

# Study of the Features of Systolic Function of the Left Ventricle of Patients with Chronic Heart Failure in Combination with Chronic Obstructive Pulmonary Disease

*Badritdinova Matluba Najmidinovna*

*Associate professor DSc*

*Fayzullayev Tillo Togaymurodovich*

*Assistant of the department of internal disease in family medicine Bukhara State medical institute after named Abu ali ibn Sina*

**Annotation:** The combination of chronic obstructive pulmonary disease (COPD) and chronic heart failure (CHF) represents a frequent challenge in clinical practice due to shared risk factors such as smoking, environmental influences, and comorbidities. This study aimed to investigate the changes in systolic function of the left ventricle (LV) in patients with CHF, COPD, and their combination, focusing on clinical assessment and exercise tolerance. A total of 120 patients were divided into three groups: CHF (n=40), CHF + COPD (n=40), and COPD (n=40). Comprehensive echocardiographic evaluations and clinical assessments were conducted.

Results revealed that while most LV systolic function parameters remained within normal ranges, significant deviations were observed in LV myocardial mass and hypertrophy, particularly in CHF and CHF + COPD groups. Patients with CHF demonstrated more pronounced abnormalities compared to those with isolated COPD. Moreover, COPD was associated with preserved LV systolic function in 100% of cases outside terminal CHF stages. Functional classification of patients by NYHA showed predominant moderate (II) and severe (III) physical activity limitations across all groups, with no significant differences.

Key findings indicate a progression of LV dysfunction and myocardial remodeling severity in the series COPD – COPD + CHF – CHF. These results underscore the importance of echocardiographic evaluation in differentiating the impact of CHF and COPD on cardiac structure and function. Understanding these distinctions aids in tailoring management strategies for this complex patient population.

**Keywords:** systolic function, chronic obstructive pulmonary disease, left ventricle.

**Introduction.** The combination of chronic obstructive pulmonary disease (COPD) and cardiovascular pathology is one of the most common in clinical practice. Such a frequent combination is primarily due to the presence of common risk factors, such as tobacco smoking, environmental influences, alcoholism[1, 2, 3].

Heart failure, which is most unfavorably manifested in systolic dysfunction of the left ventricle, is naturally associated with the severity and duration of COPD, with a decrease in ejection fraction, shortening of the anterior-posterior dimension of the left ventricle (LV) [4]. Various forms of changes in segmental and global contractility have been associated with COPD and are often found in its combination with CHF [5].

The aim of the study was to identify the features of changes in systolic function of the left ventricle in patients with CHF combined with COPD in relation to clinical assessment, exercise tolerance.

**Material and methods.** The study included patients of three groups: CHF (group 1), CHF combined with COPD (group 2) and only COPD (group 3). The number of people in each group was 40 people.

Patients in all groups received standard treatment for the underlying and concomitant diseases in accordance with modern domestic and international recommendations.

Most of the subjects were men - 93 (77.5%) people, women - 27 (22.5%).

The average age of patients was  $(60.81 \pm 1.2)$  years. The average duration of COPD in the 3rd group was  $(9.4 \pm 0.7)$  years, in the 2nd group -  $(21.70 \pm 0.27)$  years. The average duration of CHF in the 2nd group was  $(16.6 \pm 0.21)$  years, in the 1st group -  $(18.1 \pm 0.24)$  years (differences between the groups are significant). The smoking index in patients of the 3rd group was  $23.8 \pm 0.72$ , in the 2nd group -  $21.60 \pm 0.57$ , in the 1st group -  $7.70 \pm 0.31$  (differences between the groups are significant). In the etiology of CHF, the main share was accounted for by a combination of ischemic heart disease (IHD) and arterial hypertension (AH) - 37%, IHD accounted for 22%, AH alone accounted for 14%, post-infarction atherosclerosis (PICS) - 10%, IHD in combination with diabetes mellitus - 5%, myocardial infarction - 5%, heart defects - 4%, dilated cardiomyopathy (DCM) - 3%. Echocardiographic examination was performed on ultrasound scanners ACCUVIX V20 prestige (MEDISON, Korea) and Micromaxx (Sonosific, USA) using a vector sensor (2-4 MHz), including one- and two-dimensional echocardiography and Doppler echocardiography. Averaged indices of three cardiac cycles were calculated. The following parameters of the left ventricle were determined: end-systolic and diastolic sizes (ESD, EDS, cm), end-systolic and diastolic volumes (ESV, EDV, ml), interventricular septum (IVS, cm) and posterior wall (PW, cm) thickness, relative wall thickness (RWT), myocardial mass (MMLVM, g), left atrium (LA) and right ventricle (RV) sizes, right atrial volume. For morphometric characteristics of the LV, indices of parameters calculated for the surface area of the patient's body were used: iSV, iEDR ( $\text{cm}^2/\text{m}^2$ ), iSVCO, iEDV ( $\text{ml}/\text{m}^2$ ), iMMLV ( $\text{g}/\text{m}^2$ ). Systolic function of the LV was assessed by the fractional shortening (FS) of the anteroposterior dimension of the LV in systole (%), the value of the ejection fraction (EF, %). The function of the valves and the calculation of the systolic pressure in the pulmonary artery (SP PA, mmHg) were studied. Clinical assessment of patients with CHF included determination of the functional class according to the NYHA classification. In the statistical analysis, the contingency index ( $\chi^2$ ), analysis of variance (ANOVA) were used, with the reliability level of the obtained results  $p < 0.05$ .

**Results and discussion.** The analysis showed (Table 1) that, in general, patients with moderate [II functional class (FC), 35.9%] and severe (III FC, 53.8%) limitations of physical activity predominated, only 3 (3.8%) patients out of 78 noted minimal limitations of physical activity (I FC), and 5 (6.4%) patients noted complete or partial loss of working capacity (IV FC)

In both groups (CHF, COPD + CHF), patients with II FC and III FC predominated. Moderate limitations of physical activity and complete absence of discomfort during rest (II FC) were noted by 42.1% and 30.0% of patients with COPD + CHF and CHF, respectively, and a noticeable decrease in working capacity, disappearing during rest, was noted by 42.1 and 65.0% of patients, respectively. No differences were found between the groups according to the NYHA functional class. A number of features were identified:

- 1) the average values of the sizes, volumes of the cavities and parameters of systolic function of the LV in the groups were either within the normal range (LV EDD, LV ESR, EF, FU), or had a mild degree of deviation (IVSPT, LV TZS, LV EDV, LV ESV, PA SP);
- 2) the size of the right ventricle (anterior dimension) and the value of systolic pressure in the pulmonary artery were within the normal range or slightly increased, and in COPD they were minimal;
- 3) the most pronounced deviations from the norm were found for LV MM and LV iMM, and in the groups with CHF and COPD + CHF the degree of deviation was severe;
- 4) there was a deterioration in most indicators in the series COPD - COPD + CHF - CHF, and it was in the groups with CHF that more pronounced violations were noted than with isolated COPD; 5) the differences between the COPD, CHF and CHF+COPD groups for all the parameters presented were reliable. Since the increase in the LV myocardial mass is primarily associated with overload, pressure (increased afterload) and is the main diagnostic criterion for hypertrophy, the differences identified

between the groups for this parameter are probably associated with different rates of LV hypertrophy (LVH). Thus, in the group of patients with COPD, LVH was detected in 22.5% of cases, while with CHF and CHF+COPD it was almost 3 times more common - 60%. The differences between the groups are reliable. The lower rate of LVH in patients with COPD is probably associated with a lower incidence of arterial hypertension. This is probably due to the lower frequency of hypertension in patients with COPD, as well as the compensatory increase in myocardial mass in heart defects, DCM, and post-infarction cardiosclerosis observed in patients with CHF.

### Conclusions:

1. The systolic function of the LV is preserved in most patients outside the terminal stage of CHF, in COPD - in 100% of cases.
2. EchoCG parameters allow to clearly differentiate the negative impact of CHF and COPD. Deterioration of most parameters was noted in the series COPD - COPD + CHF - CHF, and it was in the groups with CHF that more pronounced disorders were noted than in the group with COPD.
3. The type of myocardial remodeling is interconnected with the diagnosis. Normal LV geometry was almost 2 times more common in COPD. The presence of COPD in patients with CHF does not affect the type of LV myocardial remodeling.

### Literature

1. *Мареев, В.Ю.* Национальные рекомендации ВНОК и ОССН по диагностике и лечению ХСН (третий пересмотр) / В.Ю. Мареев, Ф.Т. Агеев, Г.П. Арутюнов // Журнал сердечная недостаточность. — 2009. — Т. 10, № 2. — С.64—103.
2. *Behar, S.* Prevalence and prognosis of chronic obstructive pulmonary disease among 5,839 consecutive patients with acute myocardial infarction / S. Behar, A. Panosh, H. Reicher-Reiss // Am. J. Med. — 1992. — Vol. 93. — P.637—641.
3. *Kachel, R.G.* Left ventricular function in chronic obstructive pulmonary disease / R.G. Kachel // Chest. — 1978. — Vol. 74 (3). — P.286—290.