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A RETROSPECTIVE STUDY OF ECHOCARDIOGRAPHIC FINDINGS IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS IN A TERTIARY CARE HOSPITAL

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Abstract

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a disease state characterized by the presence of airflow obstruction due to chronic bronchitis or emphysema, the airflow obstruction is generally progressive and may be accompanied by airway hyper-reactivity and may be partially reversible. Chronic bronchitis is defined as the presence of chronic productive cough on most of the days for at least 3 months, for at least 2 consecutive years. Emphysema is defined as abnormal permanent enlargement of distal air spaces, distal to terminal bronchioles, accompanied by destruction of their walls without obvious fibrosis.

Materials and Methods: This study was retrospective Study of, hospital data on echocardiographic findings in 172 COPD patients visiting the Out Patients & In Patients in 1 year from October 2023 to September 2024 at the Department of Respiratory Medicine, GVPIHC&MT, Visakhapatnam.

Results: Among 172 cases analysed in the study, mean age was 69.85 ±10.36 years with youngest being 40 and oldest being 95 years. There were 80(47%) males and 92 (53%) females in the study population (n=172). Around 40% of the individuals were having dilated right chambers of the heart and around 20% with left heart chambers dilatation. Among COPD cases commonest valvular disorder was tricuspid regurgitation (50%), followed by mitral regurgitation (30%) other valves were less involved.

Conclusion: COPD is in most instances associated with some form of cardiac abnormalies, so echocardiographic evaluation in timely basis has pivotal role in early detection of the hemodynamic and mechanical alterations like PH (Pulmonary Hypertension), Ventricular Diastolic or Systolic dysfunctions, (LVDD or LVSD), Tricuspid Regurgitation(TR), Ventricular Failures, dilated cardiac chambers, Left Ventricular Hypertrophy (LVH) ,corpulmonale etc.

Key Words: Chronic Obstructive Pulmonary Disease, Cardiac Abnormalies, Spirometry, and Echocardiographic Evaluation.

INTRODUCTION

Chronic Obstructive Pulmonary Disease is a disease state characterized by the presence of airflow obstruction due to chronic bronchitis or emphysema, the airflow obstruction is generally progressive and may be accompanied by airway hyper-reactivity and may be partially reversible.[1] Chronic bronchitis is defined as the presence of chronic productive cough on most of the days for at least 3 months, for at least 2 consecutive years. Emphysema is defined as abnormal permanent enlargement of distal air spaces, distal to terminal bronchioles, accompanied by destruction of their walls without obvious fibrosis.[2]

COPD is a leading cause of death and disability worldwide. In India, COPD is the second most common lung disorder after pulmonary tuberculosis and remains a major public health problem. Risk factors for COPD include both host factors like alpha-1 antitrypsin deficiency and environmental exposure like tobacco smoke and the disease usually arises from an interaction between these 2 types of factors.[3] Diagnosis of COPD is confirmed by an objective measurement of airflow obstruction by spirometry. COPD has been classified by severity according to GOLD guidelines into 4 stages - Stage I: Mild COPD (FEV1/FVC < 0.7, FEV1 $\geq 80\%$ predicted), Stage II: moderate COPD (FEV1/FVC < 0.7, FEV1 $\geq 50\%$ but $< 80\%$ predicted), Stage III: Severe COPD (FEV1/FVC < 0.7, FEV1 $\geq 30\%$ but $< 50\%$ predicted), Stage IV: Very severe COPD: (FEV1/FVC < 0.7, FEV1 $< 30\%$ predicted).[4]

Echocardiography is portable, non-invasive and relatively accurate method for evaluating the cardiac status. The right ventricular function, right ventricular filling pressure, left ventricular functioning, valvular function and tricuspid regurgitation can be assessed through echocardiography. The pulmonary artery pressures obtained through echocardiography is comparable to the values obtained through right heart catheterization. It aids in rapid and early detection of cardiac dysfunction and thus help in early initiation of treatment. Early recognition of RV dysfunction and initiation of treatment can prolong the survival of COPD patients as most of the increased mortality associated with COPD is due to cardiac involvement. Echo can thus serve as a useful aid to reduce mortality and morbidity associated with COPD.

Present study was done to study the effect of COPD in cardiac anatomical & functional parameters and observe the hemodynamic and mechanical alterations like Pulmonary Hypertension, Ventricular Diastolic or Systolic dysfunctions, Ventricular Failures, dilated cardiac chambers, Valvular Abnormalies, corpulmonale etc.

Materials and Methods: This study was retrospective Study of, hospital data on echocardiographic findings in 172 COPD patients visiting the Out Patients & In Patients in 1 year from October 2023 to September 2024 at the Department of Respiratory Medicine, GVPIHC&MT,

Visakhapatnam. The diagnosis of COPD was made based on Post Bronchodilator Spirometry and in selective cases radiological investigations like Chest X-ray (PA view & Lateral View), HRCT Thorax . Among the patients with anticipated cardiovascular remodeling due to COPD is usually advised for the echocardiographic assessment in our institution. The properly managed data in record keeping book in 12 months were addressed for this study after ethical approval from institutional review committee.

Inclusion criteria: COPD patients

Exclusion criteria: Patients having preexisting other respiratory and cardiovascular comorbidies like bronchial asthma, tuberculosis, hypertension, valvular heart diseases were excluded.

Study Design, population and Method: Retrospective Case study in the Department of Respiratory Medicine, GVPIHC&MT, Visakhapatnam.

Sample Size (n) & Study Period: Hospital data from October 2023 to September 2024, was observed and total 196 cases diagnosed as COPD. 24 cases excluded as per Exclusion criteria.

Sample Size: 196 -24=172.

Echocardiographic examination was done to see cardiac structural and functional abnormalies due to remodeling associated with underlying COPD. Those echocardiographic findings were recorded manually in the record book of Echo-room.

Statistical Analysis: Data will be organised using Microsoft Excel Software and statistically analysed using SPSS 24 Software. Frequency analysis is done using Descriptive analysis.

RESULTS

Among 172 cases analysed in the study, mean age was 69.85 ±10.36 years with youngest being 40 and oldest being 95 years. There were 80(47%) males and 92 (53%) females in the study population. (n = 172)

Heart Chamber	Normal	Dilated
Right Atrium (RA)	98 (57%)	74 (43%)
Right Ventricle(RV)	102 (59%)	70 (41%)
Left Atrium(LA)	130 (76%)	42 (24%)

Left Ventricle(LV)	134 (78%)	38 (12%)

Table 1: Status of the heart chamber among the COPD patients

Around 40% of the individuals were having dilated right chambers of the heart and around 20% with left heart chambers dilatation.

PAH Category	Frequency	Percentage
Normal (PASP≤25)	82	48
Mild (PASP 25-49)	38	22
Moderate (PASP 50-69)	38	22
Severe (PASP ≥70)	14	8

Table 2: Distribution of patients by Pulmonary Arterial Hypertension

	None	Mild	Moderate	Severe
Aortic regurgitation (AR)	142 (83%)	24 (14%)	6 (3%)	0
Mitral regurgitation(MR)	124 (72%)	38 (12%)	4 (2%)	6 (4%)
Tricuspid regurgitation(TR)	86 (50%)	36 (21%)	38 (22%)	12 (7%)
Pulmonary regurgitation(PR)	172 (100%)	0	0	0
Mitral stenosis(MS)	170 (99%)	2(1%)	0	0
Aortic stenosis(AS)	168 (98%)	2(1%)	0	2(1%)
Pericardial effusion (PE)	170 (99%)	2(1%)	0	0

Table 3: Valvular condition among COPD cases (n = 172)

Among COPD cases commonest valvular disorder was tricuspid regurgitation (50%), followed by mitral regurgitation (30%) other valves were less involved.

Ventricular functional parameter	Yes	No
Left ventricular diastolic dysfunction	64 (37%)	108 (63%)
Concentric left ventricular hypertrophy	12 (7%)	160 (93%)

Left ventricular systolic dysfunction	52 (30%)	120 (70%)

Table 4: Left ventricular functional status among COPD patients: (n = 172)

Among the various factors analyzed in echocardiographic assessment; there was significant association between the PH with right atrial dilatation, right ventricular dilatation, left atrial dilatation, LVDD, Tricuspid regurgitation ($p<0.05$) while rest of the parameters did not have.

DISCUSSION

COPD is a chronic lung parenchymal disease of elderly group usually after 40 years which was found true with our study with mean age of patients being 69.85±10.36 years and this is also supported by other studies as well.[6] Pulmonary arterial hypertension is the common finding with those individuals with COPD and this study revealed 90(52%) individuals having PH which is comparable with another study where PH was 55% among COPD cases. In contrast one small study including 100 COPD patients showed PH in 70% and while two other shared quite low 38.7%, 19% PH study with severity of the disease while present study showed association of right chamber dilatation and left atrium dilation with PH.[7]

In our study, among 172 cases in 37% of the cases left ventricular diastolic dysfunction and in 30% of the individual left ventricular systolic dysfunction was present in contrast REPENSAR study revealed slightly lower rate of ventricular dysfunction of 17%.[8] Same study stresses the congestive heart failure being co-existing comorbidity of COPD cases and it has negative impact on patient survival so timely echocardiogram evaluation is needed to early diagnosis and intervention of the effect of COPD on heart. Echocardiographic evaluation readily and reliably detects the PH. The Copenhagen City Heart Study showed LVH prevalence significantly high in COPD (17.7%) than without COPD (12.1%). Same study also stresses, patients having COPD will have high cardiovascular diseases.[9]

Among valvular disorder associated with COPD, tricuspid regurgitation was commonest one (50%) with different severity in our study and depending on the study sample and community it varies and one study showed TR in 77% of the COPD paents. Left ventricle abnormalies like dilated left ventricles, LVDD, concentric ventricular hypertrophy, LVSD are also present in significant number of COPD patients in our study accounting 22%, 37%, 7%, 30% respectively while in another study, left ventricle enlargement was seen in 6%, LVDD in 12%, LVSD in 13%.[10]

CONCLUSION

COPD is in most instances associated with some form of cardiac abnormalies so echocardiographic evaluation in timely basis has pivotal role in early detection of the hemodynamic and mechanical alterations like PAH, LVDD, LVSD, TR, dilated cardiac chambers etc.

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