ABSTRACT

BACKGROUND: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. COPD is currently the 4th leading cause of death in the world. This study was undertaken to study the electrocardiographic (ECG) and echocardiographic changes in COPD patients with different grades of severity of the disease, as assessed clinically and through pulmonary function testing.

METHODS: The present study includes the Chronic Obstructive Pulmonary Disease and Cor-Pulmonale subjects in Indoor setting of Pulmonary Medicine Department in tertiary care hospital. The study pattern was Cross-sectional analytical study with statistical application of Chi-square test. The data was collected using pre tested questionnaire, which elicited demographic and clinical information.

RESULT: In present study, 50 patients of COPD were studied clinically, spirometry, electrocardiography and echocardiography. Statistically significant correlation with severity was found in the incidence of P-Pulmonale, Right Axis Deviation (RAD), Right Ventricular Hypertrophy (RVH) and Right Bundle Branch Block (RBBB) among ECG findings and Right Ventricular (RV) dilatation, RV failure, Pulmonary hypertension, Cor-Pulmonale among echocardiography findings.

CONCLUSION: COPD is a fairly common disease among the respiratory patients and it is more common in males and in the 5th and 6th decade. The incidence of ECG and echocardiographic findings are more common as the disease duration and severity increase and echocardiography is better than ECG in the diagnosis of RV dysfunction in COPD.

Keywords: Cor-Pulmonale, Electrocardiography, Echocardiography, P-Pulmonale

INTRODUCTION

The global initiative for chronic obstructive lung disease (GOLD), defines COPD as a disease state characterized by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases. COPD will be the 7th leading cause of DALYs lost world wide in 2020. It occurs in up to 50% of the patients with moderate to severe COPD. 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. COPD is generally a progressive disease, especially if a patient’s exposure to noxious agents continues. If exposure in stopped, the disease may still progress due to decline in lung function, that normally occurs with ageing. Nevertheless, stopping exposure to noxious agents even after significant airflow limitation is present can result in some improvement in function and will certainly show or even halt the progression of the disease.

MATERIALS AND METHODS

The present study includes the Chronic Obstructive Pulmonary Disease and Cor-Pulmonale subjects admitted in Pulmonary Medicine Department in tertiary care hospital. Participants who gave written informed consent were included in this study.
Clinical Profile, Electrocardiographic and Echocardiographic in Patients

**Study type:** Cross-sectional Analytical study

**Study setting:** Indoor facility of Department of Tuberculosis and Respiratory Diseases, Tertiary care hospital.

**Study period:** Study was conducted for period of 6 months which include 4 months for data collection and 2 months for data entry and data analysis.

**Sample size:** 50

**Data collection:** All the 50 randomly selected COPD patients were studied clinically radio logically, electrocardiographically, echocardiographically and also with pulmonary function tests. Patients were investigated when their condition stabilized, before they were discharged, after obtaining informed consent.

**Inclusion criteria:** Patients with history of cough with expectoration of at least 3 months duration in 2 consecutive years. Patients with history of breathlessness of long standing duration with or without cough.

**Exclusion criteria:** Patients with pulmonary pathology like Bronchial asthma, Bronchiectasis, Tuberculosis, Pneumoconiosis, Restrictive lung disease like kyphoscoliosis etc. Patients with Rheumatic, Congenital or Ischemic heart disease and Hypertension.

**Method:** The study included the 50 patients of Chronic Obstructive Pulmonary Disease and Cor-Pulmonale subjects in Indoor facility of Tuberculosis & Respiratory Disease Department in tertiary care hospital. All the subjects gave an informed consent after detailed procedure of clinical examination and the non-invasive technique was explained to them. A brief history, height, weight, age, sex and findings of general, systemic, radiological examination, pulmonary function tests, ECG and Echocardiography were entered in the patient information chart giving a separate ID for each subject. Patients were asked about the duration of symptoms like cough, amount, nature and diurnal variation of expectoration and severity of breathlessness to clinically categorize them into predominant chronic bronchitis and predominant emphysema. Clinical examination consisted of both general, physical and systemic examination. In general examination particular attention was given to the presence or absence of cyanosis, clubbing of fingers and signs of right heart failure. A detailed examination of respiratory, cardiovascular, and per abdominal examination was carried out, to know the physical signs of COPD, presence of right ventricular hypertrophy or dilatation and right ventricular failure and pulmonary hypertension. All cases were subjected for pulmonary function test using spirometric evaluation of Forced expiratory volume in one second (FEV1), Forced vital capacity (FVC), Ratio of FEV1 / FVC. The best of three attempts were taken. A chest X–ray PA view and 12 lead ECG was taken and watch for diagnostic points. All patients were subjected to echocardiographic examination including 2-D and M-mode echocardiography to note the presence of pulmonary hypertension, right ventricular hypertrophy, right ventricular dilatation and right ventricular failure.

**RESULTS**

In present study, 50 patients of COPD were studied clinically, by chest X-ray, spirometry, electrocardiography and echocardiography. The incidence of COPD is 24% (154 out of 540 patients) of all respiratory cases admitted in tertiary care hospital in surat in the year 2015. A male preponderance of 4:1 was found with a mean age of 59.34 ±10.3 years. Mean duration of symptoms was 5.84 years with majority having severe disease (Mean FEV1 36.5 ±11.81, % of the predicted). Most of the patients had a smoking history greater than 20 pack years and presented commonly with dyspnea and cough with expectoration. Clinical evidence of cor pulmonale was 36% and pulmonary hypertension was 32%. X-ray evidence of emphysema and chronic bronchitis were present in 80 and 66% respectively. ECG evidence of RVH was found in 44% (22 out of 50) patients. Other common findings were P-Pulmonale (48%), low voltage complexes (30%) and poor progression of R-waves (34%).
Clinical Profile, Electrocardiographic and Echocardiographic in Patients

Echocardiographic evidence of Cor-Pulmonale was found in 52% of patients, Pulmonary hypertension in 54%.

**Table 1: Correlation between Clinical profile, Electrocardiography and Echocardiography as per Cor-Pulmonale**

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of patient having Cor-Pulmonale (n=50)</th>
<th>% of Cor-Pulmonale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical profile</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Electrocardiography</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>26</td>
<td>52</td>
</tr>
</tbody>
</table>

In this study the diagnosis of Cor-Pulmonale could be made in 36% (18/50) by clinical method, 44% (22/50) by electrocardiographic method and 52% (26/50) by echocardiographic method.

**Table 2: Correlation between Clinical profile, Electrocardiography and Echocardiography as per RVH**

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of patient having RVH (n=50)</th>
<th>% of RVH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical profile</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>Electrocardiography</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>23</td>
<td>46</td>
</tr>
</tbody>
</table>

In this study the diagnosis of RVH could be made in 32% (16/50) by clinical method, 44% (22/50) by electrocardiographic method and 46% (23/50) by echocardiographic method.

**Table 3: Correlation between Clinical profile, Electrocardiography and Echocardiography as per Pulmonary hypertension**

<table>
<thead>
<tr>
<th>Method</th>
<th>No. of patient having Pulmonary hypertension (n=50)</th>
<th>% of Pulmonary hypertension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical profile</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>Electrocardiography</td>
<td>24</td>
<td>48</td>
</tr>
<tr>
<td>Echocardiography</td>
<td>27</td>
<td>54</td>
</tr>
</tbody>
</table>

In this study the diagnosis of Pulmonary hypertension could be made in 32% (16/50) by clinical method, 48% (24/50) by electrocardiographic method and 54% (27/50) by echocardiographic method.

**DISCUSSION AND CONCLUSION**

In present study, most of the patients had breathlessness, cough with sputum expectoration and tachypnea on presentation which was correlate with findings of J. C. Banerjea 48 n(%), 1966. 4

Clinical signs of right ventricular hypertrophy was present in 32% (16/50) of the patients and pulmonary hypertension in 32% (16/50) of the patients which was correlate with finding of Gupta & Khastgir n(%), 1989. 5 In present study, ‘p’ pulmonale (48%) correlate with Silver calatayud (46.2%), RAD (52%) correlate with Padmavathi and Raizada,1972; RVH (44%) correlate with FJC Millard, 1967 6 and incomplete RBBB (10%) Milnor (1957) 9 correlate with which are ECG signs of cor pulmonale, are found with increasing incidence as duration of disease increases although, not statistically significant and findings of low voltage complexes and poor progression of ‘r’ wave, which are ECG signs of emphysema bear no correlation with duration of the symptoms. In the present study, 52% (26/50) of the patients had echocardiographic evidence of cor pulmonale, comprising of R.V dilatation, R. V. hypertrophy, R. A. dilatation or evidence of R.V. failure, or interventricular septum motion abnormality, it is clear that the findings in our study correlates well with most of the findings in the study by Himelmann et al, except the higher incidence of cor pulmonale in the study by Himelmann et al. 10 The incidence of all the echocardiographic findings increased as the severity of the disease increased, i.e. maximum incidence was found in the most severely affected group of patients. By comparing the electrocardiographic and the echocardiographic changes, with respect to duration and severity of the disease and to see which of them is a better predictor of right ventricular dysfunction in COPD, so that the patients can be identified at an earlier stage of the disease, as early recognition and treatment of right ventricular dysfunction in COPD, leads to prolonged survival and improved quality of life.

**REFERENCES**
