

MEDICAL SCIENCES

THE CONDITION OF THE DIAPHRAGMATIC MUSCLES DURING REMODELING OF PERIPHERAL HEMODYNAMICS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND CORRECTION METHODS

Rakhimova D.

Alyavi A.

Nuritdinova S.

Atahodjaeva G.

*The Republican Specialized Scientific-Practical Medical Centre of Therapy and Medical Rehabilitation,
TashPMI, Republic of Uzbekistan.
<https://doi.org/10.5281/zenodo.14169121>*

Abstract

To evaluate the health-related endothelial imbalance in 54 patients with chronic obstructive pulmonary disease with peripheral hemodynamic dysfunction, and to find out how this is related to the parameters of right ventricular remodeling function and parameters of respiratory function. Consequently, endothelial imbalance is associated with the parameters of the condition of the diaphragmatic muscles and remodeling and functioning of the right ventricle.

Keywords: the condition of the diaphragmatic muscles, chronic obstructive pulmonary disease, peripheral hemodynamics, respiratory function, right ventricle of the heart, remodeling.

The course of chronic obstructive pulmonary disease (COPD) largely depends on timely effective management tactics. The reason for the increase in the prevalence and mortality from COPD complicated by chronic pulmonary heart disease (CHL) in Uzbekistan is underdiagnosis and late detection of the disease. In order to establish early diagnosis, adequate prevention and treatment of CHL, it is necessary to clarify the pathogenesis of this disease, the factors leading and exacerbating its course (2,6).

In the development of chronic obstructive pulmonary disease, causal factors include tobacco smoke and ingestion of aggressive factors (sulfur oxide, nitrogen, various oxidants, dust, etc.). The negative impact on the structural and functional state of the condition of the diaphragmatic muscles has been well studied (7,9). In European countries, thirst for bitches has been reported in 5-16% of the adult population and is one of the leading causes of temporary unemployment and disability worldwide. 4% of the total mortality rate in the world, ranks 4th in terms of death, and as of 2020 - 6.8% (4.7 million). people) are estimated to cover (6,10).

The prevalence of chronic obstructive pulmonary diseases, organized societies (American Thoracic Society/European Respiratory Society – (ATS/ERS), 2006. according to available data, the number of men per 100,000 inhabitants increased by 9.34%, women - by 7.33%, and in Russia - by 16%. 28.7% of patients aged 5 years before the start of sook, they were considered group II disabled, and 17.1% of patients were group I disabled (1.8).

At the same time, leading scientists (4,8) note that the mechanism of development of right ventricular remodeling in patients with CHL remains incompletely elucidated. The question of the role of the autonomic nervous system (ANS), peripheral circulatory system and lung ventilation capacity (VSL) in the progression of CHL requires further study. Currently, it has become obvious that chronic hyperactivation of the sympatho-

adrenal system leads to the development of a number of pathological effects, including the occurrence of vegetative imbalance (5).

The studies of the Central Asian God show the invocation of respiratory diseases caused by geomeorological factors and the uneven distribution of the Lord, and emphasize the relevance of research in this regard. The climate of Uzbekistan is characterized by sharp differences in continentality and regions: sunlight radiation, pollination and air heating levels, a sharp decrease in relative humidity in summer, high oxygen content in the atmosphere, low clouds, sharp differences between summer and winter, daytime and evening air temperatures. Environmental degradation is also differentiated by the gods, which leads to an increase in morbidity. Disasters on the islands are the largest air pollutants, dust and salt storms, in the vicinity of the gods. From 75 to 180 kg of salt dust per year rises into the atmosphere from the drier bottom parts of the island and spreads over very long distances. It was found that approximately 80% of particles with a size of 5 microns easily accumulate in the respiratory part of the respiratory organs. Because the reasons are the composition of dust particles and the property of penetrating deep into the respiratory tract. One of the complications of the ecological disasters of Boga Island is the increase in the number of respiratory diseases in Central Asia (1.5).

In COPD, it is also of interest to study at the level of vegetative and microcirculatory blood circulation at various stages of the disease, which is important not only for a more complete disclosure of pathogenetic mechanisms, but also for the development of an adequate treatment package (3).

Vasodilator therapy is performed, 0.005 g for patients with chronic obstructive pulmonary disease and arterial hypertension. intravenous administration of a dose of verapamil increases the load on the right ventricle of the heart and reduces its overall blood pressure and resistance. It was suggested that pulmonary artery

resistance decreased in only 65% of patients with an average pulmonary artery pressure in 30% of patients. According to the findings, calcium antagonists are effective against recurrent pulmonary hypertension, while the opposite effect is observed with organic changes in the vascular system (6,13).

According to the authors (5,14), when taking amlodipine at a dose of 5-10 mg per day in patients with chronic obstructive pulmonary disease and hypertension for 4 weeks, it was noted improvement of the activity of external respiration and central hemodynamics. It was noted that calcium antagonists improve the quality of life of patients and do not have a negative effect on their sexual activity.

In tests, calcium antagonists recommend long-term treatment for acute synomas, reducing pulmonary artery hypertension by 5.2% through endothelin receptors, noting that peripheral hemodynamics improves the maximum systolic frequency by 12%, increases the amount of oxygen in the blood by 7.7% (4.12).

In some sources, calcium antagonists have been used for a long time and negatively affect the suspension, negating all the positive effect shown by them. At this time, it is important to remember that if the dose is adjusted by a differentiated approach to side effects, a significant calculation of general hypotension and severe tachycardia, then unpleasant effects such as peripheral redness, a feeling of a rush of heat, ankle tumors scare the attending physicians (3.11).

Statistical processing of the research results was carried out using the standard Excel-2012 program using modern IBM-type computing systems. In the field, methods of variational parametric and nonparametric statistics were used, which calculated the arithmetic mean (M), the quadratic mean (for example), the average standard error (m), and the relative magnitude (frequency as a percentage). The statistical significance of the obtained indicators (r) is checked using the Student's Hold criterion (t), which calculates the division rate (as for the efficiency criterion) and the equality of total variances (Fisher's criterion- F) when comparing averages. For statistically significant changes, a confidence level of $R < 0.05$ was assumed. The quality indicators were calculated using the χ^2 (XI-square) criterion and the z -criterion (glans) for statistical significance.

To simplify and improve the assessment of the body's condition, the diagnostic criterion of individual risk (IXDK) was developed. For significant statistical changes, the reliability level $R < 0.05$ was adopted.

The purpose of the study. To find out the role of the autonomic nervous system in the mechanism of development of peripheral vascular and right ventricular remodeling in patients with COPD complicated by chronic pulmonary heart disease and to develop correction methods.

48 patients with COPD complicated by CHL and 30 healthy individuals (ZL) were comprehensively examined.

According to Doppler echocardiography (Doppler echocardiography), pulmonary hypertension (mean pulmonary arterial pressure LADsr greater than 25 mmHg) without dilation of the right ventricle (DPJ) and

with DPJ (anterior wall thickness of the pancreas less than 5 mm, with the anterior-posterior size of the pancreas is more than 2.5 cm).

Depending on the results of echocardiography, all patients with COPD were divided into groups: HCL with LH without BPH (group 1) and with BPH - group 2. As a result of the operation, groups 1 and 2 were divided into two subgroups 1a (14 billion) and 2a (12 billion), which received the basic group (BT) for GOLD (2006). Patients of 1b (12 patients) and 2b groups (10 patients) were added to BT with nebivolol (H) and ozone therapy (FROM).

The patients were examined on the day of admission and on the 10th day of treatment. Nebivolol was prescribed in a standard average dose (5-10 mg per day), in the form of intravenous administration of an ozone-oxygen mixture in saline solution (1000 mcg / l).

The functional state of the peripheral ANS was studied by cardiointervalography (CIG) using mathematical analysis techniques. The following indicators were calculated during the processing of the CIG: Mode (Mo , sec.) is the most common value of the duration of the r-r interval in a particular state, the amplitude of the mode (AMo , sec.), the variation range (DX , %) and the main integral indicator of heart rate regulation, which reflects the state of compensatory regulation mechanisms and is a criterion for the intensity of adaptation mechanisms - the stress index (IN , us.ed). Endothelium-dependent vasodilation (EDV) was evaluated using brachial artery Dopplerography (PA) using a Toshiba ultrasound system in SH 60A (Japan) in constant-wave mode. The maximum systolic blood flow rate (MSS , m/s) and vascular circulatory resistance index (ICS , units) were measured in response to a compression test (CP).

The functional state of the lung ventilation capacity was determined on a Medicor device (Hungary), with an estimate of the volume of forced exhalation in 1 second ($OFV1$, %), vital capacity lung (FVC , %) and the Tiffno index ($OFV1/FVC$, %).

Users working with the help of the Excel software package using the t - criterion of the Student. The differences between the obtained parameters were significant at $p < 0.05$.

The KIG analysis showed that healthy individuals are characterized by eitonía and vagotonía. In patients with COPD complicated by CHL with LH, there is a decrease, and in patients with BPH, an increase in Mo and DH indicators, respectively. In patients with COPD complicated by CHL with LH, an increase is noted, and in patients with BPH, a decrease in Amo and IN indicators compared with similar indicators of ZL.

The results obtained indicate tension in the system of humoral provision of vegetative functions and increased functional activity of the sympathetic department of the ANS. The analysis of integral indicators of the state of tension of adaptive processes in the body of patients indicates an increase in their IN . Characterizing the existing changes in patients with COPD complicated by CHL with BPH, we can state the fact of a decrease in the tension of sympathoadrenal and, in parallel, an increase in humoral and parasympathetic mechanisms in ensuring vegetative homeostasis.

In parallel with an increase in the sympathetic tone of the ANS, there is also a decrease in the ability of the PA to actively vasodilate. Thus, the analysis of the results of samples with reactive hyperemia showed that in patients with CHL, the maximum systolic blood flow rate was significantly reduced and correlated with the severity of the disease. In patients with COPD, complicated by LH and BPH, MSS indicators in response to CP were significantly reduced, and ICS was increased, compared with those in healthy individuals.

Prior to treatment, an inverse relationship between disorders in the regulation of pulmonary hemodynamics and lung ventilation was revealed in patients with COPD. Thus, an increase in ADSSR is gaining in all groups and a decrease in OFV1, FVC and OFV1/FVC compared to similar indicators of ZL. The analysis of the obtained indicators shows the role of sympathicotonia and obstructive syndrome in the development of pulmonary hypertension.

The results of the study found that in patients with COPD complicated by CHL, after treatment with nebivolol and ozone therapy on the background of BT, positive changes in the parameters of the functional state of the peripheral ANS were noted in subgroups 1b and 2b. There was a significant decrease in hyper- and parasympathicotonia, expressed in changes in Mo; DH and Amo indicators against the background of an improvement in the stress index of compensatory mechanisms of IN regulation by 7.2 and 5.5% ($p < 0.05$). This indicates a decrease in the activity of the sympathetic department of the ANS. However, even in the period of clinical improvement, patients retain a relatively high tension of sympathoadrenal links in the adaptive reactions of the body. In subgroups 1a and 2a after BT, the change in indicators was unreliable ($p > 0.05$).

In patients with COPD complicated by chronic pulmonary heart in subgroups 1b and 2b, there was a significant increase in the maximum systolic velocity after compression test, respectively, by 7.0 and 6.2%, as well as a decrease in the circulatory vascular resistance index by 6.5 and 4.8% ($p < 0.05$).

Patients with an increased risk of lightness in the dynamics of combined treatment in subgroups 1b and 2b increased: FEV1 - by 7.3 and 6.2%; FVC - by 6.5 and 6.1%; FEV1/FVC - by 6.8 and 6.2% (compared with pre-treatment, $p < 0.03$). Thus, it was found that with the use of nebivolol and ozone therapy against the background of standard therapy, there was a marked improvement in AF indicators towards a decrease in manifestations of bronchoobstructive syndrome in all observation groups. At the same time, in subgroups 1b and 2b, the dynamics of the indicators of ANS, AF and improvement in the ability of blood vessels to active vasodilation turned out to be the greatest, which indicated an additional broncho- and vasodilating effect of additional therapy for BT.

At the same time, after the therapy with the use of BT alone, it did not have a significant effect on the studied indicators.

It was found that before treatment, changes in the ability of blood vessels to actively vasodilate were par-

allel to violations of bronchial patency, functional activity of the sympathetic and parasympathetic divisions of the ANS.

We noted an improvement in the parameters of the vegetative status, the state of endothelium-dependent vasodilation and the level of lung ventilation in patients with COPD complicated by CHL against the background of complex treatment with nebivolol and ozone therapy against the background of BT.

Consistently, with progression, it may reveal mal-adapting compounds in the ANS, which is revealed by sympathicotonia, revealing as a result a decrease in adaptive ability with prolonged hypoxia of the brain.

A decrease in the ability of peripheral vessels to actively vasodilate positively correlates with indicators of the functional state of the bronchopulmonary system.

In patients with COPD complicated by chronic pulmonary heart disease, nebivolol and ozone therapy on the background of BT significantly improve the parameters of endothelium-dependent vasodilation and indicators of the state of the autonomic nervous system, while maintaining a relatively high tension of sympathoadrenal links in the adaptive reactions of the body.

References:

1. Alyavi A.L., Rakhimova D.A., Atakhodzhaeva G.A., Sabirzhanova Z.T., Gazieva H.Sh., Usmanova U.Sh. (2021). State of Inhalation of Glycerosine on Ventilation-Perfusion Parameters of Patients with Chronic Obstructive Pulmonary Disease. *Annals of the Romanian Society for Cell Biology*, 707–711. <http://analsofrscb.ro/index.php/journal/article/view/161>
2. Alyavi AL, Rakhimova DA, Tillaeva Sh Sh, Sabirjonovna ZT. Ventilation- perfusion ability of the lungs and pulmonary hemodynamics in the dynamics of treatment with nebivolol in bronchial asthma with pulmonary hypertension file:///C:/Users/Win10Pro/Downloads/Ventilation-Perfusion_Ability_of_The_Lungs_and_Pul.pdf
3. Influence of various treatment regimens on functional – oxidation dysfunction and hipoxy celle cutanea in patients with chronic obstructive pulmonary diseases and parodontitis. J. Rizaev, D. Rakhimova, S. Jumaev. 10.31838/ijpr/2020.12.01.210. <http://www.ijpronline.com/ViewArticleDetail.aspx?ID=16942>
4. Study a comparative analysis of the relationship between disorders quality of life and psychoemotional status of patients at different steps of severity of bronchial asthma relating to arterial hypertension and efficiency of various modes of complex therapy D.A. Rakhimova and Sh. Sh. Tilloeva. 2019. URL <https://doi.org/10.5958/2278-4853.2019.00286.6>
5. Influence of ozonotherapy on the functional status and medical aspects of quality of life in patients with bronchial asthma. *International Research Journal of Medicine and Medical Sciences*. D. Rakhimova, Sabirjanova Z. Ahmadreza Abedi. *International Research Journal of Medicine and Medical Sciences* Vol. 3(1), pp. 17-21, March 2015 ISSN: 2354-211X. <https://www.netjournals.org/pdf/IRJMMS/2015/1/15-019.pdf>

6. Changes in vegetative-hemodynamic relationships in the comorbid state of patients with respiratory pathology. Rakhimova D.A., Erkinov Y., Alavi A.L., Aliakhunova M.Yu. 61st ERA Congress, Stockholm, Sweden, from May 23 to 26, 2024, (Web of Science). P.12363. <https://www.era-online.org/events/stockholm-2024/>
7. Korakulova Z.T., Atakhodjaeva G.A., Rakhimova D.A. Studying the features of heart remodeling processes depending on the degree of renal dysfunction. 61st ERA Congress, Stockholm, Sweden, from May 23 to 26, 2024, (Web of Science). P. 12375. <https://www.era-online.org/events/stockholm-2024/>
8. David G. Benditt, E. Kenneth Weir and Mark R. Pritzker. Is cardiac r-therapy useful for right ventricular failure and pulmonary arterial hypertension? // Small circle of blood circulation. -2014. - Volume 4 (4). -pp.552-559.
9. Seyfart H. J., Bossone E., D'Andrea A. et al. Assessment and prognostic significance of the contractile reserve of the right ventricle in patients with pulmonary arterial hypertension // Blood circulation. -2014. - Volume 126(17).
10. Borgdorff MA, Bartelds B, Dickinson MG, Boldersma B, Weij M, Zandvoort A, Silljé HHW, Steendijk P, de Vroomen M, Berger RMF. Sildenafil enhances systolic adaptation, but does not prevent diastolic dysfunction, in the pressure-loaded right ventricle // Eur J Heart Fail. - 2012. -Vol. 14(9). - P.1067–1074.
11. Burgel PR, Paillasseur JL, Peene B, et al. Two distinct chronic obstructive pulmonary disease (COPD) phenotypes are associated with high risk of mortality // PLoS One. -2012. -Vol.7. - P.e51048.