



Evaluation of Cardiac Function by Echocardiography in Chronic Obstructive Pulmonary Disease Patients and its Correlation with Disease Severity

Authors

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Abstract

COPD IS A leading cause of death and disability worldwide. COPD has considerable effects on cardiac function, most of the increased mortality associated with COPD is due to cardiac involvement specially pulmonary artery hypertension, cor-pulmonale, cardiac arrhythmias, congestive heart failure and pulmonary embolism. Echocardiography provides a rapid, non-invasive portable & almost accurate method to evaluate cardiac function.

Introduction

COPD is defined as a disease state characterized by airflow limitation that is not fully reversible. In India COPD is the most common lung disorder after pulmonary tuberculosis and remains a major health problem. According to World Bank data it is expected to move from status in 2000 as the 4th and 12th most frequent case of mortality and morbidity, respectively 3rd and 5th leading case of mortality and morbidity respectively in 2020.

Prevalence in men could increase from 2 to 22% and in women from 1.2 to 19%^[1]. COPD has considerable effect on cardiac function. Most of the increased mortality associated with COPD is due to cardiac involvement specially, pulmonary artery hypertension, cor-pulmonale, cardiac arrhythmias, congestive heart failure and pulmonary embolism. Right ventricular dysfunction is common in patients with COPD. Pulmonary artery hypertension, cor-pulmonale

and tricuspid regurgitation are major cardiovascular complications. Echocardiography can be used to assess ventricular dimensions, wall thickening and ventricular volume overload in patients with COPD. 2D echocardiography may be technically difficult in patients with COPD because of increase in retrosternal air which transmits sound waves poorly but an adequate examination assess cardiac function more accurately .

Material and Methods

The study was conducted in the department of medicine, Vardhaman Mahavir Medical College and Safdarjung Hospital New Delhi for the period of 2 years the study will include 40 patients diagnosed with COPD attending OPD and IPD in department of medicine.

Inclusion Criteria- All diagnosed COPD patients

Exclusion Criteria- known case of lung carcinoma, bronchial asthma, active pulmonary tuberculosis, diabetes, hypertension, any cardiac illness.

Methods

All selected patients were subjected to routine investigations including CBC, LFT, KFT, Blood sugar, Lipid profile followed by spirometry diagnosed and classified according to GOLD guidelines (FEV1/FVC ratio<70% predicted), mild (FEV1 \geq 80%), moderate (50% \leq FEV1<80%), severe(30% \geq FEV1<50%) and very severe (FEV1<30%) respectively. Then all were subjected to resting 2D echo in the cardiology department of VMMC and Safdarjung Hospital by expert cardiologist.

Measurement of pulmonary artery pressure- $PASP=4V^2+CVP$. PH was classified into mild moderate and severe category as PASP 30-50,50-70 and >70mm Hg respectively. Left ventricular systolic function by measuring ejection fraction (56-78%). left ventricular diastolic dysfunction (LVDD)=early rapid filling (E)/ late filling (A) ratio. Cor-pulmonale dilation of RA and RV, PAH, TR and clinical feature.

Observation and Result

In this cross sectional study we include a total of 40 patients of COPD (male=57.50%, female=42.50%) between the age of 18 to > 60 years in which mean age of the patients were 51.8+9.33 standard deviation. Out of 40 COPD cases mild, moderate, severe and very severe COPD cases were 17(42.50%), 10(25%), 6(15%), and 7(17.50%) respectively. Echocardiographic changes present in 21 (52.50) cases out of 40 patients. Most common echocardiographic finding is pulmonary artery hypertension 19(47.50%) followed by RA dilated 12(30%), left ventricular diastolic dysfunction (LVDD) 15(37.50%), Tricuspid regurgitation (TR) 11(27.50%), RV dilated 10(25%), cor-pulmonale 10(25%), RVH 10(25%), RVSD 5(12.50%), LVSD 2(5%) respectively. In our study various stages of severity of COPD reveals that as severity of COPD increases the prevalence of cardiac dysfunction increases, so more severe COPD is associated with more prevalent and more severe cardiac manifestation. The distribution of patients according to relation of various echocardiography findings of COPD showed statistically significant relation with severity of COPD. (P Value < 0.05)

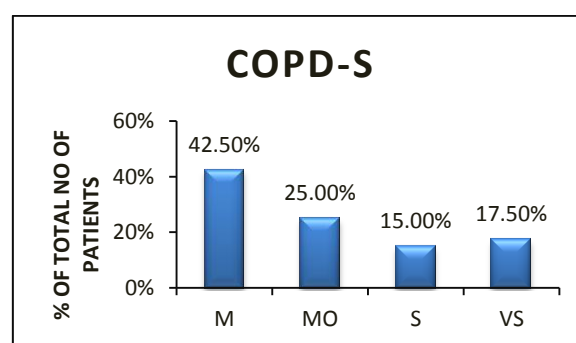


Figure 1: Distribution of COPD cases according to severity.

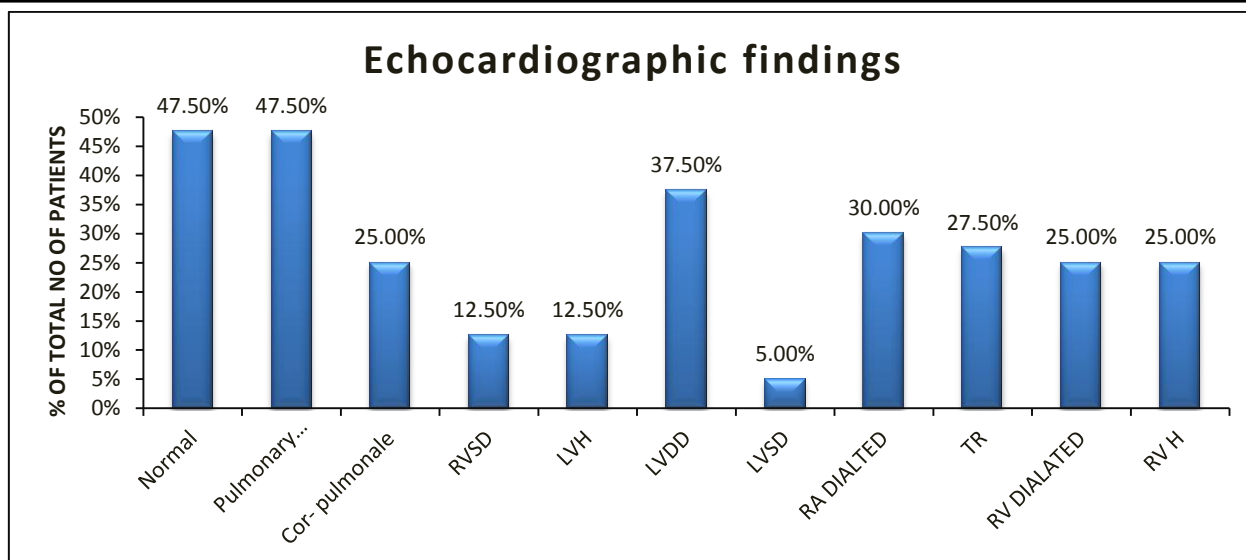


Figure 2: Distribution of echocardiographic finding in COPD

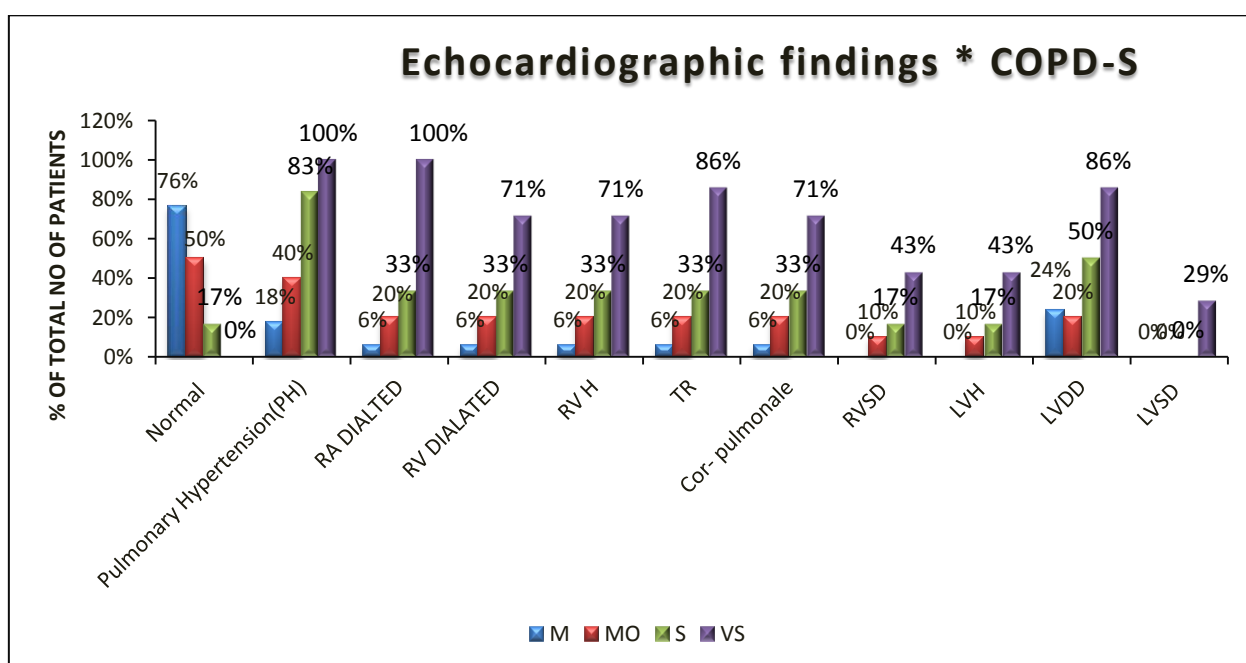


Figure 3: Distribution of echocardiographic finding according to severity of COPD.

Discussion

COPD has considerable effect on cardiac function including those of right ventricle, left ventricle and pulmonary blood vessels. Most of the increased mortality associated with COPD is due to cardiac involvement. In the present study, it was observed that majority of patients were in age group 51-60 years (42.50%). The mean age of patients was 51.8 ± 9.33 years. In a study conducted by D. Radhakrishnan et al^[2] mean age of presentation was 61.63 years and COPD was more common male than female. In our study, the

distribution of patients according to severity of COPD showed that majority of patients were having mild COPD (42.50%) followed by moderate COPD (25%) severe and very severe COPD observed in 15% and 17.5% patients respectively. In a study done by N.K. Gupta et al^[3] to assessed the cardiac changes secondary to COPD by echocardiographic findings and severity of COPD observed out of 40 patients mild, moderate, severe and very severe COPD were 45%, 27.5%, 12.5% and 15% respectively. In our study, pulmonary hypertension (47.5%) was the

chief finding followed by LVDD (37.5%) among patients with COPD. The other findings included RA dilated (30%), TR (27.50%), RV dilated (25%), RVH (25%), Cor-pulmonale (25%), RVSD (12.5%), LVH(12.5%) and LVSD(5%). Ramakrishna Racha konda et al^[4] studied echocardiographic finding among COPD patients and observed that pulmonary artery hypertension was seen in 94.84%, RVH was seen in 26.82%. In our study RVH was found in 25% of cases, RA & RV dilated in 30% and 25% respectively. In the present study, the distribution of patients according to relation of cor-pulmonale with severity of COPD showed that among 10 patient with cor-pulmonale majority of patients having very severe COPD (71.43%) followed by severe (33.33%) and Moderate (20%). The various comparative studies of various stages of severity of COPD reveals that as severity of COPD increases the prevalence of cardiac dysfunction increases, so more severe COPD is associated with more prevalent and more severe cardiac dysfunction.

Conclusion

Echocardiography provides a rapid, non invasive portable and accurate method to evaluate the right ventricular function, right ventricular filling pressure, tricuspid regurgitation, left ventricular function and valvular function. Echocardiography is very sensitive even in mild to moderate COPD patients. It is important to assess a patients of COPD not only with clinical, radiological, spirometry criteria but also with echocardiographic findings as echo parameter can assess the severity and outcome of the disease better. 2D echocardiography is more sensitive than radiography and clinical methods in detecting cardio vascular complication in COPD patients.

References

1. Murray CJ, Lopez AD. Evidence based health policy lessons from the global burden of disease study. *Science J.* 1996;274:740-743.
2. Krishnan RD, Srihari B. A study on the severity of right ventricular dysfunction in correlation with the severity of lung dysfunction in chronic obstructive pulmonary disease patients – COPD. *Am J Sci Med Res.* 2015;1:112-119.
3. Gupta NK, Agrawal RK, Srivastav AB, Ved ML. Echocardiographic evaluation of heart in chronic obstructive pulmonary disease patients and its co-relation with severity of disease. *Lung India J.* 2011;28:105-109.
4. Rachakonda R, Beri S, Kalyankumar PV. Study of ECG and echocardiographic findings in COPD patients in a tertiary care center. *J Evolution Med. Dent. Sci.* 2016;5:1276-1280.