VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

STUDY OF SPIROMETRIC PROFILE AND CARDIOVASCULAR CHANGES IN COPD

Medicine

KEYWORDS:

HARITA KRISHNA VEERAPANENI — Post Graduate, Department of Pulmonary Medicine, ASRAM Medical College, Eluru, Andhra Pradesh, India,

P.YUGANDHAR — Professor, Department of Pulmonary Medicine, Asram Medical College, Eluru, Andhra Pradesh

SATYA SRI SUNNAM — Professor & HOD, Department of Pulmonary Medicine, Asram Medical College, Eluru, Andhra Pradesh

ABSTRACT

Background: COPD is leading cause of morbidity and mortality worldwide. The major morbidity of COPD is due to its impact on cardiac performance caused by pulmonary hypertension. This study attempts to assess the ECG and ECHO changes in COPD and to correlate with the duration and severity of the disease.

Methods: 50 patients of COPD admitted to Alluri Sitaramaraju Academy of Medical Sciences, Eluru between September 2014 to September 2015, who met inclusion criteria were randomly selected. Detailed history and physical examination findings were recorded. Investigations like CXR, ECG, 2D ECHO, Spirometric evaluation of FEV1, FVC and ratio of FEV1/FVC were done.

Results: The mean age of presentation was 66.87 ± 7.21 years with male predominance. Mean duration of dyspnoea 7.013 ± 5.0439 and cough of 9.092 ± 6.303 years. Majority of patients had severe disease and had smoking history more than 20 pack years (mean 56.9 ± 23.99). ECG and Echo findings that showed significant correlation with severity were 'p' pulmonale, right axis deviation, right bundle branch block, right ventricular hypertrophy and poor 'r' wave progression, RA & RV dilatation, RV failure, pulmonary hypertension and cor-pulmonale. Diagnosis of cor-pulmonale clinically was 36%, ECG 44%, Echocardiographically 54%.

Conclusion: COPD is more common in males in the 6th and 7th decade. Most of them have fairly advanced disease at presentation. The incidence of ECG and ECHO findings increase as the severity and duration of disease increases and echocardiography is better than ECG or clinical methods in detecting RV Dysfunction.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) which encompasses both chronic bronchitis and emphysema is one of the commonest respiratory conditions of adults not only in the developed world but also in the developing world as smoking epidemic is rapidly increasing in developing world. But unlike developed world where smoking is equally prevalent in both the sexes it's uncommon in females in developing world especially in India. Chronic obstructive pulmonary disease is one of the leading causes of morbidity and mortality in adults all over the world. The epidemiological scenario is expected to worsen and World Health Organization predicts that COPD will become the third leading cause of death (currently fourth) and fifth leading cause of disability (currently twelfth) worldwide by year 2020.[1,2] COPD is characterized by slowly progressive air flow obstruction, resulting in dyspnoea and exercise limitation, and pulmonary arterial hypertension is its major cardiovascular complication.[3] Right ventricular dysfunction is common in patients with COPD particularly in those with low oxygen saturation. It occurs in upto 50% of patients with severe COPD.[4] When present; it can reduce exercise tolerance, increase dyspnoea, and contribute to an overall decrease in functional status, and portends a higher mortality rate. Its recognition and treatment may lead to prolonged survival and improved quality of life.

AIM

To study Spirometric profile and cardiovascular changes in chronic obstructive pulmonary disease and to correlate electro cardiographic and echocardiographic findings with duration and severity of the disease

METHODOLOGY

Study was undertaken in 50 patients with COPD above 30 years of age including both the gender at ASRAM Medical college Eluru over period of 1 year. Detailed history about the symptoms like cough, sputum production and severity of breathlessness was asked. Patients were asked for history of swelling of legs, distension of abdomen, puffiness of face, headache, drowsiness, fatigue and decreased urine output. History suggestive of tuberculosis, bronchiectasis, ischemic heart disease, bronchial asthma and rheumatic heart disease to exclude them from the present study. Detailed physical examination to look for signs like pedal oedema, cyanosis, flapping tremors, raised JVP, tachypnoea, use of accessory muscles of respiration, decreased chest movements with respiration, hyper resonant note on percussion, prolonged expiratory phase of breathing with rhonchi, loud P_2, parasternal heave and tender hepatomegaly. All patients were subjected to Routine blood investigations, Urine analysis Sputum analysis for AFB stain, gram stain, culture and sensitivity, ELISA for HIV, Arterial blood gas analysis, Chest X-ray PA views and lateral views were taken for all patients, 12 lead Electrocardiograph, All patients were subjected to both 2 D Echocardiogram to note the presence of pulmonary hypertension, right ventricular hypertrophy, right ventricular dilatation and right ventricular failure, Spirograms were obtained for each patient. Four parameters were taken i.e. FEV1, FVC and FEV1/FVC %.

Statistical analysis

Data analysis was done using mean, standard deviation and Chi square test. P value significance taken less than 0.05.

RESULTS:

A total of 50 cases were studied. Of this 82% were male and 18% were females. The mean age of presentation in this study group is 66.86 ± 7.29 years and range is 52 to 87 years. Maximum number of COPD patients were clustered in the age group of 60 to 79 years that is in the seventh and eighth decade (78 %). No of patients less than 50 years were 16% and only 6% of the patients were aged 80 years and above. The mean duration of symptoms was 9.88±6.123 years, ranged between 2 and 25 years. Maximum number of patients (52%) had symptoms of 1 to 9 Years duration, followed by 10 to 19 years (38%). Patients presenting with duration of symptoms above 20 years were on 10%. The mean FEV1 was 42.14±11.63 percentage of predicted, ranged between 25 and 66% of predicted. Maximum number of patients (58%) had severe airflow obstruction at the time of presentation followed by 28% patients who had moderate airflow obstruction and 14% of them had very severe airflow obstruction.

The mean duration of tobacco use was 56.9 pack years with range from 24 to 110 pack years. Majority of the patients (64%) had history of tobacco exposure for more than 40 pack years. All patients in this

study had history of more than 20 pack years of tobacco exposure. Majority of patients with severe disease (i.e. 18/29 patients) and very severe disease (i.e. 4/7 patients) had history of more than 40 pack years of tobacco exposure.

All patients in this study had history of breathlessness at presentation. 90 % of the patients had history of cough with sputum production. 38% of the patients presented with swelling of the legs and 24% of the patients presented with symptoms suggestive of CO_2 narcosis like headaches, drowsiness, and lethargy. The most common sign at presentation was tachypnoea (88%) followed by loud P2 (46%). 36% of patients had signs suggestive of right heart failure (elevated JVP, pedal oedema, tender hepatomegaly). 24% of the patients had cyanosis and 10% of the patients had clubbing.

The most common ECG abnormality in present study in right axis deviation of P wave (64%) followed by right axis deviation of QRS complex (60%). 42% of the patients in this study had P pulmonale and right bundle branch block (complete and incomplete). R wave amplitude in V5 or V6 < 5mm and R/s ratio in V5 or V6 < 1 is seen in 28% and 24% of patients respectively. R wave amplitude in V1 ≥ 1 is seen in 8% and 32% of patients respectively. Only three patients had S1S2S3 syndrome. Statistical analysis showed significant correlation between ECG findings like right axis deviation of P wave, amplitude of R wave in V_5 or V_6 < 5mm, R/S ratio in V_5 or V_6< 1 and severity of the disease. ECG findings like right bundle branch block, R wave amplitude in V_1>7 mm and R/S ratio in V_1 were not found to correlate with severity of the disease. In the present study R wave amplitude in V_5 or V_6 < 5mm, R/S ratio in V_5 or V_6< 1 , RAD of QRS were found to significantly correlate with duration of the disease. But other ECG parameters like right axis deviation of P wave, right bundle branch block, R wave amplitude in V_1>7 mm and R/S ratio in V_1 were not found to correlate with duration of the disease.

54% of the patient in this study had echocardiographic evidence of cor pulmonale. 54% had echocardiographic evidence of pulmonary hypertension. 42% patients had right ventricular Dilatation and 32 % had right ventricular hypertrophy, 34% had right atrial dilatation, 8 % of the patient had echocardiographic features of RV failure and 18% had Intraventricular septal motion abnormalities. In the present study R.V wall hypertrophy and cor pulmonale were found to significantly correlate with duration of disease. But other Echo findings like R.A Dilatation, R.V Dilatation, R.V Failure, Pulmonary hypertension were not found to correlate with duration of the disease.

DISCUSSION

In this study males form 82% of patients, comparable to other studies[5,6]. This higher incidence of COPD in males can be attributed to higher incidence of smoking amongst men. In this study none of the women was a smoker, but all of them had history of cooking with dried wood fuel and other biomass exposure. As with the previous studies[7,8], the maximum number of patients were in the age group of 60 to 79 years with mean age 66.87 (±7.21) years. As with the previous studies[8,9,10] most of the patients (26/50) gave history of symptoms of 1to 9 years duration, with a mean duration of dyspnoea 7.013 ±5.0439 and cough of 9.092 ±6.303 years.

Most of the patients in the present study had tachypnoea (44/50) at presentation. Clinical signs of pulmonary hypertension were present in 46% (23/50) of the patients. This can be explained by the fact that clinical signs of pulmonary hypertension and cor pulmonale are usually found in advanced cases as they are masked due to hyperinflation of lungs.

Among ECG changes Right axis deviation of QRS was present in 60% (30/50) of the patients in the present study when compared to previous studies[11,12]. Incidence of R/S ratio in V1 > 1 ranges from 7-7.5% and the findings of 32% in the present study of this range. Milnor et al [13] has emphasized the importance of inclusion of this criteria in the diagnosis of RVH and states that tall R and R' in V1 is the result of vectors of increased magnitude from the hypertrophied right ventricle. The incidence of R wave amplitude in V1 >7mm ranges from 2.6% - 21% and the finding of 8% in this study is well within this range and comparable with Murphy and Hutcheson[12] study**.** The large number of patients showing a dominant S wave in V5 and V6 confirms that it is important pointer to RVH. Silver & Calatayud[14] in a group of 173 patients with COPD with impaired lung function, found that R wave amplitude in V6 ≤ 0.5 mV and R/S ratio in V6<1 were the best QRS criteria for RVH. This was supported in study by Murphy and Hutcheson. So our study correlates with Murphy and Hutcheson[12] and Silver & Calatayud[14] studies. In our study 38%(19/50) patients found to have incomplete RBBB. This could be due to presentation of more severe cases.

Statistical analysis showed significant correlation between ECG findings like right axis deviation of P wave, R wave amplitude in V5 or V6 < 5mm and R/S ratio in V5 or V6<1 and severity of the disease. But ECG findings like RBBB, R wave amplitude in V1>7mm an R/S ratio in V1>1 did not correlate with the severity of the disease. Most of the patients in our study belonged to the category of severe degree (58%) of COPD according to GOLD criteria, followed by moderate degree (28%) of COPD. Caird and Wilcken[15] (1962), observed that 'P' pulmonale and evidence of RVH are much more frequent when FEV1 falls below 45% of normal than above it.

While correlating ECG findings with duration of symptoms data regarding duration of symptoms is solely based on history that the patient gives, and the patient usually disregards minimal symptoms of cough and breathlessness, which may be present for many years, without affecting his daily life. Therefore we can say that R wave amplitude in V5 or V6 <5mm and R/S ratio in V5 or V6 <1 and right axis deviation of QRS complex which are ECG signs of RVH, are found with increasing incidence as duration of disease increases.

In the analysis of ECHO findings, our study showed 54% of patients had Echocardiographic evidence of cor pulmonale, compromising R.V dilation, R.V hypertrophy, R.A dilation, or evidence or R.V failure , or interventricular wall motion abnormaility. Similar incidences were found in some previous studies[16,17]. On correlating ECHO findings with severity of disease, the incidence of all the findings increased as severity of disease increased.

All the findings had statistically significant correlation with severity except R. V. hypertrophy and inter ventricular wall motion abnormality, probably because Lesser number of patients in the moderate severity group, and variation in measurement of RV wall thickness due to presence of trabeculae, and differentiating it from surrounding structures. Studies by Higham et al[3], showed pulmonary hypertension in 43% in moderate and 68% in severe group, and a study by N.K Guptha, Ritesh Kumar Aggarwal showed 54.5% in moderate and 60% in severe and 100% in very severe groups, as compared to 28% and 68.9 in our study. The higher incidence in severe group is due to higher percentage of patients in severe group. On correlating ECHO findings with duration of disease, statistical correlation was found with R.V dilation, pulmonary hypertension, and cor pulmonale.

In this study the diagnosis of cor-pulmonale could be made in 36% by clinical method, 44% by electrocardiographic method and 54% by echocardiographic method. This shows that echocardiography can detect more number of patients with cor pulmonale in COPD is similar to previous studies. This is because clinical signs are often difficult to detect in patients with COPD, because of over inflation of chest and posterior rotation of heart. ECG criteria for detecting right ventricular hypertrophy have a reasonably high specificity (86-96%) but relatively low sensitivity (38-63%). Echocardiography in COPD is not without inherent drawbacks. The substernal location of the right ventricle itself, and also the difficulties posed by the over inflation of lungs, which reduces the window available for examination, leads to problems in obtaining a good echocardiographic study. But most studies report that adequate examination can be obtained in more

VOLUME-6 | ISSUE-3 | MARCH - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

than 70% of the patients. Therefore early and periodic echocardiography in COPD patients can help in detection of pulmonary hypertension and cop pulmonale in early stage there by ensuring adequate treatment and reducing morbidity in COPD.

References:

1. Chen JC, Mannino DM. Worldwide epidemiology of chronic obstructive pulmonary disease. Curr Opin Pulm Med 1999;5:93-99.
2. Murray CJ, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. Lancet 1997;349:1436-42.
3. M.A.Higham, D. Dawson, J. Joshi, P. Nihoyanno Paulos, N W Moell. Utility of echocardiography in assessment of pulmonary hypertension secondary to COPD. Eur. Respir. J. 2001; 17 : 350-355.
4. James R Klinger, Nicholas S Hill. Right ventricular dysfunction in chronic obstructive pulmonary disease, Evaluation and management. Chest 1991; 99 : 715-723.
5. V. K. Singh and S. K. Jain. Effects of Airflow limitation on electrocardiogram in Copd. Indian Journal of chest disease and allied sciences, 1989; 31(1): 1-8.
6. Chappell AG. The electrocardiogram in chronic bronchitis and emphysema. Brit Heart J 1966; 28: 517-22.
7. Kellar CA, Shepard JW Jr., Chun DS, Vasquez P, Dolan GF. Pulmonary Hypertension in Chronic Obstructive Pulmonary disease. Multivariate analysis. Chest 1986 ; 90(2) : 185-192.
8. Putnik M, Povazan D, Vindisjesic M. Electrocardiography and echocardiography in the diagnosis of chronic cor pulmonale (Article in Serbo Croatian (Roman)). Med Pregl, 1998 ; 51(11) : 528-31.
9. J. C. Banergae. Natural history and sympotomatology of chronic cor pulmonale. Indian Journal of Chest Disease, 1965; VIII : 174-181.
10. Gupta S, Khastgir T, Gupta MP, Sethi KK, Manoharan S. Clinical, Haemodynamic and Echocardiographic study in chronic cor pulmonale. JAPI 1989 ; 37(6) : 373-376.
11. FJC. Millard. The electrocardiogram in chronic lung disease. British Heart Journal 1967; 29; 43-50
12. Murphy ML, Hutcheson F. the electrocardiographic diagnosis of right ventricular hypertrophy in chronic obstructive pulmonary disease. Chest 1974; 65; 622-27
13. Milnor WR. Electrocardiogram and Vectorocardiogram in right ventricular hypertrophy and right bundle branch block. Circulation 1957; XVI. : 348-367.
14. Silver HM, Calatayud JB. Evaluation of QRS criteria in patients with COPD. Chest 1971 ; 59(2): 153-159.
15. Francis I. Caird, David E.L. Wilcken. The electrocardiogram in chronic bronchitis with generalized obstructive lung disease. Its relation to ventilatory function. The American Journal of Cardiology, 1962; 10: 5-11.
16. N. Danchin, A Cornette, A Henriquez. J. P. Godenir, G. Ethevenot, J. M. Polu, P. Sadant. Two dimensional echocardiographic assessment of the right ventricle in patients with chronic obstructive lung disease. Chest 1987 ; 92(2) : 229-233.
17. Himelmann RB, Struve SN, Brown JK, Namnum P, Schiller NB. Improved recognition of cor pulmonale in patients with severe chronic obstructive pulmonary disease. Am J. Med. 1988 ; 84 : 891-898.