

## CHRONIC COR-PULMONALE: THE EXPERIENCE OF A TERTIARY CARE TEACHING HOSPITAL IN GUJARAT

Rameshchandra M Thakker<sup>1</sup>, Shashi Mundhra<sup>2</sup>, Gunjan Upadhyay<sup>1</sup>, Rima B Shah<sup>3</sup>, Amit M Shah<sup>3</sup>

<sup>1</sup> Department of TB and Chest, GMERS Medical College, Gandhinagar, Gujarat, India

<sup>2</sup> Department of Medicine, GMERS Medical College, Gandhinagar, Gujarat, India

<sup>3</sup> Department of Pharmacology, GMERS Medical College, Gandhinagar, Gujarat, India

Correspondence to: Amit M Shah (dr\_amit84@yahoo.co.in)

DOI: 10.5455/ijmsph.2014.270820141

Received Date: 18.08.2014

Accepted Date: 27.08.2014

### ABSTRACT

**Background:** Cor-pulmonale is a condition due to chronic changes in lung parenchyma or its vasculature which leads to right ventricular hypertrophy and pulmonary hypertension. It is a common cardiovascular morbidity require varied investigations like ECG, 2D Echo, x-Ray chest for its proper management.

**Aims & Objectives:** To study the etiological factors of cor-pulmonale and its relation to clinical findings, chest x-ray, Electrocardiography (ECG) and 2D Echocardiography (2D-Echo).

**Materials and Methods:** A total of 60 patients diagnosed with cor-pulmonale were included in the study. Detail history, clinical examination, ECG, 2D-Echo and x-ray chest were carried out for all patients and the findings were analysed using SPSS version 20.

**Results:** Out of total 60 patients, 52 were male and 8 were female. Maximum number of patients 38 (63%) were above the age of 50 years. 12 (40%) were having chronic bronchitis, 18 (30%) were having pulmonary tuberculosis, 10 (16.7%) were having bronchial asthma. In ECG, P pulmonale was observed in 58 (99.66%) of cases. 48 (80%) were having right ventricular dilatation and right atrial dilation was observed in 30 (50%) of patients.

**Conclusion:** Chronic bronchitis and pulmonary tuberculosis were found to be most common causes for developing chronic cor-pulmonale. X-ray chest, ECG and 2D-echo are essential part of management of patient. Chest x-ray gives information on etiological factors, ECG provides information on RVD and 2D Echo provides information on pulmonary hypertension more effectively though all the tests may be required for work up of patients with cor-pulmonale.

**Key Words:** Cor-pulmonale; Chest X-Ray; Electrocardiography; 2D-Echocardiography

### Introduction

Long standing pulmonary disease will develop into pulmonary hypertension which leads to right ventricular hypertrophy (RVH) and right ventricular failure (RVF).<sup>[1]</sup> The end result of long standing disease process will be chronic cor-pulmonale. Right ventricular hypertrophy will end up developing right heart failure.<sup>[2]</sup> Chronic cor-pulmonale as a cause of congestive cardiac failure (CCF) is being recognized in recent years. Therefore recognition of chronic cor-pulmonale is of great importance to physicians, pulmonologists and cardiologists. Analysis of the cardiovascular diseases in India reflects significant number of cases of cor-pulmonale.<sup>[3]</sup> The prevalence rate in India is 4.8 – 19% of all cardiovascular diseases.<sup>[4]</sup> The Gujarat state is advancing towards urbanization and industrialization very fast. Air pollution creates many lung problems starting from allergic diseases to bronchitis. Man has sacrificed his lungs in the advancement process taking place in his surroundings. On one side we are trying to develop our science, technology and industries and as a result we are producing chronic lung conditions like bronchitis, emphysema, Asthma, Interstitial lung disease

(ILD) etc. which may lead to cor-pulmonale also known as pulmonary heart disease.

Therefore, the present study was planned with the aim of identifying the etiological factors and knowing its relation with clinical findings, chest X-ray, ECG and 2D-Echo.

### Materials and Methods

This was a prospective cross-sectional observational study conducted in department of General medicine and department of TB and Chest at College of Medical sciences, Amargadh, a teaching tertiary care hospital, Gujarat during the period of January 2010 to December 2010. The study protocol was approved by Institutional Ethics Committee. Patients were explained clearly about the nature and purpose of the study in detail in their local language. A written informed consent was obtained before enrolling them for the study.

A total 60 patients of more than 15 years age and of either sex and admitted with cor-pulmonale as diagnosed by physician were included in the study. Patients with

congenital valvular heart disease, hypertension, Ischemic Heart Disease (IHD) or any other cardiac abnormality were excluded from the study. All the patients were thoroughly examined by the physician and specialist of TB and Chest for signs and symptoms and appropriate investigations were ordered. Detailed history, general physical examination, chest X-ray, ECG, 2D-echo were carried out for all the patients and finding were recorded in a structured case record form. All the investigations were part of routine management of Cor-pulmonale patients so no extra cost was burdened for the patients for the study. Etiological causes were identified for the development of the cor-pulmonale with help of thorough workup and its association with different investigations was carried out.

### Statistical Analysis

All data were analyzed with the help of SPSS version 20 software. Data were represented as actual frequencies, percentages and mean as appropriate. Chi square test was used for analysis and association of qualitative data. P value less than 0.05 was considered as significant.

## Results

Out of total 60 patients, 52 were male and only 8 were female. The ratio of male: female was 7.5:1. The age of the patients was varied from 15-70 years. Maximum number of patients 38(63%) were in the between 50-70 years, while 8 (13%) patients were in between 30 to 50 years and 14 (24%) were below 30 years of age. 52 (85%) of patients were from urban area out of which 42 (70%) were industrial workers.

### Presenting Symptoms and Duration of Underlying Condition

50 (83.33%) of patients were suffering from distressing cough associated with expectoration from last 1-5 years duration. Dyspnoea was second most common symptom after cough. It was severe dyspnoea and duration was also from last 1-5 years. This was the most alarming symptom in majority of cases for hospitalization. 36 (60%) patients were having history of dyspnoea for last 2-5 years while 8 (13.4%) patients had history of dyspnoea for more than 5 years while 16 (26.6%) were history of less than one year duration. 90% of all the patients were having edema of some degree. It was pitting type and below knee. Edema was improved with the improvement in the cardiac function. Other presenting features were chest pain, epigastric pulsation,

palpitations, hemoptysis, clubbing and cyanosis. All the symptoms of the patients are shown in table 1.

**Table-1: Different signs and symptoms in chronic cor-pulmonale patients (n=60)**

Symptoms and Signs	Number of Patients, n (%)
Cough	60 (100)
Dyspnoea	60 (100)
Odema feet	54 (90)
Chest pain	24 (40)
Palpitations	50 (83.3)
Haemoptysis	6 (10)
Oliguria	12 (20)
Clubbing	42 (70)
Cyanosis	6 (10)
Congested eyes	36 (60)
Prominent neck veins	58 (96.6)
Enlarged liver	54 (90)
Epigastric pulsation	56 (93.33)

**Table-2: Underlying pulmonary diseases in patients of chronic cor-pulmonale (n=60)**

Disease	Number of Patients, n (%)
Chronic bronchitis	24 (40)
Emphysema	6 (10)
Pulmonary TB	18 (30)
Bronchial asthma	10 (16.67)
Bronchiectasis	2 (3.33)
Total	60 (100)

**Table-3: ECG changes in patients of cor-pulmonale (n=60)**

ECG Changes	Number of Patients, n (%)
Sinus tachycardia	40 (66.67)
P pulmonale	58 (96.66)
Right axis deviation	46 (76.67)
R/S ratio >1	28 (46.67)
Right bundle branch block	6 (10)

**Table-4: 2D-Echo findings in patients of cor-pulmonale (n=60)**

2D- Echo Findings	Number of Patients, n (%)	
Right ventricular dilatation	48 (80)	
IVS motion paradoxical	40 (66.67)	
Tricuspid valve amplitude	42 (70)	
Pulmonary artery dilatation	24 (40)	
Right atrial dilatation	30 (50)	
Changes in pulmonary valve	Decrease A dip	50 (83.33)
	Decrease EF slope	58 (96.67)
	Systolic fluttering	18 (30)
Doppler tricuspid regurgitation	Mild	10 (16.67)
	Moderate	6 (10)
	Severe	24 (40)
Absent		20 (33.33)
Doppler pulmonary regurgitation		6 (10)

### Underlying Pathological Diseases for Developing Cor-pulmonale

Chronic bronchitis was found to be most common (24, 40%) cause for developing cor-pulmonale in this study followed by pulmonary TB (18,30%). All the underlying pathological disorders were shown in table 2.

### ECG Findings of the Cor-pulmonale Patients

Out of 60 patients, 58 patients were showing p

pulmonale (tall peak p wave of  $\geq 2.5$  mm). Second most common finding was right axis deviation in 46 patients and sinus tachycardia in 40 patients. All ECG findings are summarized in table 3.

## 2D –Echo Findings in Cor-pulmonale Patients

All the patients were undergone 2D-Echo. Right ventricular dilatation was found in 80% of patients with right atrial dilation in 50% of patients. Tricuspid regurgitation was also found in 40% of patients. Details are shown in table 4.

## X-ray Findings of Cor-pulmonale Patients

All patients were undergone X-ray chest PA view. 36 (60%) of patients were having emphysema of some degree. Bronchovascular markings (BVM) were prominent in all cases suggestive of chronic bronchitis. Vertical heart was found in 24 (40%) of patients. Right ventricular hypertrophy was found in 38 (64%) patients and most of them had right atrial enlargement. Pulmonary TB was found in 18 (30%) of patients.

## Discussion

This study was undertaken with the objective of highlighting causative agents, presenting symptoms and different investigations used in the management of cor-pulmonale patients.

It is clear from the study that high prevalence of cor-pulmonale is in urban and industrial area. Out of 60 patients, maximum were from age group of 50-70 years. This finding is well correlated with the study in which 65% were in the same age group.<sup>[4]</sup> This study has clearly shown male preponderance with male:female ratio of 7.5:1, which is quite different from other study showing male: female ratio of 1.2: 1.<sup>[5]</sup> Probable reason for this deviation could be more number of male patients attending to hospital. Moreover, In Gujarat, male being an outdoor worker, engaged in labour and other industry has more exposure to irritating fog, fumes, dust and other precipitating factors. Also smoking is prevalent in higher amount in males as compared to females which may contribute to the development of the disease.

Smoking is also an initiating factor in developing chronic bronchitis and it was found as most common underlying cause for development of cor-pulmonale. Other literature also support in majority of patients being male and smokers for development of cor-pulmonale. Platts et al

has also established the role of smoking in developing cor-pulmonale in their study.<sup>[6]</sup>

All patients were admitted in the hospital with moderate to severe dyspnea and distressing cough with expectoration. Patients with cor-pulmonale may present with RVH, asymptomatic RV dysfunction.<sup>[7]</sup> Raised jugular venous pressure, enlarged liver and edema feet were present in majority of patients suggestive of congestive cardiac failure. Majority of patients had pulmonary hypertension as evidence by epigastric pulsation (93.33%). While comparing the clinical signs for pulmonary hypertension and RVH in patients with and without chronic obstructive pulmonary disease (COPD), it was found that these signs were seen only in very few cases with COPD, which may be due to inflation of chest. The majority of patients presented with signs and symptoms of cardiac failure and they asked for medical advice only when their symptoms were distressing. Pulmonary hypertension as a complication of COPD was also shown by Naeije R.<sup>[8]</sup>

In this study 64% patients had changes of pulmonary hypertension on chest x-Ray. X-ray can serve as useful tool for identifying underlying cause for development of cor-pulmonale as well as to identify the cause of acute exacerbation. The use of non-invasive imaging technique to assess the anatomy and function of pulmonary vessels and heart has taken an added importance. It is not only a diagnostic tool but also it is useful for prognosis and treatment follow up.<sup>[9]</sup>

12 lead ECG was also carried out in all study patients. Sinus tachycardia was found in 66.67% of patients. All the patients in the study were admitted to the hospital with infective exacerbation of the disease. Many of the patients were taking beta agonist for bronchodilation, to relieve dyspnoea, which is one of the reasons for tachycardia. Right axis deviation was found in 76.67% of patients. Mittal SR et al.<sup>[10]</sup> had reported that Q/R ratio in  $avR > 3$  as diagnostic of chronic cor-pulmonale. In this study, Q/R ratio was  $> 3$  in 90% of patients. Right atrial enlargement by measuring pin lead II was detected in 96.66%. Right ventricular enlargement by taking ratio R/S in V1 was present in 46.67% patients. The reported incidence of RVH in such patients varies from 28-75%, which is on lower side in our study.<sup>[11,12]</sup>

2D Echo was found to be very useful investigation in evaluating the patients of cor-pulmonale. By using 2D Echo right atrial enlargement was found in 50% of

patients and right ventricular hypertrophy in 80% of patients. Various degree of pulmonary hypertension was seen in 96.67% of patients which is consistent feature of cor-pulmonale. Only 2 (3.33%) patients had very early changes of cor-P in which pulmonary hypertension was not seen. In such cases early diagnosis of cor-P can be made with the help of cardiac catheterization. Thus, combined clinical, echocardiography, electrocardiography and cardiac catheterization can make nearly cent percent correct diagnosis of cor-P in very early stage. The commonest changes in pulmonary valve found was decrease EF slope, decrease A dip followed by systolic fluttering.<sup>[13]</sup> It was also observed that systolic flutter was present in only those cases who had severe pulmonary hypertension where there was associated moderate to severe Tricuspid Regurgitation and even Pulmonary regurgitation. A study comparing ECG, vector echocardiography and echo data by Kudaiberdiev Z, allowed the distinction of four grades of RVH. Apparent ECG signs of RVH in chronic bronchitis develop much later, usually after development of secondary pulmonary hypertension.<sup>[14]</sup>

## Conclusion

Cor-pulmonale is a major cardiovascular morbidity prevalent in the population. The high incidence of cor-pulmonale was found in urban and industrial areas secondary to chronic bronchitis. In patients of chronic cor-pulmonale, X-ray chest is a poor tool for detection of pulmonary hypertension, but gives information on the etiology. ECG and 2D echocardiography are helpful investigations for detection of cor-pulmonale as well as its severity and treatment prognosis. Combination of the

chest X-ray, ECG and 2D-echocardiography investigations is an essential part of management of patients of cor-pulmonale.

## References

1. Craig A, Piquette MD, Stephen I, Rennard MD, Gordon L, Snider MD. Chronic Bronchitis and Emphysema: In: Murry JF, Nadel JA. Text Book of Respiratory Medicine, Philadelphia, W B Saunders, 2000:1187-1245.
2. Robert N, Jean LV. Pulmonary hypertension. Clin Chest Med. 2001;22:517-529.
3. Padmavati S, Arora R. Sex differences in chronic cor pulmonale in Delhi. Br J Dis Chest. 1976 Oct;70(4):251-9.
4. Vakil RJ. Heart disease in India. Am Heart J. 1954 Sep;48(3):439-48.
5. Padmavathi S, Pathak SN. Chronic cor-pulmonale in Delhi- A study of 127 cases. Circulation. 1959;20:343-352.
6. Platts MM, Hammond JD, Stuart-Harris CH. A study of cor pulmonale in patients with chronic bronchitis. Q J Med. 1960 Oct;29:559-74.
7. Haddad F, Doyle R, Murphy DJ, Hunt SA. Right ventricular function in cardiovascular disease, part II: Pathophysiology, clinical importance, and management of right ventricular failure. Circulation. 2008 Apr 1;117(13):1717-31.
8. Naeije R. Pulmonary hypertension and right heart failure in chronic obstructive pulmonary disease. Proc Am Thorac Soc. 2005;2(1):20-2.
9. Hovnanian A, Menezes E, Hoette S, Jardim C, Jasinowodolinski D, Souza R. The role of imaging techniques in the assessment of pulmonary circulation. J Bras Pneumol. 2011 Jun;37(3):389-403.
10. Mittal SR, Jain SC. Q/R ratio in lead a VR--diagnostic of RVH of chronic cor pulmonale. J Assoc Physicians India. 1984 May;32(5):430-1.
11. Bredikis AJ, Liebson RP. The ECG in COPD - biventricular hypertrophy, voltage, rhythm changes. The Journal of Respiratory Disease. 1998;19:43-47.
12. Kilpatrick JA. Electrocardiographic changes in chronic cor pulmonale. Brit Heart J 1951;13:309.
13. Sindhur JC, Rajoor UG. Chronic cor-pulmonale in adults: An experience from a tertiary teaching hospital in Dharwad. IJMRRS2012;2(1):12-15.
14. Kudaiberdiev Z. Diagnosis of right ventricle hypertrophy during pulmonary heart disease in patients with chronic bronchitis. Klin Med (Mosk). 1991 May;69(5):90-3.

**Cite this article as:** Thakker RM, Mundhra S, Upadhyay G, Shah RB, Shah AM. Chronic cor-pulmonale: The experience of a tertiary care teaching hospital in Gujarat. Int J Med Sci Public Health 2014;3:1169-1172.

**Source of Support:** Nil

**Conflict of interest:** None declared