



The Cardiac Evaluation in Chronic Obstructive Pulmonary Disease Patients

KEYWORDS

chronic obstructive pulmonary disease, pulmonary hypertension, tricuspid Regurgitation, left ventricular hypertrophy and cor-pulmonale

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ABSTRACT

Objectives: To assess cardiac changes and severity in COPD patients.

Methods: Electrocardiography was performed in 93 diagnosed cases of COPD who visited department of pulmonary medicine, rohilkhand medical college and hospital, bareilly.

Results: out of 93 patients, 45% had mild, 29% had moderate, 16% had severe and 10% had very severe COPD. The frequency of cardiac abnormalities like: PH, TR, LVH and cor-pulmonale increases with increase in severity of COPD.

Conclusion: All patients of COPD should undergo screening for cardiac complication by electrocardiography, as early detection of cardiac co-morbidities can reduce the risk of mortalities.

INTRODUCTION

Chronic Obstructive pulmonary disease (COPD) is one of the leading cause of death and disability worldwide. It ranked 6th as a cause of death in 1990, will become the 3rd leading cause of death by 2020 and 3rd leading cause of death by 2020 worldwide as stated by 'the Global Burden of Disease Study'[1]. COPD is proven to be a multisystem disorder among which cardiac manifestation are most common. Approximately 50% of all hospitalization accounts for cardiovascular disease, if forced expiratory volume in one second (FEV₁) > 50% of predicted [2]. Autopsy results suggest that common contributing causes of early death in patients hospitalized with severe COPD exacerbation are concomitant complications, as follows: cardiac failure, pneumonia, and Pulmonary Thromboembolism[3]. Pulmonary Hypertension, cor-pulmonale, right ventricle dysfunction and left ventricle dysfunction are the major cardiovascular complication of COPD. Evaluation of right ventricle function, right ventricular filling pressure, tricuspid regurgitation, left ventricular function and valvular function is mainly done by non invasive and accurate method called Echocardiography[4]. Pulmonary Arterial Pressure estimated by Echocardiography and by Right heart catheter is nearly same[5,6].

AIMS and OBJECTIVES

To assess cardiac changes in COPD patients by echocardiography and there severity using GOLD guidelines.

MATERIAL AND METHODS

Ninety three diagnosed patients of COPD were selected from Department of Pulmonary Medicine, Rohilkhand Medical College and Hospital, Bareilly. Patients who were not able to perform spirometry, who had any chronic Respiratory illness except COPD and other systemic diseases were excluded from study. Routine investigations including com-

plete blood count, lipid profile, blood sugar, blood urea, serum creatinine, liver function tests, pulmonary function test, electrocardiography and so on were carried out in selected patients.

All the patients were investigated by spirometry and diagnosed and classified according to GOLD guidelines (post bronchodilator FEV₁ /forced vital capacity (FVC) ratio < 70% predicted), mild (FEV₁ ≥ 80% of predicted), moderate (50% ≤ FEV₁ < 80% predicted), severe (30% ≤ FEV₁ < 50% predicted), and very severe (FEV₁ < 30% predicted), respectively.

All patients were subjected to resting two-dimension transthoracic Doppler echocardiography in the cardiology department of Rohilkhand Medical College and Hospital. Echocardiography includes assessment of pericardium, valvular anatomy with function, chamber sizes, right ventricular filling pressure, tricuspid regurgitation and cardiac function through applying proper method by expert cardiologists.

RESULTS

Overall 93 patient were taken in our study and out of them, the number of patients with mild, moderate, severe and very severe COPD were 45%, 29%, 16% and 10%, respectively [table 1].

Table 1: Patient classification according to severity of COPD

SEVERITY OF COPD	No. OF PATIENTS (n=93)	% PATIENTS
Mild(FEV ₁ > 80% predicted)	42	45
Moderate(50%<FEV ₁ <80% predicted)	27	29

SEVERITY OF COPD	No. OF PATIENTS (n=93)	% PATIENTS
Severe(30%<FEV ₁ <50% predicted)	15	16
Very severe(FEV ₁ <30% predicted)	9	10

Electrocardiography findings in our study includes 26% of patients were with no findings, tricuspid regurgitation(TR) was found in 74% patients, mild moderate and severe Pulmonary Artery Hypertension was found in 28%, 20% and 3% patients, Cor-pulmonale and Left ventricle Hypertrophy(LVH) were seen in 24% and 11% patients [table 2].

Table 2: ECHO findings.

Findings	Number of patients(n=93)	% patients
Normal Study	24	26
TR	69	74
PH	48	52
Mild PH	26	28
Moderate PH	19	20
Severe PH	3	3
Cor-Pulmonale	22	24
LVH	12	11

In mild, moderate, severe & very severe COPD patients the frequency of PH were 17%, 52%,60% & 78% and In mild, moderate, severe & very severe COPD patients the frequency of cor-pulmonale were 12%, 15%, 40% & 44% [table 3].

Table 3: Frequency of PH and cor-pulmonale with severity of COPD.

Severity of COPD	Number and % of Patients with PH	Number and % of patients with Cor-Pulmonale
Mild(42)	7(17%)	5(12%)
Moderate(27)	14(52%)	4(15%)
Severe(15)	9(60%)	6(40%)
Very Severe(9)	7(78%)	4(44%)

In mild, moderate and severe PH patients frequency of cor-pulmonale were 12%, 74% and 100% [table 4].

Table 4: Frequency of cor-pulmonale with severity of PH

Severity of PH	Frequency of Cor-Pulmonale
Mild(26)	3(12%)
Moderate(19)	14(74%)
Severe(3)	3(100%)

DISCUSSION

COPD complication commonly includes impairment of right ventricular dysfunction and pulmonary blood vessels in its clinical course. Significant structural changes occur in pulmonary circulation in patients with COPD. Intimal thickening and medial hypertrophy in the smaller branches of the pulmonary arteries is related to presence of hypoxemia and chronic ventilator insufficiency. Remodeling, increase in blood viscosity and alteration in respiratory mechanics leads to a significant increase in pulmonary vascular resistance, the consequence of which is pulmonary hypertension. Severe PH leads to right ventricle hypertrophy. Prevalence of PH in COPD is unknown, 20-90% of patients are reported with elevation of pulmonary arterial pressure with worsening airflow obstruction[7,8,9,10]. PH in COPD progress slowly and occurs in mild as well as severe forms of disease. The incidence of PH is directly proportional to severity of COPD.

In one study the 5 year survival rates were 50% in patients with mild PH(20-30mmHg), 30% in patient with moderate to severe PH(30-50mmHg) and 0% with very severe PH(>50mmHg) and thus high degree of PH bears a poor prognosis and this also has been observed in COPD patients receiving long term oxygen therapy[11]. The present study findings reveals 52% patients of various severity of COPD have findings of PH. The frequencies of PH in mild, moderate, severe and very severe COPD were 17%,52%,60% and 78%, respectively. These frequencies are nearly similar in previous studies [12,13].Severe PH is generally present only in severe or very severe COPD[13].

Approximately 25% COPD patients develop cor-pulmonale [14]. In our study cor-pulmonale is present in 42% cases. Favouring our study cor-pulmonale was found in 40% patient with COPD in one autopsy study[15,16]. It is estimated that in United States approximately 85% patients with cor-pulmonale have COPD[14]. Left ventricular hypertrophy(LVH) was present in 11% patients in our study, in one previous study LVH was found in 25%-60% patients dying of COPD mainly in patients who had right ventricular hypertrophy.

CONCLUSION

Our study shows a high prevalence of pulmonary hypertension, cor-pulmonale and left ventricular dysfunction in patients with COPD and complications increases with severity of disease. More severe is the disease, more is its complications. At last we concluded that all patients of COPD should undergo screening for cardiac complications by echocardiography.

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