

IMPORTANCE OF ECHOCARDIOGRAPHY IN ASSESSING PULMONARY HYPERTENSION IN NEWLY DIAGNOSED PATIENTS WITH MODERATE AND SEVERE COPD

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Abstract: *Objectives: The study aims at emphasizing the importance of echocardiographic active search of pulmonary hypertension in patients diagnosed with moderate and severe chronic obstructive pulmonary disease (COPD), knowing the importance of prognosis and subsequent evolution in developing chronic cor pulmonale (CCP). Materials and methods: The study was conducted on a sample of 61 patients diagnosed with moderate and severe COPD, in whom Doppler echocardiography was performed in order to calculate pulmonary artery systolic pressure (PASP) through the non-invasive method. There has also been evaluated left ventricular diastolic dysfunction. Statistical correlations between PASP and age, body mass index (BMI) were also aimed at. Results: In the newly diagnosed COPD patients, there was no statistical correlation between PASP value and the degree of respiratory functional impairment expressed by maximum forced expiratory volume (EFV %) in the first second, patient age, BMI. PASP has been shown to be closely correlated with left ventricular diastolic dysfunction, which is closely related to existence of comorbidities. Conclusions: The study proves the importance of complex assessment even since the diagnosis of COPD patients, regarding the existence of pulmonary hypertension, knowing the unfavourable evolution in time, for the patients who develop CCP.*

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a disease with slow and progressive evolution, whose prevalence is increasing, leading to progressive deterioration of ventilatory function. Diagnosis is often delayed because of symptoms' slow installation. Progressively, it may be accompanied by increased pulmonary vascular resistance and pulmonary hypertension (PH) gradual installation. This has an important prognostic role because it has a slow but steady evolution towards the occurrence of right ventricular failure and death. PH occurs secondly to the anatomical changes in the lungs, along with the constriction of the smooth muscles of the arteries and pulmonary arterioles caused by hypoxia and subsequent vascular remodeling, as well as by the decrease of the pulmonary capillaries due to tissue destruction, characteristic of COPD. Several groups of investigators have identified more complex pathophysiological factors responsible for pulmonary hypertension, other than hypoxemia. Echocardiography is the initial screening method, accessible and non-invasive, useful in diagnosing pulmonary hypertension. More recent studies have evaluated the prevalence and functional implications of pulmonary hypertension in patients with COPD. There has been emphasized the importance of clearly defining pulmonary hypertension and there has been highlighted the heterogeneous aspect of its presence in patients with COPD.

PURPOSE

The study aims at emphasizing the importance of echocardiographic active search of pulmonary hypertension in patients diagnosed with moderate and severe chronic obstructive pulmonary disease (COPD), knowing the importance of prognosis and subsequent evolution in developing chronic cor pulmonale (CCP).

MATERIALS AND METHODS

In a group of 61 patients newly diagnosed with

moderate and severe COPD, echocardiographic measurements were performed to identify the values of systolic pulmonary arterial pressure and the presence of left ventricular relaxation disorders. The calculation of pulmonary arterial systolic pressure (PASP) was performed by Bernoulli method, assessing right atrial pressure according to the inferior vena cava dimensions and to its collapse in inspiration - normal values below 35 mmHg.(1)

Right arterial pressure was assessed as follows:

- 0-5 mmHg (3 mmHg) in those with inferior vena cava (IVC) below 2,1 cm and inspiratory collapse greater than 50%;
- 5-10 mmHg (8 mmHg) in those with IVC below 2,1 cm and inspiratory collapse below 50% and in those with IVC diameter over 2,1 cm and inspiratory collapse greater than 50%;
- Over 10-15 mmHg in those with IVC greater than 2,1 cm and inspiratory collapse below 50%.

Echocardiographic certain diagnosis of HP is made by identifying tricuspid regurgitation, which makes it possible to calculate the pulmonary pressure. The method of estimating pulmonary pressure by the use of tricuspid regurgitation is more correct (most accurate). The presence of pulmonary hypertension is confirmed at mean values of pulmonary arterial pressure (PAP) > 25 mmHg at rest and > 30 mmHg during exercise or of PAPS greater than 35-36 mmHg. Evaluation of left ventricular diastolic function was performed by assessing transmitral diastolic flow pattern, namely the E / A ratio.(1)

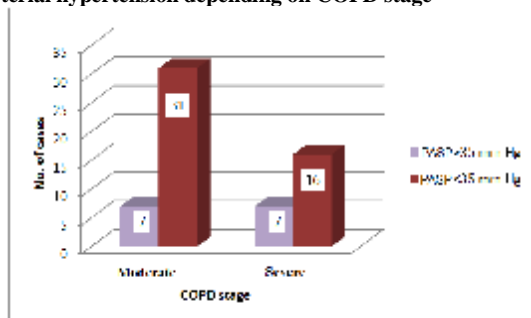
RESULTS AND DISCUSSIONS

The prevalence of pulmonary hypertension in patients with COPD is high in advanced stages; in the early stages, it is not present at rest, only during physical exercises. Frequently, pulmonary hypertension is moderate and the progression is slow. Only a small subset of patients (1-3%) has disproportionately high values of pulmonary artery pressure.(2)

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In the study group, I have identified values of systolic pulmonary artery pressure greater than 35 mmHg in 14 patients, 7 patients with moderate COPD, stage II (18.42%) and 7 patients (of 23) with severe COPD, stage III (30, 43%) (figure no. 1). A similar study estimated the presence of pulmonary hypertension in 28% of patients with chronic lung disease, COPD being the most commonly involved. Most studies have reported a prevalence of PH in patients with COPD between 30-70%.(3,4,5) To check if there are significant statistical differences between the values of pulmonary artery pressure and pulmonary function impairment degree, χ^2 test was applied.

Figure no. 1. Distribution of cases with systolic pulmonary arterial hypertension depending on COPD stage



There is a higher frequency of cases of pulmonary hypertension in patients with stage III COPD than those with stage II COPD, but there was no statistically significant association between COPD stage and systolic PAP (χ^2 test, $p = 0.351$). In our study, the degree of respiratory functional impairment expressed by forced expiratory volume (FEV) in the first second is not statistically significantly correlated with systolic pulmonary arterial pressure values ($p = 0.720$). The absence of a statistical significant correlation between pulmonary hypertension and FEV suggests the existence of some more complex mechanisms and distinct triggers responsible for increased pulmonary pressure, highlighting the mediocre value of FEV in assessing the prognosis of patients with COPD. A study on 74 patients with non-severe COPD showed that echocardiographic appearance of pulmonary hypertension has important functional consequences, better correlating with the 6-minute walk test than with FEV.(6) Feingersh and collaborators studied the frequency of pulmonary hypertension in 159 patients, of whom in 105, arterial systolic blood pressure could be measured by continuous Doppler method and assessing tricuspid regurgitation jet. They identified pulmonary hypertension with a frequency of 60%. There has been established a statistically significant correlation of systolic pulmonary artery pressure with age and FEV. No significant correlations were established with the body mass index, gender, smoking status, total lung capacity and residual volume.(7) In our study, I aimed at assessing the existence of a statistical correlation between PASP with age and body mass index (BMI), but I did not obtain any significant correlation ($r = 0.170$, $p = 0.190$, respectively $r = -0.270$, $p = 0.109$). It can be concluded that the value of FEV, BMI and age do not have a clear independent role in causing pulmonary hypertension of PASP. Knowing the multifactorial determinism of the occurrence of left ventricular diastolic dysfunction and its negative prognostic value, there has been studied its presence in patients with moderate and severe COPD. The importance of early diagnosis of left ventricular relaxation disorder and pulmonary hypertension play an important part in early identifying the risk of the patients to develop chronic cor pulmonale. Funk et al. noticed the presence of left ventricular diastolic dysfunction in COPD patients regardless of the existence of pulmonary hypertension.(8) A similar study enrolling patients

with COPD showed a close correlation between left ventricular diastolic dysfunction and blood pressure average values.(9) This study demonstrated a statistically significant correlation between left ventricular diastolic dysfunction and pulmonary arterial systolic pressure ($r = 0.3003$, $p = 0.046$). Therefore, the study of PH presence in patients with COPD has a particularly important role because of the clinical implications it holds and the prognostic importance with reduced survival. Knowing that the presence of pulmonary hypertension evidenced by echocardiography and correlated with development of left ventricular diastolic dysfunction is associated with decreased survival in patients with COPD, independent of age and FEV, it is important to early evaluate the patients with COPD by echocardiography.

CONCLUSIONS

1. Within the context of late diagnosis of COPD, it is important to actively search for the presence of pulmonary hypertension by using the noninvasive echocardiographic method, knowing the negative impact of the presence of PH, being responsible in the future years, for the occurrence of chronic cor pulmonale.
2. It seems that the presence of pulmonary hypertension is not statistically significantly correlated with the degree of respiratory functional impairment (FEV%), with age or BMI. Thus, it supports the hypothesis that many factors are involved in pulmonary hypertension determinism.
3. The presence of pulmonary hypertension correlates with left ventricular relaxation disorders, an element which hold important prognostic role in the outcome of patients with COPD. It is emphasized the importance of identifying the comorbidities frequently responsible for the alteration of this parameter, and their co-treatment, with a view to improve survival and quality of life of patients with COPD.

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