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A study of clinical and echocardiographic profile of patients of chronic obstructive pulmonary disease helping in early diagnosis of Cor pulmonale

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Abstract: COPD is a major cause of chronic morbidity and mortality throughout the world. Cor pulmonale is a strong predictor of death in COPD. Early diagnosis of cor pulmonale in COPD plays a vital role. The present study was undertaken to make an early diagnosis of cor pulmonale in COPD and to correlate clinically the findings of echocardiography in presence or absence of pulmonary hypertension. One hundred patients with mild to moderate COPD who attended chest clinic of JNMC Hospital, AMU, Aligarh, were taken up for the study. A detailed history and investigations were carried out including X-ray Chest, spirometry, echocardiography etc.Out of the 100 patients, 49 had mild COPD; 51 had moderate COPD; 45 had RVH with normal PAP; 35 had RVH, TR, PR and mild PAH; and 20 had moderate PAH. On applying Chi square test, correlations between RVH and severity of COPD, between TR, PR and PFT and between PAH and PFT were found to be significant. A significant correlation was also found between RVH, TR, PR on echo and severity of COPD. A significant correlation was also found between severity of COPD and pulmonary artery hypertension on echocardiography. It was seen in the current study, that cor pulmonale is an important cause of morbidity and mortality in patients of COPD and a correlation was found between various echocardiographic parameters and severity of COPD, making it evident that echocardiography is an important and useful tool in detecting cor pulmonale early, before full clinical signs develop.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality throughout the world [1]. Many people suffer from this disease for years and die prematurely from it or its complications. One of the most dreaded complications of COPD is cor pulmonale. Cor pulmonale is defined as right ventricular enlargement; hypertrophy or dilatation, secondary to disease of the lung vasculature or parenchyma. It occurs in 25% of patients of COPD [2]. Cor pulmonale is a strong predictor of death in COPD. Thus early diagnosis of cor pulmonale in COPD plays a vital role in reducing morbidity and mortality due to COPD [3]. Clinical diagnosis of cor pulmonale is based on some specific signs and symptoms in patients of COPD. The clinical diagnosis of cor pulmonale is supported by further investigations in the form of X-ray chest, EKG, and echocardiography. Low voltage QRS is a finding frequently associated with cor pulmonale from COPD, but not from other pulmonary diseases. In patients who have severe COPD without waking hypoxemia, cor pulmonale is detected nearly twice as often by echocardiography as by other methods. Echocardiography is done for:

- Visualisation of right ventricle
- Measurement of right ventricular systolic pressure
- Measurement of peak pulmonary pressure
- Detection of any valvular abnormality

The prognosis of cor pulmonale is very poor, particularly because it occurs late in the process of severe disease. So the management of cor pulmnonale is based on its early detection and timely intervention. In case of COPD, cor pulmonale occurs commonly in moderate to severe COPD, so our main aim is to halt the progress of COPD, so that cor pulmonale does not develop and to detect earliest changes in COPD indicating cor pulmonale. The current study was conducted with the following objectives:

- Early diagnosis of cor pulmonale in patients of COPD by clinical examination, electrocardiography and echocardiography.

- To correlate clinically the findings of echocardiography in the presence or absence of pulmonary artery hypertension.

MATERIALS AND METHODS

One hundred patients with mild to moderate COPD who attended the chest clinic of JNMC Hospital, AMU, Aligarh, were studied over a period of 18 months.

Inclusion Criteria:

- Previously diagnosed cases of mild to moderate COPD, diagnosed on the following criteria:
  - History of dysopnea, chronic cough or sputum production, and/or history of exposure to risk factors for the disease.
  - The diagnosis was confirmed by spirometry with the presence of a post bronchodilator FEV1/FVC <0.70 and FEV1 < 80% predicted.
- Chronic cases of COPD but stable on therapy.

Exclusion Criteria:

- Patients with severe and very severe COPD.
- Recent respiratory tract infection in the preceding six weeks.
- Patients having congenital or organic cardiovascular disease.
- Pregnant females
- Chest X-ray showing any significant bulla, parenchymal scars, cavity, mass or opacity
- Patients having tuberculosis.

METHOD

A detailed history including age, occupation, educational status, symptoms with special reference to cough, shortness of breath, sputum production and exposure to risk factors was recorded.

Laboratory Techniques Employed:

- X-Ray chest (PA view)
- Electrocardiography
- Arterial Blood Gas analysis
- Pulmonary Function Test
- Echocardiography
- Hemoblobin
- TLC
- DLC
- ESR
- Plasma Glucose
- Blood Urea
- Urine Examination
- Sputum smears for AFB

Echocardiography:

2-Dimensional and M-mode recording of the cardiac images was done with Ultra Mark 8 Echocardiogram. Measurement of right atrial area and left atrial area was done in 2-D image captured at end diastole. The measurements of RV size, LV size, thickness of RV wall, IVS and LV posterior wall were done in M mode image at end diastole. The distance in M mode images and the areas in 2-D images were calculated. The ratio of RA and LA area and cavity size of RV and LV was calculated. Severity of pulmonary artery hypertension was correlated with various parameters including smoking status, pulmonary function test, and pulmonary artery dilatation on X-ray chest, using chi square test.

RESULTS

The analysis of observations was done with respect to the various clinical parameters. Special consideration was given to find out early changes in X-ray chest and ECG in COPD patients going into cor pulmonale. Echocardiography was done to confirm and correlate the findings in these patients. The main purpose of the study was to diagnose cor pulmonale as early as possible with the help of thorough clinical examination and investigations. Majority of the patients were in the age group of 60-70 years. Eighty four out of 100 patients were smokers. There was no significant difference in the age group among smokers and non-smokers (p value 0.418). Out of the total 100 patients, 12 were females and 88 were males; 50 patients had onset of disease between 41-50 years, followed by 30 patients who had onset between 30-40 years and 20 patients had onset between 51-60 years. 49 patients had mild COPD with FEV1 > 80%; 51 had moderate COPD with FEV1 50-80%. Patients with severe and very severe COPD were not included in the study. Most of the patients had pulmonary artery dilatation on X-ray chest PA view, followed by tubular heart and normal pulmonary artery diameter; only 9 patients had both cardiomegaly and pulmonary artery dilatation. Nineteen patients had normal ECG, while the most frequent finding was presence of RVH in 21 out of 100 patients. On applying Chi-square test, correlation between RVH and severity of COPD was found to be statistically significant with a p value of <0.001. Correlation between TR, PR and PFT was also found to be significant with a p value of 0.037. Correlation between PAH and PFT was also significant with a p value of <0.001. Correlation between smoking and PAH was also found to be significant with a p value <0.001. Out of 84 smokers, 35 had mild PAH and 20 had moderate PAH. All 16 non-smokers had normal PAP. Significant correlation was found between P-pulmonale and RVH in ECG and RVH on echo (p value <0.037 and 0.030 respectively). No significant correlation was found between poor progression of 'R' wave and RBBB in ECG and RVH on echo.

ECG findings of those with cardiomegaly on Chest X-ray

ECG Findings	Number
RVH	8
RAD	5
RBBB	3
P-pulmonale	1
Poor progression of R wave	1

Correlation Between Echo Characteristics and Severity of COPD

Echo Characteristic	Number
RVH, TR, PR & mild PAH	35
RVH, Normal PAP	45
Moderate PAH	20

Echo Characteristics of Subjects

Severity	No. of patients		Echo Characteristics
Mild	49	40	RVH; PAP NORMAL
		9	RVH; TR; PR and mild PAH
Moderate	51	5	RVH; PAP Normal
		26	RVH; TR; PR and mild PAH
		20	Moderate increase in PAP

Echo characteristics in those with Cardiomegaly on X-ray

Echo Characteristics	Number
RVH, Normal PAP	14
Moderate PAH	2
RVH, TR, PR and mild PAH	2

Correlation Between Echo findings and ECG findings

Parameters correlated	P Value
P-pulmonale and RVH on Echo	0.037
RVH in ECG and RVH on Echo	0.030
PPRW and RVH on Echo	0.066
RBBB and RVH on Echo	0.117

DISCUSSION

In the current study, 12 patients were females and 88 were males. Many workers have reported that the disease is more predominant in males than females [4, 5]. It is evident from the current study that the maximum number of patients of COPD had their onset of disease in between 41-50 years. Guleria *et al* have reported similar findings in their study where the maximum number of patients had age of onset between 40-70 years [6]. In the current study, out of 28 patients with normal cardiac size and normal pulmonary artery diameter on X-ray chest, 23 had normal pulmonary artery pressure on echo, only 5 had mild PAH; and out of 45 patients who had pulmonary artery dialatation, 25 had mild PAH and 14 had moderate PAH. Thus, PAH and pulmonary artery diameter were correlated significantly ($p < 0.001$). This is in conformity with the study of Matthay *et al* [7]. In the current study, RVH in ECG was correlated significantly with RVH on echo, with a p value of 0.030. Two patients had S1S2S3 in ECG, and both of them had moderate PAH in echo. This is in conformity with the results of Incalzi RA *et al* [8]. In the current study, P-pulmonale was more common in those with more deranged pulmonary functions. This is in concert with the findings of Singh *et al* [9]. We have found statistically significant correlation between pulmonary artery dilatation on X-ray and PAH on echo; cardiomegaly on X-ray and PAH on echo; PAH on echo and smoking; RVH on echo and PFT; RVH on ECG and RVH on echo; and RVH on ECG and PAH on echo.

CONCLUSIONS

Out of 100 patients, majority were above 50 years of age. No significant correlation was found between age of patients and severity of COPD. A significant correlation was found between pulmonary artery dilatation on X-ray and PAH on echo; between smoking and pulmonary artery hypertension; between severity of COPD and pulmonary artery hypertension on echo; between P-pulmonale on ECG and RVH on echo; between RVH in ECG and RVH on echo; and between RVH,TR, PR on echo and severity of COPD. It is concluded that cor pulmonale is an important cause of morbidity in COPD patients. Our study aimed at early diagnosis of cor pulmonale in COPD patients by clinical examination, chest X-ray, ECG and echocardiography.

REFERENCES

[1]. World Health Report. Geneva: World Health Organisation. http://www.who.int/whr/2000/en/statistics.htm; 2000
[2]. Mc Nee W. Pathophysiology of cor pulmonale in COPD. Am J Respair Crit Care Med 1994; 150: 833-853
[3]. Fishman AP. Chronic cor pulmonale. Am Rev Respair Dis. 1976; 114; 775-794
[4]. Oswald NC et al. Recent trends in chronic bronchitis. Lloys Luke, Medical Book Ltd. London. 17, [5, 25, and 34]
[5]. Chapman KR et al. Epidemiology and costs of chronic obstructive pulmonary disease. Eur RespairJ. 2006; 27 (1):188-207.
[6]. Guleria JS et al. American Review Res Dis. 1969. 100: 490.
[7]. Wiedemann HP, Matthay RA. A textbook of Cardiovascular Disease. 5th edition. Philadelphia. WB Saunders. 1997.
[8]. Incalzi RA et al. Electrocardiographic signs of chronic cor pulmonale: a negative prognostic finding in chronic obstructive pulmonary disease. Circulation. 1999; 99:1600-1605.
[9]. Sigh VK and Jain SK. Effects of airflow limitation on the electrocardiogram in chronic obstructive pulmonary disease. Ind J Chest Dis & All Sci. Vol 31: 1-8. 1989.