Original Research Article

A prospective study of ecg and echocardiographic changes in chronic obstructive pulmonary disease patients in a tertiary care hospital

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Abstract

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. COPD is 4th leading cause of death in the world and becomes 3rd leading cause of death by 2030 worldwide. COPD accounts for a substantial number of visits to general physician, emergency department, hospital admissions and also a cause for frequent absence from work. COPD is associated with considerable morbidity and a patient of COPD causes financial burden to the family as well as to the national health expenditure.**Materials and Methods:** This is a hospital based cross-sectional study carried out in the Department of Pulmonary Medicine, Maheswara Medical College & Hospital and Hyderabad from January 2019 to December 2019. A total of 50 patients with proven diagnosis of COPD were subjected to ECG and echocardiographic studies. Blood samples drawn were subjected for CBC and ABG tests. Patients with Bronchial asthma, post pulmonary tuberculosis, and any existing cardiac illness were excluded.**Results:** In the study, males outnumbered females (86% vs 14%) with male to female ratio of 6.14:1. The most common age group was 41 to 50 years (30%), 28% of the patients were aged between 51 to 60 years, 16% of the patients were aged 61 to 70 years, 12% of the patients were aged > 70 years and 14% were aged < 40 years.**Conclusion:** The most common ECG abnormality observed in COPD patients was P pulmonale and ECG abnormalities are significantly associated with the severity of COPD. 2. The Echocardiographic study showed significant increase in the right heart parameters, which is more profound in patients with very severe COPD group.

Keywords: Chronic Obstructive Pulmonary Disease, ECG, CBC, ABG, Bronchial asthma.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. COPD is 4th leading cause of death in the world and becomes 3rd leading cause of death by 2030 worldwide[1]. COPD accounts for a substantial number of visits to general physician, emergency department, hospital admissions and also a cause for frequent absence from work[2].

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COPD is associated with considerable morbidity and a patient of COPD causes financial burden to the family as well as to the national health expenditure[3]. It is necessary to diagnose the disease early and identify patients who are likely to develop complications of pulmonary hypert-ension, right ventricular hypertrophy and corpulmonale to prevent long-term complications, promote longevity and improve quality of life[4].Presence study was carried out to correlate the relationship of ECG and ECHO changes in patients with COPD and to evaluate these changes in patients with spirometry and ABG results. About 52 patients were from Medicine ward, 37 were from Surgery ward and 11 from Orthopaedic ward were taken into the study[5,6].

Materials and method

This is a hospital based cross-sectional study carried out in the Department of Pulmonary Medicine, Maheswara Medical College & Hospital and Hyderabad from January 2019 to December 2019. A total of 50 patients with proven diagnosis of COPD were subjected to ECG and echocardiographic studies. Blood samples drawn were subjected for CBC and ABG tests. Patients with Bronchial asthma, post pulmonary tuberculosis, and any existing cardiac illness were excluded.

Results

In the study, males outnumbered females (86% vs 14%) with male to female ratio of 6.14:1. The most common age group was 41 to 50 years (30%), 28% of the patients were aged between 51 to 60 years, 16% of the patients were aged 61 to 70 years, 12% of the patients were aged > 70 years and 14% were aged < 40 years. More than half of the study population had moderate COPD (52%) and nearly one fourth (24%) had severe COPD while 18% of the patients had very severe COPD and only 6% of the patients had mild COPD. The most common clinical presentation observed was tachypnoea (76%) followed by pedal edema and crepitations (60%), clubbing in 48%, bronchi in 46% and cyanosis in 22%. Most of the patients (60%) had duration of illness between 5 to 10 years and 24% of the patients had duration of > 10 years. Smoking history was noted in 90% of the patients and most of the smokers (30%) reported history of > 25 pack years. Loud P2 suggestive of pulmonary hypertension was noted in 26% of the patients and positive S3 in 4% of the patients.

Table 1: **Distribution of study population according to the ECG abnormalities**

ECG Abnormalities	Distribution (n=36)	
	Number	**Percentage**
P pulmonale	20	55.56
RAD	15	41.67
R/S in V1X1	12	33.33
RBBB	6	16.67
R/S in V1>1	6	16.67

Table 2: Correlation of COPD severity with ECHO parameters

ECHO Parameters	Severity	No of patients	Mean	SD
RV Area (cm^2)	**Mild**	3	13.23	3.20
	Moderate	26	17.02	6.67
	Severe	12	16.98	4.49
	Very Severe	9	23.41	6.88
	F Value		3,267	
	P Value		0.030	
RA Area (cm^2)	**Mild**	3	9.10	6.54
	Moderate	26	9.17	3.32
	Severe	12	10.29	2.95
	Very Severe	9	14.99	3.90
	F Value		6.193	
	P Value		0.001	
RVF WT (cm)	**Mild**	3	0.53	0.21
	Moderate	26	0.77	0.26
	Severe	12	0.95	0.17
	Very Severe	9	0.91	0.20
	F Value		3.617	
	P Value		0.020	

X-ray findings revealed emphysema in 42% of the patients and cardiomegaly in 16% of the patients. P pulmonale was the commonest ECG abnormality (55.56%) followed by RAD (41.67%), R/S in V1X1 (33.33%), RBBB and R/S in V1> 1 (16.67% each). On 2D echocardiography, RV area in patients with mild COPD was 13.23 ± 3.20 cm^2 whereas it was 17.02±6.67 cm^2 in patients with moderate COPD and 16.98± 4.49 cm^2 in severe and 23.41±6.88 cm^2 in patients with very severe COPD. With regard to RA

area, substantial increase was noted with respect to the stages of COPD. RA area in patients with severe COPD was 10.29±2.95 cm^2 and 14.99±3.90 cm^2 in very severe COPD patients. Similarly, RVF WT in patients with severe COPD was 0.95±0.17 cm and 0.91±0.20 cm in very severe COPD (p=0.020).

ABG abnormalities noted were noted in 52% of the patients which were respiratory acidosis (42.86%), metabolic acidosis (19.05%), respiratory alkalosis (19.05%), and metabolic alkalosis (14.29%) and mixed (4.76%).

Discussion

In the present study male preponderance was observed which could be due to the high rate of smoking among men5. More than half of the study population had moderate COPD (52%) which is comparable with other studies. In the present study, abnormal ECG findings were noted in 78% of the patients[7]. In a study conducted by Venakateshwararao et al. 33.9% had normal ECG while 66.1% had significant ECG changes. P pulmonale was the commonest ECG abnormality noted among 55.6% of the patients in our study followed by RAD (41.67%), R/S in V1X1 (33.33%), RBBB, and R/S in V1> 1 (16.67% each). Our results corroborate with the other studies[8].In the present study, significant association was found between ECG abnormalities and COPD severity. 39.1% of the patients with very severe COPD had abnormal ECG findings compared to 17.4% of the patients with severe COPD. These findings suggest that COPD poses the risk of cardiovascular diseases and the risk increases with severity of COPD. These findings were consistent with other studies[9].On 2D echo the difference in the values of parameters RA area, RV area and RVF WT were in correlation with the severity of COPD and was statistically significant. These findings implicate hand in hand increase in RA area, RV area, and RVF WT with disease severity in patients with COPD[10].

Conclusion

The most common ECG abnormality observed in COPD patients was P pulmonale and ECG abnormalities are significantly associated with the severity of COPD. 2. The Echocardiographic study showed significant increase in the right heart parameters, which is more profound in patients with very severe COPD group.

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