Section: General Medicine

Original Research Article

TO STUDY THE CLINICAL PROFILE AND ELECTROCARDIOGRAPHIC CHANGES IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality globally. Global Initiative for Chronic Obstructive Lung Disease, (GOLD) has described COPD as a common preventable and curable disease which has great implications on global health. The WHO's Global Burden of Disease and Risk Factors Project Estimates show that COPD is currently the fourth leading cause of death in the world but is predicted to be the third leading cause of death worldwide. The aim and objective is to analyse the clinical signs and symptoms of COPD patients. To analyse the ECG changes in COPD patients and to correlate them with the severity of the disease.

Materials and Methods: Fifty patients of COPD admitted to Guru Nanak Dev Hospital, Amritsar between November 2018 and November 2020, who met inclusion criteria were randomly selected. A detailed history and physical examination findings were recorded. Investigations like Chest radiograph, ECG and spirometric evaluation of FEV1, FVC and ratio of FEV1/FVC was done.

Results: The mean age of presentation was 66.60±6.56 years. A male to female ratio was 6.14:1 with a male preponderance of the disease was found. Most of the patients had smoking history for more than 20 pack years (mean 56.37±23.99) and commonly presented with breathlessness and productive cough. Clinical evidence of pulmonary hypertension was seen in 46% patients. In ECG most common finding was right axis deviation of P wave (66%), followed by right axis deviation of QRS (60%).

Conclusion: ECG is better modality than clinical methods in detecting right ventricular dysfunction in COPD.

Keywords: Chronic Obstructive Pulmonary Disease, Pulmonary arterial hypertension, ECG, Spirometry.

INTRODUCTION

COPD is characterised by persistent respiratory symptoms and air flow obstruction that is due to airway an alveolar abnormality. chronic obstructive pulmonary disease is defined as a disease state characterized by air flow obstruction that is not fully reversible.[1] The hallmark of COPD is air flow obstruction. COPD includes emphysema, chronic bronchitis and severe airway disease. Emphysema is an anatomical defined condition characterized by destruction of the lung alveoli with airspace enlargement. Chronic Bronchitis is clinically defined as a condition with chronic cough and phlegm. Small airway disease is a condition in which small bronchioles are narrowed and reduced in number. COPD clinically presents with persistent respiratory symptoms including dyspnea, cough and excessive sputum production.

Based on burden of obstructive lung disease program (BOLD) and other large scale epidemiological studies it is estimated that number of COPD cases was

384 million in 2010 with a global prevalence of 11.7%.[1] Globally there are around 3 million deaths annually.[3] With increasing prevalence of smoking in developing countries and aging population in high income countries the prevalence of COPD is expected to rise over the next 40 years and by 2060

,There may be over 5.4 million deaths annually from COPD and related conditions.[4] The historically higher rate of smoking among males is the likely explanation for the higher prevalence of COPD among males; For the prevalence of COPD among female is increasing as the gender gap in smoking rates has diminished in the past 50 years.[5] cigarette smoking is the most well studied risk factors of COPD ,It is not only the risk factor and there is evidence from epidemiological studies that non-smokers may also develop chronic air flow obstruction.[6] Pack years of cigarette smoking is most highly significant predictor of FEV 1, but only 15% of the variability in FEV 1 is explained by pack-years.

COPD results from complex interaction between genes and the environment.

Cigarette smoking is the major environmental risk factor for the development of COPD, The development of air flow obstruction is in smoker is highly variable. Severe deficiency α1 AT deficiency (AATD) is a proven genetic risk factor for COPD.[7] Other factors such as occupational exposures, ambient air pollution and respiratory infections are also important. Occupational exposures, including organic and inorganic dusts, chemical agents and fumes, are an underappreciated risk factors for COPD.[8] Patients with features of both Asthma and COPD have been described as the "Asthma-COPD overlap syndrome" (ACOS). Both Asthma and airway hyper responsiveness are risk factors for COPD.[9] Pulmonary function tests particularly FEV1, remains the reference marker for the diagnosis, assessment of severity and prognosis of COPD. ECG is a rapid, non-invasive, portable and accurate bedside investigation. Hence, it is of great importance, if a high degree of correlation between ECG changes and spirometric studies can be established, which indicate the severity of COPD. This study attempts to correlate the ECG changes with the severity of the disease as assessed by pulmonary function tests.

Aims and Objectives

- To analyse the clinical signs and symptoms of COPD patients.
- To analyse the ECG changes in COPD patients and to correlate them with the severity of the disease.

MATERIALS AND METHODS

This study includes n=50 patients with the diagnosis of COPD Who met the inclusion criteria after obtaining written informed consent. The patients were recruited from wards and OPD of Guru Nanak Dev Hospital, Amritsar. This study was undertaken after approval of the Institutional Ethics Committee, Government Medical College, Amritsar.

Inclusion Criteria

The patients were admitted with symptoms of airway obstruction of more than two years duration and in whom clinical diagnosis of COPD was made and were subjected to investigations. If FEV1/ FVC < 0.7 and FEV1 <80% of the predicted, which did not change significantly after bronchodilator therapy were included.

Exclusion criteria:

Bronchial asthma, Tuberculosis, Clinically symptomatic patients of ischemic heart disease, Rheumatic heart disease and Clinically symptomatic patients with thyrotoxicosis.

Type of study

It was a descriptive study of clinical profile and ECG changes. Data analyses was done using mean, standard deviation and Chi square test. All patients were subjected for chest radiograph, ECG and spirometric evaluation of FEV1, FVC and ratio of FEV1/FVC. The severity of COPD was assessed according to Global Initiative for Obstructive Lung Disease 2006 guidelines.

RESULTS

The present study includes 50 patients with COPD who met the criteria of inclusion and exclusion were randomly selected . The mean age of presentation in this study group is 66.60±6.56 years and range is 52 to 82 years. In this study maximum number of COPD patients were clustered in the age group of 60 to 79 years that is in the seventh and eighth decade (82%). In this study 86% were males and 14% were females. The mean duration of symptoms was 9.88±6.38 years, ranged between 2 and 25 years. In this present study smokers were 86% and non-smoker were 14%. The mean duration of tobacco use was 56.37±23.99 pack years with range from 24 to 120 pack years. Majority of the patients (66%) had history of tobacco exposure for more than 40 pack years. The mean FEV1 was 42.15±11.63 percentage of predicted, ranged between 25 and 66 percent of predicted. All patients in this study had history of more than 20 pack years of tobacco exposure. Majority of the patients with severe disease (i.e. 19/29 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 cough with sputum production and breathlessness at presentation.

36% of the patients presented with swelling of the legs and 22% of the patients presented with symptoms suggestive of carbon dioxide narcosis which included headache, drowsiness, lethargy.

The most common sign at presentation was tachypnoea (88%) followed by loud P2 (46%).

34% of patients had features suggestive of right heart failure (elevated JVP, pedal odema, tender hepatomegaly).

20% of the patients had cyanosis and 8% of the patients had clubbing.

Table 1: Frequency and occurrence of ECG changes.

ECG findings	No. of cases	Percentage (%)
RAD of QRS complex	30	60
P pulmonale	21	42
RAD of P wave	33	66
R wave amplitude in V5orV6 <5 mm	14	28
R/S ratio in V5or V6 <1	12	24
RBBB	21	42
R wave amplitude in V1>7mm	4	8
R/S ratio in V1 >1	16	32
Others	5	10

Table 2: Correlation of ECG findings with duration of disease

ECG Findings	1-9 yrs. N=27		10-19 yrs. N=17		>20 yrs. N=6		X2	p-value	Significance
	No.	%	No.	%	No.	%			
RAD of P wave axis	17	62.96	13	76.47	3	50.00	1.63	0.444	NS
R wave amplitude in V5 or V6<5mm	5	18.52	4	23.53	5	83.33	10.5	0.005	S
R/S ratio in V5 or V6<1	3	11.11	5	29.41	4	66.67	0.72	0.013	S
RBBB	12	44.44	7	41.18	2	33.33	0.256	0.880	NS
R wave amplitude in V1>7mm	1	3.70	1	5.88	2	33.33	6.01	0.049	S
R/S ratio in V1>1	9	33.33	5	29.41	2	33.33	0.793	0.961	NS
RAD of QRS	11	40.74	15	88.24	4	66.67	9.93	0.007	S

Table 3: Correlation of ECG findings with severity of disease

ECG Findings	GOLD II (Moderate) N=14		GOLD III (Severe) N=29		GOLD IV (Very severe) N=7		X2	p-value	Significance
	No.	%	No.	%	No.	%			
RAD of P wave axis	8	57.14	22	75.86	2	28.57	5.87	0.053	NS
R wave amplitude in V5 or V6<5mm	0	0.00	12	41.38	2	28.57	8.02	0.018	S
R/S ratio in V5 or V6<1	0	0.00	10	34.48	2	28.57	6.25	0.044	S
RBBB	6	42.86	14	48.28	1	14.29	2.68	0.262	NS
R wave amplitude in V1>7mm	1	7.14	3	10.34	0	0.00	0.839	0.657	NS
R/S ratio in V1>1	5	35.71	8	27.59	3	42.86	0.728	0.695	NS

DISCUSSION

Mean age and SD of the patients was 66.60±6.56 years which was similar to Keller & Shepard et al, 1986,[10] and Putnik and Povazan, 1998,[11] which was 59±7 yrs and 59.25 yrs respectively.

According to FEV1 present study showed 58% of patients had FEV1 30-49% followed by 28% patients with 50-79% and 14% with <30% of FEV1, which was not similar to Higham et al,[12] 1988, according to him 57.6% of patients had FEV1 <30% followed by 30-49% and 50-79% of FEV1 respectively.

In this study, majority of the patients (33/50) had a history of tobacco use of more than 40 pack years, with a mean of 56.37±23.99 pack years. And according to BTS guidelines most patients with COPD have at least 20 pack years of smoking history.[13] Our finding correlates well with this study.

Right axis deviation of QRS was present in 60% (30/50) of the patients in the present study which was more then Milnor, 1957,[14] constituting 18.75% and less then Padmavathi and Pathak, 1959,[15] constituting 74%.

In the present study, only two patients had evidence of complete RBBB (4%). Similarly in the study by Padmavathi and Raizada et al,[16] 4 patients out of 544 patients had RBBB and Chappell,[17] study had 2 cases out of 122 patients. Milnor (1957),[18] is of the opinion that presence of RBBB is more commonly due to coronary disease than RVH and is also found in persons without heart disease.

In the present study R wave amplitude in V5 or V6 <5mm and R/S ratio in V5 or V6 <1, R wave amplitude in V1 >7mm and right axis deviation of QRS complex were found to have correlation with duration of the disease. But other ECG findings like right axis deviation of P wave, RBBB, R/S ratio in V1≥1 did not correlate with duration of the disease. Therefore we can say that R wave amplitude in V5 or V6 <5mm, 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.

CONCLUSION

COPD is more common in males and especially in the 6th and 7th decade. Most of the patients have fairly advanced disease at presentation. ECG is better modality than clinical findings in detecting right ventricular dysfunction in COPD. Few ECG findings for a right ventricular dysfunction correlate with the severity and duration of the disease.

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