

*Materials of Conferences***BRONCHIAL ASTHMA:  
IS CARDIORESPIRATORY CONTINUUM?**

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This article is devoted to the issues of cardiac remodeling of the patients with asthma, which can be defined as cardio-respiratory continuum. Key steps of the continuum – increase in diastolic dimension, wall thickness of the right ventricular remodeling and development of chronic heart failure. Discover the main predictors of pathological remodeling. Remodeling process involves not only the right but the left side of the heart. The models predict cardiac remodeling system.

**Introduction.** The last decade of chronic non-specific pulmonary disease located on the 3rd place of incidence, morbidity and mortality rates among other types of pathology. BA suffered the world's 300 million people [1]. According to some estimates, the death from asthma is about 250,000 people per year [2]. The definition of functional state heart is essential to assess the severity of the clinical course of the disease, their prognosis and therapy.

The aim of the study was to identify cardiac remodeling in asthma, the construction of a mathematical model to optimize its forecasting diagnostics.

**Materials and methods of research.** It studied 283 asthmatic patients of varying severity. All patients underwent a comprehensive examination, which included clinical, immunoenzymometric (determining the level of N-terminal fraction of brain natriuretic propeptide (NT-proBNP), the activity of angiotensin-converting enzyme (ACE) inhibitors) and instrumental methods of respiratory function, ECG, echocardiogram, ambulatory Holter electrocardiography (HMECG) with the assessment of heart rate variability (HRV).

**Results of research and their discussion.** HMECG revealed increased activity sympathoadrenal system (SAS) as the weighting of the severity of asthma. At the same time it noted aggravating rhythm disorders, in particular arrhythmias. Its frequency and nature correlate with disease severity. Increased total pulmonary resistance have been identified in patients with asthma of moderate severity receiving oral corticosteroids. From this group of patients, hypertrophy of the prostate detected. With increasing severity of asthma we found increased work of the right ventricle. Diastolic dysfunction occurred when strikers and became more frequent at the patients with severe asthma. The left ventricle remodeling took place parallel to the

right. Concentric the left ventricle remodeling was observed starting with mild asthma. In patients with severe number of patients who had similar remodeling, it grew to 33%. Asymptomatic left ventricular diastolic dysfunction in severe asthma was found in 14% of cases.

Neurohormonal activation was detected systems that participated in the remodeling of the pancreas. First, the activation of SAS revealed that illustrated the results of the analysis of heart rate variability. With increasing severity of asthma were identified offset the sympatho-vagal balance (LF/HF) towards SAS. Hyperactivity SAS led to the development of arrhythmias are compounded with disease severity. It has been found to influence the parameters of SAS right ventricle. A moderate correlation between tightness LF/HF and diastolic size of the right ventricle, the thickness of the anterior wall of the right ventricle ( $r = 0,41$  and  $r = 0,45$ , respectively).

Secondly, RAAS activation is detected, which was confirmed by increased levels of ACE. With moderate asthma ACE level was elevated in 60% of patients. The most frequently raising ACE was patients with severe asthma (in 94% of patients). It was in group that have the highest level of pulmonary and body vascular resistance. RAAS activation is known to participate in the development of cardiac remodeling. With increasing severity of asthma has increased the number of prognostically unfavorable types of remodeling. The correlation of right ventricle parameters of ACE level was weak.

Third, the observed activation of natriuretic peptides. It is manifested by increased levels of NT-proBNP in patients, since patients are with the strikers. In this group, the activity of NT-proBNP in 40% above normal, yet 30% had borderline significance. In severe asthma in 71% of patients it exceeded 350 fmol/ml, in the remaining cases were borderline significance. Increased activity of NT-proBNP has acknowledged the violations of myocardial function. Detected a moderate correlation tightness of NT-proBNP and diastolic size of the right ventricle ( $r = 0,35$ ). So, we can talk about cardiorespiratory continuum in asthma.

In view of the adjusted coefficient of determination were selected potential predictors affecting the thickness of the anterior wall of the right ventricle in asthma. These included NT-proBNP, ACE, LF/HF, FEV1, the total pulmonary resistance. The prognostic model of hypertrophy of the prostate in patients with asthma, presented in the form of a linear multiple regression equation:

$$Y = 0,768 + 0,0001 \cdot X_1 - 0,0001 \cdot X_2 + 0,018 \cdot X_3 - 0,005 \cdot X_4 + 0,0001 \cdot X_5,$$

where  $Y$  – the thickness of the anterior wall of the right ventricle (see);  $X_1$  – the level of NT-proBNP (fmol/ml);  $X_2$  – ACE (mg/ml);  $X_3$  – LF/HF;  $X_4$  – the level of FEV1;  $X_5$  – the level of the total pulmonary resistance (din.s. cm-5).

The standard error of the regression equation  $s_y = 0,093$ . Multiple correlation coefficient  $r = 0,639$ . The thickness of the anterior wall of the right ventricle by 40,8% is determined by the abovementioned predictors. Hence the above equation can be used to predict remodeling RV.

**Discussion.** Analysis of the results shows that patients with asthma observed structural, geometric changes in the myocardium of both right and left ventricles. As the worsening conditions they grow. Given that we found no major violations in the examined blood gas, as well as significant changes in pulmonary hemodynamics, we can assume neurohumoral effect on the myocardium. Indeed, it was found to offset the autonomic regulation of the cardiovascular system in the direction of sympathetic. Our studies have shown that high blood pressure is not an exclusive contributor to the remodeling of the pancreas. Along with hemodynamic factors are equally important neurohormonal activation of local systems, primarily myocardial. It is obvious that the main role in the process of remodeling plays SAS, RAAS and extremely important, synthesized in the myocardium, natriuretic peptides. It is the activation of neurohormonal systems in patients with

asthma could be explained by changes in the structure and friendly left ventricular function. Analysis of the relationship between the concentration of NT-proBNP and diastolic size of the prostate in patients with asthma showed a moderate correlation. We found a weak correlation between the size of the right ventricle diastolic thickness and the anterior wall of the right ventricle. Analysis of the relationship between the thickness of the anterior wall of the right ventricle and the balance of the autonomic nervous system index revealed a significant relationship.

**Conclusion.** It can be concluded that the development of cardiac remodeling of the patients with asthma comes the amid neurohumoral changes involving hyperactivation SAS, RAAS system of natriuretic peptides.

#### References

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