



ORIGINAL RESEARCH PAPER

General Medicine

ECHOCARDIOGRAPHIC AND ELECTROCARDIOGRAPHIC CHANGES IN RELATION TO THE CLINICAL PROFILE OF THE PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

KEY WORDS: COPD, chronic bronchitis, emphysema, ECG changes, echocardiographic findings

Dr BinayKumar Singh*

(Associate Professor), Department of medicine ESI PGIMSR Basaidarapur Delhi, *Corresponding Author

Dr Swati tripathi

Medical officer

ABSTRACT

Background Chronic Obstructive Pulmonary Disease (COPD) one of the major respiratory diseases causing high morbidity and mortality worldwide. There are various patterns seen in the radiography and echocardiographic picture in the patients suffering from COPD. This study aims to study the various echocardiographic and electrocardiographic findings in relation to clinic profile of patients. **Method** This study was conducted in ESIC PGIMSR and Model hospital Basaidarapur in Medicine department. A total of 60 patients were selected who fulfilled our inclusion criteria. **Results** In our study out of total 60 cases 46 were males and 14 were females. 38 patients were suffering from chronic bronchitis and 22 patients were suffering from emphysema. Most patients were farmers, laborers and housewives. In the present study left ventricular diastolic dysfunction was found in 6 cases (10%), 5(8.33%) were found to have pericardial effusion, 5 cases out of the total of 60 cases were found to be having co-existent dilated cardiomyopathy, which was statistically insignificant (p=0.643), 11 patients had a diminished LV ejection fraction (<50%) suggesting a systolic LV dysfunction. **Conclusion** Echocardiographic as well as ECG findings were found in most of the patients suffering from chronic bronchitis and emphysema.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is the fourth leading cause of death in the world, and it affects millions of patients worldwide. This is also a disease of increasing public health importance around the world. Chronic obstructive pulmonary disease (COPD) has been defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as a disease state characterized by airflow limitation that is not fully reversible. COPD includes chronic bronchitis, emphysema, and small airway disease, in which small bronchioles are narrowed 'A disease state characterized by air flow limitations that is not fully reversible'. Patients with COPD develop progressive and predominantly fixed airflow limitation that leads to a history of progressively worsening breathlessness.

The risk factors for development of COPD include both active and passive cigarette smoking, occupational exposures, modern lifestyle and increasing air-pollution. Though there are several risk factors, its relation to cigarette smoking is of outstanding importance.¹

COPD is often associated with sever hemodynamic consequences. The monitoring of electro-cardiographic (ECG) changes and echo-cardiography has enabled the physician to understand the underlying pathology and to detect abnormalities in respiration and cardiac functions due to respiratory diseases at the earliest. Present study has been conducted to detect various cardiac manifestation at the earliest before they manifest.

AIM:

To study various echocardiographic and electrocardiographic features in patients of chronic obstructive pulmonary disease (copd) Objective: To detect various cardiac abnormalities at the earliest

Material and Method: The present study consists of 60 cases of chronic obstructive pulmonary disease who were selected from the wards of the department of medicine, ESIC Hospital, Basaidarpur, New Delhi

Type of study: Observational study

Inclusion criteria

History suggestive of chronic bronchitis and emphysema like:

a. Presence of chronic productive cough on most days for 3 months in each of two consecutive years when other causes of chronic cough production of respiratory disease excluded (chronic bronchitis)

- b. Progressive dysnoea on exertion
- c. History of smoking
- d. History of exposure to occupational hazard patients with history of dust exposure

Exclusion criteria:

- a. Patients having congenital heart disease
- b. Patients having rheumatic heart disease
- c. Patients with coronary artery disease
- d. Respiratory disease other than chronic obstructive lung diseases were excluded from the present study.

These patients were subjected to a thorough clinical evaluation, detailed physical examination and laboratory investigation.

Routine investigations:

- a. Hb
- b. TLC
- c. DLC
- d. Skiagram Chest

Special investigations

- a. 12 lead echocardiography
- b. Pulmonary function tests
- c. 2- D Echocardiographic examination: Echocardiography was done in the department of medicine ESIC Hospital Basaidarapur New Delhi Echocardiographic assessments were done in 2-dimensional mode, M mode and Doppler mode using color flow mapping.

Results and discussions

This series consists of 60 cases of COPD out of which 38 (63.3%) cases were having a predominant chronic bronchitis pattern and 22 (36.6%) cases were having a predominant emphysematous pattern

Age distribution

In the present study, out of the 60 cases, only 5 cases were 40 years or less (8.3%), while the rest were above 40 years of age (91.7%). Maximum prevalence was in the 6th decade.

This was in accordance with the reports by Dong et al (2005), Anne et al (2005) and Viejo et al (2006). Viejo et al (2006), in his study had reported the mean age of COPD to be 67 years (+/- 10.7 years)

Sex distribution

In the present study, out of the total 60 patients 46 were males (76.66%) and 14 were females (23.34%). This goes against the global statistical reports 2, 3, that state that prevalence is now only slightly higher in men (1.7% VS. 1.4%), while in the Indian scenario the male-female ratio is 1.156:1 (Jindal 2006). However, a population-based study in Spain shows that in the age group of 40- 69 years maximum prevalence were in males (79%) 4.

Another explanation for the higher prevalence rate in this study could be due to the fact that in India females are less affected by many of the important risk factors for COPD like smoking, occupational exposure to dust etc.

The proportion of men was even higher in case of emphysema (male: female- 90.9% vs. 9.1 %). This trend however was in accordance with global statistics reports, which state that in case of emphysema the prevalence rates are even now higher for men.

Distribution according to Occupation

In the present study, majority of patients were farmers, laborers and housewives as shown in (Table 1) Turpin et al (2003) had suggested that occupation by itself could be a risk factor for COPD because of the associated risk of exposure to various risk factors like dust and smog.

Distribution according to smoking

In the present study, 15 patients were smokers (25 %). Incidence of smoking was higher in case of emphysema than with chronic bronchitis (50.0% vs. 10.5%).

This was in accordance with the reports of Mannino et al (2003) and Lundback et al (2006). According to their reports the incidence of smoking in COPD patients were 50% and 44% respectively. However, Mannino et al (2002) and Calverley et al (2003) have reported an incidence in the range of 80-90% 6

Radiological features in COPD

All the cases of emphysema had flat diaphragm, vertical heart, increased translucency of lung field, widening of intercostal spaces and most had prominent pulmonary conus. In radiological examination X-ray chest PA view suggests that lung parenchyma contains more volume of air than normal.

Electrocardiographic anomalies in COPD

Rate and rhythm

In the present study, arrhythmias were found in 3 patients out of total 60.

Friedberg (1958) attributed the development of arrhythmias to pH fluctuations.

PWAVE

In the present study, P wave abnormalities in the form of p-pulmonale was present in 13 patients out of the total 60(21.7 %). It was more common in case of chronic bronchitis (31.6%) than with emphysema (4.5%).

This was consistent with the study of Kemper et al (1970) who found p- pulmonale in 10 out of the total 47 cases he studied (21%).

QRS Complex

In the present study, low voltage QRS complexes were seen in 21 cases (35%) of cases. Low voltage complexes were present in cases of chronic bronchitis (23.7 %) and 12 cases of

emphysema (54.5%). This was in accordance with the observations of Silver et al (1970) and Kemper et al (1970)

LEAD I SIGN

In the present study, lead I sign was seen in 4 cases (6.6%), of which 2 cases were having chronic bronchitis (5.3%) and 2 had pulmonary emphysema (9.1%).

S1 S2 S3 Pattern

In the present study, S1S2S3 pattern was found in 3 cases (5%) of which 2 cases had chronic bronchitis (5.3%) and 1 had pulmonary emphysema (4.5%).

This observation was similar to the observations by Kemper et al (1970) and Perlman et al (197).

MEAN QRS AXIS

In the present study, right axis deviation was seen in 9 cases (23.7%). It is evident from Table 11.5 that RAD was higher in emphysema than with chronic bronchitis (31.7% vs. 23.7%). This was supported by the findings of Spodick et al (1963) and Chappellet al (1970) who reported similar findings LAD was observed in 4.370 Cases of pulmonary emphysema, which is nearer to the findings of Murphy et al (1974) who observed LAD in 8.4% cases of emphysema.

Rotation of the heart

In the present study, clockwise rotation of heart was found in 11 cases (11.3%) and was higher in cases of emphysema (22.7% vs. 15.8%). This was supported by Vishwanathan et al (1960) and Millard (1967) who also observed clockwise rotation to be higher in case of emphysema than with chronic bronchitis 7,8

Right ventricular hypertrophy in COPD

In present study RVH (by ECG criteria) was found in 19 cases (31.6%). The incidence was higher in case of chronic bronchitis than with emphysema (34.2% vs. 27.3%).

This was in accordance with Spodick et al (1959), Raman (1961), Seizer (1966), Millard et al (1967), Cohen (1976) and Boyd (1980), Fedosova et al (2001) and Katsutoshi et al (2007) 9,10

Echocardiographic features in COPD

Echocardiographic abnormalities were found in as many as 56 patients (93.3%) and it was higher among patients with emphysema than with chronic bronchitis (94.5% vs. 92.9%). A normal echocardiogram was reported in only 4 patients.

ECHOCARDIOGRAPHIC EVIDENCE OF COR-PULMONALE AND RV SIZE

In the present study, echocardiographic features of cor-pulmonale as evidenced by a dilated right atrium and ventricles or both were found in 33 cases of chronic bronchitis (86.8%) and 14 patients of emphysema (63.6%) and which comes to a total of 47 patients (76.7%) which was statistically significant (p=0.036). This is in accordance with the results of Rasche et al (2007) who have reported the prevalence of echocardiographically defined cor-pulmonale in COPD to be 80% 11, 12. It is also in accordance with the studies of Danchin et al (1987), Schulman et al (1996) and Anselm (2007). While according to Fishman (1976) the actual prevalence of cor-pulmonale in COPD patient's is more than 40% based on autopsy studies. (Table-2)

Tricuspid regurgitation in COPD

In the present study, tricuspid regurgitation was found in 6 patients (15.8%) of chronic bronchitis and 9 patients of emphysema (40.9%) with RV dilatation and was statistically significant (p=0.030). Overall tricuspid regurgitation was found in 15 patients (26.7%) which is in accordance with the findings of Tremarin et al (1991) who found that 30% of COPD patients had Tricuspid regurgitation echocardiographically 13.

RVOTD in COPD

The RVOTD (Right Ventricular Outflow Tract Diameter) measurements in this study show that 28 cases of chronic bronchitis (46.67%) and 11 cases of emphysema (18.33%) had values above 34 mm (Normal value 18 to 34 mm). Out of the total 60 cases, 59 cases (65%) showed increased RVOTD values which was statistically significant (p=0.038).

OTHER ECHOCARDIOGRAPHIC FINDINGS IN COPD

LV diastolic dysfunction

In the present study left ventricular diastolic dysfunction was found in 6 cases (10%). LV diastolic dysfunction was higher in chronic bronchitis than with emphysema (10.5% vs. 9.1%). However, the presence of Diastolic dysfunction in COPD was not statistically significant (p=1.0)

LV systolic dysfunction and LVEF in COPD

In the present study out of the total of 60 patients, 11 patients had a diminished LV ejection fraction (<50%) suggesting a systolic LV dysfunction, of which 5 had dilated cardiomyopathy. Apart from these only 1 patient had severely diminished LVEF (2.6%) indicating systolic Impairment of LV function is not a significant Occurrence in COPD (p=0.443). This was supported by the findings of Niederman et al (1986), Kacheli (1977), Buda et al (1979), Steele, (1975), and Alain et al (2000)14.

DILATED CARDIOMYOPATHY IN COPD

In the present study, 5 cases out of the total of 60 cases were found to be having co-existent dilated cardiomyopathy, which was statistically insignificant (p=0.643).

Left ventricular hypertrophy in COPD

In the present study, left ventricular hypertrophy (LVH) was found by echocardiography in 4 patients out of the total 60 which was statistically insignificant (p=0.619). This was in accordance with the findings of Fluckel et al (1966).

Pericardial effusion in COPD

In the present study out of the total 60 patients 5(8.33%) were found to have pericardial effusion which was statistically insignificant (p>0.05).

Summary and Conclusion

The present study echocardiographic and electrocardiographic changes in relation to the clinical profile of the patients with chronic obstructive pulmonary disease

The study was undertaken in the Department of Medicine, ESIC Hospital, Basaidarapur, New Delhi.

The study included 60 cases of chronic obstructive pulmonary disease. All patients were subjected to standardized protocol of history, clinical examination, and investigations.

The morbid group consisted of 38 patients of chronic bronchitis and 22 cases of pulmonary emphysema. ECG and echocardiography were done in all the patients.

1. In the present series, the incidence of COPD was highest in the 51-60 years age group (45%), while it was least below 41 years (1.67%)

2. In the present series, 46 patients (76.66%) were males (23.34%) were females. The percentage of males was higher in case of emphysema than with chronic bronchitis (90.9% vs.68.4%).

3. In the present series, majority of patients were either laborers or farmers (both 23.5%), while the least was private sector or businessmen (both 11.7%). The p-value is significant in labourers.

4. In the present series, dust exposure and exercise were predominant precipitating factors (both 16.66%) while majority of patients did not have any apparent precipitating factors (65%).

5. In the present series, 40 patients presented within the first five years (75%), while it was least above 15 and 20 years (6.7% and 5% respectively).

6. In the present series, the main

7. complaint was cough with expectoration which was present in majority of patients. Other complaints were breathlessness, chest pain and low-grade fever.

8. In the present series, echocardiographic abnormalities were found in as many as 56 patients (93.3%) and LT was higher among patients with emphysema than with chronic bronchitis (94.5% vs.92.9%).

9. In the present series, echocardiographic evidence of cor-pulmonale was found in 47 patients (78.3%) and dilated right ventricle were found in 47 patients (78.3%) of COPD and cor-pulmonale was higher in patients with chronic bronchitis (86.8.%) than with emphysema (63.6%).

10. In the present series there was a definite co-relation between the duration of illness and the incidence and severity of cor-pulmonale.

Inference

Chronic obstructive pulmonary disease occurs primarily in the 6" and 7 decade with a definite male preponderance.

Incidence of COPD was highest among laborers and farmers and among the rural population.

It is exacerbated by dust exposure and exercise and is more common during the winter seasons. Breathlessness and cough with expectoration were the important clinical symptoms.

X-ray chest do not give much help in the diagnosis. Echocardiographic abnormalities were found in 56 patients (93.3%), with features of cor-pulmonale in as many as 47 patients (78.3%), clearly indicating the superiority of Echocardiography. This becomes very important because development of cor-pulmonale is regarded as a poor prognostic indicator in the course of COPD and hence its detection at the earliest is important. Hence echocardiography as a screening test may be advisable in all patients with COPD to detect cor-pulmonale and other abnormalities at the earliest even before they become clinically manifest.

Sources of funding

Nil

Conflict of interest

All authors have none to declare

Appendix

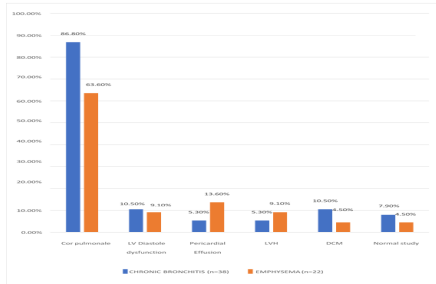
Table-1

Occupation	TOTAL		CHRONIC BRONCHITIS		EMPHYSEMA		P VALUE
	FREQUENCY	%	FREQUENCY	%	FREQUENCY	%	
Farmer	24	23.33%	10	26.32%	4	18.18%	0.472
LABORER	24	23.33%	2	7.69%	11	50.00%	0.0002
private							
sector	7	11.67%	0	0.00%	1	4.55%	0.101
HOUSEWIFE	12	20.00%	10	26.32%	2	9.09%	0.108
Business	7	11.67%	4	10.53%	0	0.00%	0.002
Others	6	10.00%	2	5.26%	4	18.18%	0.118
Total	60	100.00%	28	100.00%	32	100.00%	

Table-2

Duration of (years)	TOTAL		CHRONIC BRONCHITIS		EMPHYSEMA		P VALUE
	FREQUENCY	FREQUENCY	%	FREQUENCY	%		
1-10 (years)	44	13	29.54%	19	43.18%	0.082	
11-20 (years)	8	7	87.50%	1	12.50%	0.118	
21-30 (years)	4	2	50.00%	2	50.00%	0.567	
30-40 (years)	2	2	100.00%	0	0.00%	0.274	
>40 (years)	2	2	100.00%	0	0.00%	0.274	
Total	60	26	43.33%	22	83.33%		

Figure 1: Bar Chart depicting percentage of ecocardiographic changes in COPD



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