	-	-	2	-	3	5
heartbeat	-	-	-	5	-	10	15
cardiac pain in the heart	-	-	-	2	-	2	4
weakness	-	1	9	29	3	33	75

Table II. Indicators of external respiration function in patients with BA before treatment

indicators	control group (n=20)	BA without functional changes in CVS (n=17)	BA with functional changes in CVS (n=82)
VC, %	95,85 ± 1,51	61,75 ± 3,97***	54,34 ± 2,17***
MVL, %	98,23 ± 1,73	53,75 ± 5,54***	56,97 ± 3,28***
FEV1, %	80,3 ± 1,91	61,13 ± 4,75***	59,40 ± 2,35***
RR, in 1 min.	16,1 ± 0,7	21,75 ± 1,00***	22,06 ± 0,53***

Note: *** - p<0.001 - significance of differences in respiratory function compared to those in the control group

DISCUSSION

The results of the BA morbidity study confirm that asthma is more severe in patients with BA in combination with functional changes in the cardiovascular system. It was revealed that the pathology of cardiovascular system is more often diagnosed against the background of existing BA.

Concomitant pathology of the cardiovascular system in patients with bronchial asthma is 82%, and patients with mild bronchial asthma was - 1%, the average severity of bronchial asthma - 51%, severe bronchial asthma - 30%. Changes in intracardiac hemodynamics in patients with bronchial asthma with functional changes in the cardiovascular system were: in the formation of left ventricular hypertrophy, increase in the left atrium, increase in the size of the right ventricle and decrease in the ejection fraction.

It was found that the more severe bronchial asthma, the more pronounced the clinical symptoms of the cardiovascular system. The presence of clinical symptoms of heartbeat, coronary pain in the heart, headache, dizziness in patients with BA, indicates functional changes in the cardiovascular system. In bronchial asthma of moderate severity, these symptoms were 22%, and in severe - 27%.

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