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PREVALENCE OF LEFT VENTRICULAR DIASTOLIC DYSFUNCTION IN COPD & ITS RELATION WITH DISEASE SEVERITY

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is characterized by chronic airflow limitation and various pathological changes in the lungs. COPD also presents with significant extra-pulmonary effects and is associated with various important co morbidities that may contribute to disease severity. Chronic airflow limitation(CRL) is associated with an abnormal inflammatory response of the lung to noxious particles or gases, particularly cigarette smoke. The main causes of morbidity and mortality among COPD patients are cardiovascular disease. Cardiovascular disease is the leading cause of death worldwide, and smoking is the significant modifiable risk factor related to CVD. Among COPD patients, Cardiovascular disease (CVD) is responsible for approximately 50% of all hospitalizations and 20% of all deaths. However studies have suggested that regardless of smoking status, age or sex, a COPD diagnosis increases the risk of cardiovascular morbidity and mortality by approximately about two fold. Left Ventricular Diastolic Dysfunction (LVDD) is found to be a complication of COPD due to chronic hypoxia and as a consequence of inflammatory changes in the body. Eventhough Right Ventricular dysfunction is well studied in COPD patients, the presence of Left ventricular diastolic dysfunction (LVDD) in COPD patients is associated with increase in disease severity and frequent hospital admission. Inflammation is considered to be one of the systemic manifestations of COPD and provides an alternative hypothesis to explain the relationship between airflow limitation and cardiovascular risk. The current study is undertaken to analyse the prevalence of LV diastolic dysfunction in COPD and its relation to disease severity. Also to check whether the elevated CRP correlates with the prevalence of LVDD and severity of COPD.

KEYWORDS: Chronic Obstructive Pulmonary Disease, C-REACTIVE PROTEIN, Left Ventricular Diastolic Dysfunction.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is characterized by progressive development of chronic air flow limitation which is not fully reversible as defined by GOLD (Global Initiative Of Obstructive Lung Disease). COPD(Chronic Obstructive Pulmonary Disease) is preventable & treatable disease as well. COPD includes two broad categories which are basically Chronic Bronchitis and Emphysema. By definition, Chronic Bronchitis is characterized clinically by chronic cough with expectoration for more than three months in two consecutive years . Emphysema is described as abnormal persistent distension of the air spaces distal to the terminal bronchioles associated with destruction of their walls without any obvious fibrosis.

Aims & Objectives

To assess the prevalence of Left ventricular diastolic dysfunction (LVDD) in COPD patients.

To assess the relationship between COPD severity according to GOLD criteria and grading of LVDD and its correlation with inflammatory marker C-REACTIVE PROTEIN.

METHODOLOGY

Setting: Department Of General Medicine, Govt Rajaji Hospital, Madurai Medical College, Madurai.

Study Design: Prospective and observational study.This study will be conducted in 100 COPD patients. All patients are subjected to full medical history, basic blood investigations, CXR, SPIROMERETY, ECG, C-REACTIVE PROTIEN, ECHOCARDIOGRAPHY. They are classified into group 1 & group 2 according to GOLD criteria based on PFT.GROUP I - Mild & Moderate (GOLD CLASS 1&2) and GROUP II - Severe & very severe (GOLD CLASS 3&4) and study its associations with LVDD Grading based on echocardiography & its correlation with Serum CRP.

Source of Data: COPD patients attending / admitted in Thoracic Medicine & General Medicine OPD/ Wards during the period of March 2018 to August 2018 at Govt Rajaji Hospital, Madurai.

Sample Size: 100 COPD Patients.

Study Duration: 6 Months.

Inclusion Criteria: One Hundred patients diagnosed as COPD as per Gold (Global Initiative For Chronic Obstructive Pulmonary Disease) were included in the study population.

Exclusion Criteria: Diabetes Mellitus, Systemic Hypertension, Obesity based on BMI, Other chronic lung disease like asthma, ILD, PTB, Obstructive sleep apnea , Associated other known cardiac disease like CAD, Arrythmiyas, valvular or congenital Heart disease.

Method of Collecting Data: COPD patients of varying age and sex were selected carefully using GOLD criteria. Their written consent was taken. The history was elicited. Age, height, weight were recorded. Thorough clinical examination were carried out.The performance of PFT were demonstrated. Patients were made to undergo pulmonary function tests using Medspiror, for 3 times at every 15 minutes interval and best of 3readings was taken. The Forced Vital Capacity (FVC), Forced Expiratory Volume at the end of one second (FEV1), FEV1/ FVC ratio & FEV1 Predicted were recorded. Patient belonging all stages of COPD as per GOLD guidelines were included for the study. Then they were subjected to Echocardiography and blood investigations.

Data Collection: Relevant History & Clinical Examination**,** Age, sex, Height, Weight, BMI**,** Basic blood investigations**,** C-REACTIVE PROTIEN**,** Pulmonary Function Test By Spirometry**,** Saturated Hb with o2 by Pulse oximeter**,** ECG**,** Chest Xray PA View**,** ECHOCARDIOGRAPHY.

DISCUSSION

COPD being a systemic illness, it does not affect only the lungs. COPD has varied systemic manifestations due to the chronic inflammatory mediators, Hypoxia, Hypercarbia & various metabolic factors. Several systemic disorders In the form of Anemia, Osteoporosis, Accelerated Ischemic Heart Disease, Muscle Wasting, Depression

Cardiovascular disease is a frequent cause of mortality in COPD. Roughly 30% of COPD patients die from a cardiovascular Cause. The main findings in the current study are that there was a high prevalence (73%) of LVDD in COPD patients which is associated with increased disease severity according to GOLD classification and the presence of inflammatory markers like serum C-REACTIVE PROTIEN while in other studies the prevalence was 90%, 50%.The difference in prevalence could be attributed to different numbers of patients and severity of disease included in each study, also we excluded patients with known hypertension diabetes, OSA, other chronic lung disease, other known cardiovascular disorders which is a well-known etiology of diastolic dysfunction.

The mechanisms that might explain the presence of left ventricular diastolic dysfunction in COPD patients are many. First is chronic hypoxemia leading to intracellular calcium transport disturbances which might result in abnormalities of myocardial relaxation. This mechanism usually occurs in severe cases of COPD, grade III and IV as shown in the current study.

Second is the presence of pulmonary hypertension with chronic right ventricular hypertrophy which may develop in COPD patients followed by right ventricle dilatation. During early diastole, the ventricular septum displaces toward the left ventricular cavity and the left ventricle becomes distorted from its circular configuration. The severity of left ventricular and septal deformity depends on the transseptal pressure gradient.

Thirdly, the presence of emphysema and hyperinflation which has been related to impaired left ventricle filling. This is due to increased intrathoracic pressures which may impair cardiac function by decreasing biventricular preload and increasing left ventricular afterload.

The fourth cause is the inflammation which is considered to be one of the systemic manifestations of COPD. In the present study systemic inflammation was evaluated by measuring C-reactive protein. There was a tendency towards CRP levels with higher GOLD-stage .There was a statistically highly significant difference of inflammatory markers between COPD grades and with increasing severity of disease. This finding could explain that CRP is involved in the disease process in COPD .CRP is the well-studied biomarker of systemic inflammation in COPD.

The present study showed that patients with severe and very severe grade III and IV COPD patients have statistically significant higher prevalence and higher grading of LVDD then compared with patient grade I, II COPD.

The inflammatory markers serum CRP also showed statistically significant correlations with both of FEVI predicted and LVDD. All this findings suggest that prevalence of LVDD is associated with increased disease severity according to GOLD classification and the presence of inflammatory markers serum CRP. One explanation for this association between disease severity and diastolic function could be systemic inflammation. Inflammation is considered to be one of the systemic manifestations of COPD and provides an alternative hypothesis for explaining the relationship between airflow limitation and atherosclerotic plaque formation,

which are two factors that are also associated with myocardial ischemia and left ventricular diastolic dysfunction. Furthermore, the presence of cor pulmonale secondary to pulmonary hypertension can lead to interventricular septum deviation toward the left ventricle, which alters left ventricular geometry and delays filling.

This mechanism could also explain why disease severity was associated with worse diastolic function. The cause of increased systemic inflammatory markers in COPD patients might be due to systemic hypoxia which is observed in patients with COPD, due to deterioration of lung function.

RESULTS

100 COPD subjects admitted in the Govt Rajaji Hospital were study for left ventricular dysfunction during March 2018 to August 2018.

Age of the subjects varied from 18 to 65 years of age. Males were 78, Females were 22.

COPD severity based on GOLD class as Mild – 13, Moderate - 25, Severe – 49 and Very severe - 13patients in the study.

Prevalence of LVDD dysfunction in COPD subjects was 61% of study population with Normal being 39% of study population with GROUP 1 & GROUP 2 being 39.5% and 74.5% respectively,which was statistically significant.

C – Reactive protein was positive in 35% of COPD patients in the study group, with GROUP 1 & GROUP 2 being 10.5% and 50% respectively,which was statistically significant.C – Reactive protein was positive in 26% Patients with grade 1 & 2 LVDD and 67% in Grade 3& 4 LVDD, which was statistically significant. There was also prolonged hospital stay in patients with grade 3 and 4 left ventricular diastolic dysfunction.

Thus from the study, we came to know that as the COPD individuals progress in the airflow limitation from mild to moderate, severe & then to very severe COPD stages, they encounter higher prevalence of left ventricular diastolic dysfunction with correlation of inflammatory marker which remarkably affects severity of disease and the quality of life of COPD individuals.

CONCLUSION

COPD patients in their due course of the illness develop multiple systemic complications. LVDD is one among such systemic complications of COPD. As there is progressive airflow limitation, the severity of COPD progress which results in varied grades of LVDD. In conclusion there is a high prevalence of LVDD in COPD patients which is associated with increased disease severity according to GOLD classification and with the presence high levels of inflammatory markers (CRP), and it is important to exclude decompensated heart failure during COPD exacerbation. Hence COPD patients should be regularly monitored for abnormal LVDD & managed accordingly to improve their quality of life.

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