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Orginal research article

ECHOCARDIOGRAPHIC EVALUATION OF CARDIA IN CHRONIC OBSTRUCTIVE LUNG DISEASE.

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Abstract :

Background: Cardiovascular disease is a significant cause of morbidity and mortality in COPD.. Echocardiography provides a rapid, non-invasive, portable, and accurate method to evaluate the cardiac changes. The aim of this study was to assess the cardiac changes secondary to COPD by echocardiography. **Methods:** A total 100 of patients of COPD were selected and staged by spirometry and evaluated by 2DECHO echocardiography.

Results: The patients were divided into mild, moderate, severe and very severe COPD in our study. On echocardiography evaluation of COPD, 30 cases were normal echocardiography parameters. Pulmonary hypertension was observed in 70 . Right ventricle was enlarged in ECHO in 46 of patients. Right atrium was enlarged in ECHO in 60 of patients. Measurable tricuspid regurgitation (TR) was observed in 72 cases.

Conclusions: Prevalence of cardiac changes are common and increases as the severity of COPD increases. It is recommended that echocardiography should be done early in all cases of COPD to diagnose the cardiac complications of COPD, so that early interventions can be undertaken in order to improve quality of life and decrease mortality and morbidity in COPD patients.

Keywords: COPD, Cardiac dysfunction, Echocardiography

Introduction:

Chronic obstructive pulmonary disease (COPD) is expected to be the third leading cause of mortality in 2020. [1] COPD is a leading cause of death and disability worldwide. In India, significant cardiac manifestations. Cardiovascular disease accounts for approximately 50% of all hospitalization and nearly one third of all deaths of COPD patients, if FEV1 >50% of the

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predicted[2]. In more advanced COPD cases, cardiovascular disease account for 20%-25% of all deaths.[3]

We based on history, physical examination, chest radiography, and that post bronchodilator ratio of forced expiratory volume in 1st sec (FEV1) to vital capacity is less than 0.7 to diagnose COPD according to GOLD guidelines 2017. Ratio was measured by spirometry (3500 Spirometer; Viasys Micro Lab., England) with consideration of recommendations of American Thoracic Society/European thoracic society COPD is the second most common lung disorder after pulmonary tuberculosis and remains a major public health problem. COPD is associated with

Patients and methods :

We performed a prospective cross-sectional study on 100 patients with stable COPD who presented to Department of Medicine SIMS shivamogga from septomber 2022 to april 2023

We measured all parameters with American Society and European Association of Echocardiography recommendations[5]. All parameters were measured at end expiration as follows: we used M-mode and twodimensional techniques to asses left ventricular ejection fraction and dimension techniques in short-axis and long-axis left parasternal views. We measured peak velocity of early diastolic flow (E), peak velocity of atrial contraction (A), and their ratio (E/A) to evaluate left ventricular diastolic function. We measured them over the mitral valve in apical fourchamber view with color flow imaging for optimal alignment of pulsed wave Doppler with blood flow. Right ventricular (RV) size was assessed by measurement of right internal mid- cavity dimension in apical four-chamber view.Wemeasured tricuspid annular plane systolic excursion (TAPSE) in apical four-chamber view to asses RV systolic function. We used color flow Doppler technique to identify tricuspid regurge flow and continuous wave Doppler for measurement of the maximum jet velocity. The modified Bernoulli equation was used to estimate right ventricular systolic pressure (RVSP). Bossone et al.[6]. consider RVSP to be equal to the systolic pulmonary artery pressure (sPAP): sPAP (mmHg)=RVSP=trans-tricuspid pressure gradient+right atrial pressure. Right atrial pressure was predicted by using the inferior vena cava size and collapsibility index. We defined PH as sPAP more than or equal to 35 mmHg[7].

Aim : We used echocardiography to evaluate cardiac function in patients with COPD and correlated echocardiographic findings with COPD severity.

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Statstical analysis :

We used IBM statistical analysis of social sciences statistics software (version 22.0, 2013; IBM Corp., Chicago, Illinois, USA), for statistical analysis. We used descriptive statistics for normally distributed quantitative data such as minimum and maximum range with mean±SD and for qualitative ones, number and percentage.

We used independent t test in cases of two independent groups with normally distributed data for quantitative variables, and for analysis of qualitative data, we used inferential analyses for independent variables. $\chi 2$ test was used for differences between proportions, and Fisher's exact test for variables with small expected numbers. Pearson's correlation was used for qualitative data and partial correlation test for controlling age. We considered that level of significance at P value less than 0.050 is significant, and more than that value is not significant.

Results:

Our study included 90 males and 10 females, with mean age of 58.4±7.7 years, ranging from 40 to 79 years old . Normal echocardiography was seen in 30cases in our study.

In the analysis of echocardiographic findings, our study showed 70 of the patients had echocardioghaphic evidence of pulmonary arterial hypertension. There was statistically significant correlation between severity of COPD and PAH with correlation coefficient of +0.434 and p value <0.05 (Table 1).

Spearman's correlation coefficient between severity of COPD and prevalence of RV enlargement was +0.395 and p value was 0.005. So, as the severity of COPD increased, prevalence of cor-pulmonale/RV enlargement also increased significantly (Table 2).

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Prevalence of right atrial enlargement also correlated significantly with severity of COPD with correlation coefficient of +0.307 and p value of <0.05 (Table 3).

On correlating presence of TR with severity of COPD, statistically significant positive correlation was found with spearman's correlation coefficient of +0.387 and p value of <0.05 i.e. as severity of COPD increased, prevalence of tricuspid regurgitation also increased significantly (Table 4).

Table 1: Comparison of PAH in echo according toseverity of disease

Severity of COPD	PAH present(70)	No PAH(30)
I	0	2
II	15	14
III	50	14
IV	5	0

Table 2: Comparison of RV size in ECHO accordingto severity of disease

Severity of COPD	Normal(54)	Enlarged(46)
I	4	01
II	25	10
III	20	15
IV	5	20

Table 3: Comparison of RA size in ECHO accordingto severity of disease

Severity of COPD	Normal(40)	Enlarged RA(60)
I	4	01
II	15	14
III	16	25
IV	5	20

Table 4: Comparison of TR in ECHO according toseverity of disease.

Severity of COPD	Normal(2)	TR (72)
I	4	01
II	15	11

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III	**16**	**20**
IV	**5**	**40**

Discussion

The cardiac manifestations of COPD are numerous. Impairment of right ventricular function and pulmonary blood vessels are well known to complicate the clinical course of COPD and co-relate inversely with survival.

In this study, mean age was 59.52±12.53 years. COPD is more common in males and smokers in 5^{th} to 7^{th} decade of life.

The range of duration of disease was 4-20 years with the mean duration being 11.08±4.83 years. In study by Shreshta B et al[8], more than half of the COPD patients were in age group 60-75 years, followed by less number of patients (approximately 20.0%) in both 45-59 years and 75-89 years age groups.

On analysis by echocardiography, there is high prevalence of cardiac dysfunction in COPD patients with tricuspid regurgitation and pulmonary arterial hypertension being the most common cardiacmanifestations of COPD

PAH in ECHO in our study waspresent in 70% patients. Tiwari et al[9], 2015 found that PAH was present in 52 of COPD patients and prevalence inmild, moderate, severe and very severe patients was 17%,52%, 60% and 78% respectively.[9]

In this study of total 100 patients, RV was enlarged in ECHO in 46% of patients . Jain et al,[10] found that right ventricular dilatation was present in 66.7% of COPD patients and prevalence in mild, moderate, severe and very severe patients was 66.6%, 66.6%, 60% and 100% respectively. So the present study is comparable to the previous studies. The present study also showed a statistically significant correlation between right ventricular enlargement and severity of COPD with spearman's correlation coefficient of +0.395 and p value 0.005. So as severity of COPD increases, incidence of RV enlargement also increases.

Out of total 100 patients, RA was enlarged in ECHO in 60% of patients. Jain et al[10], found that right atrial enlargement was present in 50% of COPD patients and prevalence in mild, moderate, severe and very severe patients was 41.6%, 53.3%, 60% and 100% respectively.

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Our study also showed a statistically significant correlation between right atrial enlargement and severity of COPD with spearman's correlation coefficient of +0.307 and p value 0.03.

Out of total 100patients, TR was present in ECHO in 72 % of patients. Tiwari et al[9], observed that tricuspid regurgitation was present in 74.2% of COPD patients.[9] These findings were comparable to our study. The present study showed a statistically significant correlation between tricuspid regurgitation and severity of COPD with spearman's correlation coefficient of +0.387 and p value 0.005. So as severity of COPD increases, incidence of tricuspid regurgitation also increases

Conclusion :

The echocardiographic finding of pulmonary arterial hypertension, right ventricular enlargement, right atrial enlargement and tricuspid regurgitation positively correlated with severity of COPD as evidenced by echocardiographic finding of increased prevalence of these conditions with increasing severity of COPD. So, prevalence of cardiac dysfunction increases as the severity of COPD increases and echocardiography helps in analysis of cardiac complications of COPD. It is recommended that echocardiography should be done early in all cases of COPD to diagnose the cardiac complications of COPD, so that early interventions can be undertaken in order to improve quality of life and decrease mortality and morbidity in COPD patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by theinstitutional ethics committee

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