Original Research Article

Study of cardiac involvement in 100 patients of interstitial lung disease

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Abstract

Background: The lungs and the heart are the two vital organs in our body which are so inter-related to each other that when the one organ is having some chronic irreversible disease other also invariably gets secondarily involved. **Objective:** To study cardiac involvement in interstitial lung disease. **Methodology:** All confirmed cases of Interstitial lung disease by HRCT and on clinical history, were further evaluated by ECG and 2D ECHO to see for cardiac involvement. **Results:** 100 Patients of HRCT proven ILD underwent cardiac evaluation by ECG and 2D ECHO to see for any cardiac involvement:1)Males were 56 (56%) and females were 44 (44%) M:F = 1.27:1.2) Majority of patients 52 (52%) were in elderly age group of 61 to 80, followed by 40(40%) cases in 41 to 60 years. Only 8 (8%) patients were in younger age group of 21 to 40.3) Amongst 100 cases , cough was the commonest symptom present in all the cases(100%) followed by breathlessness seen in 96 (96%) cases, chest pain in 28(28%), fever in 12 (12%), hemoptysis in 4 (4%) and swelling over feet in 36 (36%).4) 42 (42%) were smokers and 58 (58%) were non-smokers. All smokers were male.5)46 (46%) had clubbing and 52 (52%) did not have clubbing. Of the cases who had clubbing 16 had Grade II clubbing and 30 had Grade III clubbing.6) 96 (96%) were having restrictive lung disease on Spirometry of which 42 had mild, 32 had moderate and 22 had severe restriction. Mixed pattern was seen in 44 (44%) and 4 cases had normal spirometry.7) Chest X-ray showed reticular shadow in 50 (50%), reticulonodular shadows in 32 (32%), nodular pattern in 32 (12%), consolidation in 6 (6%), cystic shadows in 16 (16%). **Conclusions:** In this study, cardiac involvement in patients of ILD was found to be common (66%). As the duration of symptoms increase cardiac involvement in patients of ILD increases and there is no significant change in gender differences found. In this study all the patients having duration of symptom more than 5 years had cardiac involvement.

Key Word: Interstitial lung disease(ILD) , Spirometry , HRCT , ECG , 2DEcho

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INTRODUCTION

Interstitial lung disease (ILD) which is also known as diffuse parenchymal lung disease are a group of diseases affecting lung interstitium.1 The main feature in interstitial lung diseases is gradual onset of fibrosis in the interstitium, which produces derangement of alveolar architecture and also loss of functional alveolar capillary units.2, Idiopathic pulmonary fibrosis (IPF), a type of ILD has an estimated prevalence of 14–43 per 100,000 and is the most common idiopathic interstitial pneumonia.3 Most commonly, the interstitial lung disease (ILD) presents with dyspnea on exertion, diffuse bilateral infiltrates on chest roentogenogram, and restrictive pattern along with diffusion impairment on Pulmonary Function Testing(PFT). Diagnosis of these diseases can be made by the combination of clinical and Roentgenographic features and pulmonary function tests. ILD has also been associated with various other co-morbidities such as lung cancer, emphysema, obstructive sleep apnea (OSA), GERD and multiple cardiovascular disorders like Pulmonary Hypertension, coronary artery disease, angina, atrial fibrillation.4Corpulmonale is the enlargement or failure of the right ventricle of the heart as a response to

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increase vascular resistance or high blood pressure in lung. ECG and echocardiography are recommended to diagnose and confirm cor pulmonal. Patients with ILD frequently present with exertional dyspnea and cough which has been shown to be closely related to quality of life.5-7 Involvement of heart is one mechanism by which ILD may either cause dyspnea or exacerbate the symptom of dyspnea.8Prevalence of pulmonary hypertension in interstitial lung disease range between 31% and 85%.9-12. Patients with PH often complain of shortness of breath with physical activity that gradually worsens over time. In ILD patients, pulmonary hypertension is usually suspected when these symptoms are out of proportion to the severity of the patient's ILD. Therefore this study has been undertaken to study cardiac involvement in 100 patients of ILD using noninvasive and readily available modalities like ECG and 2D ECHO.

AIMS AND OBJECTIVES

1. To study ECG changes in 100 patients of interstitial lung disease.
2. To study 2D ECHO changes in these patient of interstitial lung disease.
3. To study other cardiac involvements if any in these patients of interstitial lung disease.

METHODOLOGY

Inclusion criteria: All HRCT confirmed case of interstitial lung disease.

Exclusion criteria: Patients with pre existing heart disease, Active pulmonary tuberculosis

Study Protocol: Following evaluations were done on the patients selected for study: Detailed clinical history, Physical examination, chest P/A view, Sputum for AFB smear, Pulmonary Function Test, HRCT chest, Electrocardiogram (ECG) and Echocardiogram (2D ECHO) Patient's personal vital data recorded..Chest radiographs of all patients were done which were reported and interpreted by Radiologist. Spirometry was performed. CT scans were done after stabilization of the patient. Scans were obtained using high resolution protocol. These scans were prospectively reconstructed with a high spatial resolution. Radiologist analysed and reported these CT scans. All CT confirmed cases of Interstitial lung disease were further evaluated by ECG and 2D ECHO to see for cardiac involvement if any only after stabilization of patients. ECG reporting was done by Physician. 2D ECHO was done and reported by Cardiologist.

Statistical analysis: Qualitative data was represented in the form of percentages. Quantitative data was calculated using mean ± SD and/or median with range. Chi-Square test was used to compare proportions. Results were represented graphically. MS Excel 2013 and SPSS version 17 were used for analysis. P value <0.05 was considered significant

RESULTS

Table 1: Gender Wise Distribution (n=100):

Gender	No. patients	Percentage
Male	56	56%
Female	44	44%
Total	100	100%

Out of 100 cases, 56 (56%) were male and 44 (44%) were females.

Table 2: Age wise distribution (n=100):

Age	No. of Patients	Percentage
0 to 20	0	0
21 to 40	8	8%
41 to 60	40	40%
61 to 80	52	52%
Total	100	100%
Mean		59.46
Standard Deviation		11.00
Range		35-80

Above table shows age wise distribution of 100 cases. 8(8%) were in the age group of 21 to 40, 40(40%) were in the age group of 41 to 60 and 52 (52%) were in the age group of 61 to 80. Mean age was 59.46 years. Standard deviation was 11.00. Minimum age of study cases was 35 year and maximum age was 80 years.

Table 3: Spirometry findings among study cases (n=100):

Spirometry	No. of cases	Percentage
Normal	4	4%
Mild Restriction	42	42%
Moderate Restriction	32	32%
Severe Restriction	22	22%
Total	100	100%

Among 100 cases, 96 (96%) were having restriction of which 42 had mild, 32 had moderate and 22 were had severe restriction. 4(4%) cases were having normal spirometry.

Table 4: ECG Finding amongst cases of ILD (n=100):

ECG	No of Patient	Percentage
Tachycardia	66	66%
P pulmonale	60	60%
Right ventricular hypertrophy	20	20%
Left ventricular hypertrophy	8	8%
Right Bundle Branch Block	4	4%

Out of 100 cases ECG showed tachycardia in 66 (66%), P pulmonale in 60 (60%), RVH in 20(20%), LVH in 8(8%), RBBB in 4(4%) and u waves in 8 (8%) of cases.

Table 5: Frequency of various findings on 2D ECHO (n=100):

2D-ECHO changes	No. of Patients	Percentage
Pulmonary Hypertension	52	52%
Diastolic Dysfunction	32	32%

Left Ventricular Hypertrophy	6	6%
Corpulmonale	14	14%
Coronary Artery Disease	6	6%
Motion Abnormalities	2	2%
Mitral Regurgitation	4	4%
Aortic Regurgitation	2	2%
Aortic Dilatation	2	2%
Degenerative Aortic Valve	4	4%
Degenerative Mitral Valve	4	4%

Among 100 cases, 52 (52%) were having PH. Diastolic dysfunction was present in 32 (32%) cases, Corpulmonale in 14 (14%) cases, Left Ventricular Hypertrophy in 6 (6%) cases, Coronary Artery Disease in 6 (6%) cases, Mitral Regurgitation in 4 (4%) cases, Degenerative Aortic valve in 4 (4%), Degenerative Mitral valve in 4 (4%) cases, Aortic Regurgitation in 2 (2%) cases and Aortic Dilatation in 2 (2%) case**.**

Table 6: Correlation of Gender with Pulmonary Hypertension (n=100):

Gender	Pulmonary Hypertension	
	Present	Absent
Male	36	20
Female	28	16

P-0.96

When pulmonary Hypertension is correlated with gender it was found that PH is almost similar in both genders.

Table 7: Correlation of Duration of Symptoms with Pulmonary Hypertension (n=100):

Duration of symptoms	Pulmonary Hypertension	
	Present	Absent
0 to 2.5 years		
2.5 to 5 year		
5 to 7.5 year		
Mean duration of symptoms		
Standard deviation		
	p - <0.01	

In this study all the patients who had symptoms of more than 5 years were found to had Pulmonary Hypertension. Mean (±SD) duration of symptom of those who had PH was 4.40 ± 2.67 years. When duration of disease was co-related with Pulmonary hypertension, trend was found to be statistically significant (p-<0.01). Thus as duration of symptoms increase, chances of developing Pulmonary hypertension increases.

Table 8: Correlation of Pulmonary Hypertension with Spirometry (n=100):

Restriction	Pulmonary Hypertension	
	Presen	Absent
No	0	4
Mild	6	36
Moderate	24	8
Severe	22	0
	p - <0.01	

In our study all the patients who had severe restriction were found to have co-existing Pulmonary Hypertension. As severity of restriction in spirometry increases, chances of developing pulmonary hypertension increases. This correlation was found to be significant for trend (p-<0.01).

DISCUSSION

Interstitial lung disease and Heart disease may sometime present similarly initially only with complaints of exertional breathlessness. Exertional breathlessness is the commonest presenting symptom not only in cases of ILD but also of underlying associated cardiac involvement. Cardiac involvement secondarily in patients of ILD may further worsen the symptomatology as well as the prognosis of patients with Interstitial lung disease. Early detection of cardiac involvement may give a clue to treating physician about cause of worsening of symptoms or guide him to change the treatment if needed Hence, this study is undertaken to evaluate the extent and mode of cardiac involvement in patient with Interstitial Lung disease using ECG and 2D ECHO. During this study, 100 cases of ILD were evaluated after clinical examination, by ECG and 2D ECHO to see for cardiac involvement. The Male: Female ratio in this study was found to be 1.27:1, this is almost similar to that noted by Mahashur *et al.* as 1.14:1.13 Our findings were slightly higher than Muhammed Shafeeq K *et al.* who found it to be 0.94:1.15 But ratio in present study is quite low as compared to results of studies done by Tiyas sen and Zarir F Udwadia who found M:F ratios as 2:1.[14] In present study, 92% of the cases were above 40 years of age. This finding is quite high as compared to that reported by Mahashur *et al.* where 46% were older than 44 years of age.[13] Mean age of case was 59.46 years in present study which is slightly higher than that reported by Muhammed Shafeeq K *et al.* who reported mean age as 52.4 years.[15] But quite high when compared with that reported by Gagiya Ashok K *et al.* where it was only 45.23 years.[16] Of these 100 cases, 96 (96%) had restriction in spirometry and 4 (4%) cases had normal spirometry. Of this 96, 42(43.75%) had mild restriction, 32 (33.33%) had moderate restriction, and 22 (22.91%) had severe restriction on spirometry. Our findings of normal spirometry is slightly lower than to that noted by Ashok K Gagiya *et al.*[16] who noted normal spirometry in 6.76% of cases and very low than Mahashur *et al.*[13] who noted that 11% had near normal spirometry. This would be because most of the patient in present study had symptom duration more than 2.5 years whereas most patients in Mahashur *et al* study had symptom duration less than 1 year (30%). Finding of mild

restriction and moderate restriction in present study is much lower than that reported by Ashok k Gagiya *et al* as 33.24% and 40% respectively.[16] Severe restriction(22.91%) in present study is slightly lower to that noted by Mahshur *et al*.(27%).[13] Whereas, severe restriction (22.91%) in present study is much higher than what reported by Ashok k Gagiya (10%) of cases.16 In this study various ECG findings noted were tachycardia in 66 (66%) cases and p pulmonale in 60 (60%). Changes suggestive of RVH was presented in 20 (20%) cases. When overall cardiac status was evaluated using 2D ECHO, it was seen that, 66 (66%) had abnormal 2D Echo indicating cardiac involvement in patient of interstitial lung disease. Out of 100, 52 (52%) had pulmonary hypertension. Of this 52 (52%) cases of pulmonary hypertension 28 had mild PH, 10 had moderate PH and 14 had severe PH. Corpulmonale was reported in 14 (14%). Diastolic dysfunction was reported in 32 (32%) and coronary artery disease was reported in 6 (6%). Our findings of Pulmonary Hypertension in 52% of cases were higher than R. Agarwal *et al* who reported PH in 36% of cases[10], Nevins W. Todd *et al*.(2010) who reported PH in 35.71% of cases[17], Lettieri *et al*.(2006) who reported PH in 31.6% of cases.[11] When occurrence of pulmonary hypertension is correlated with gender of the patients, it was noted that both the genders were almost equally affected. Mean(±SD) duration of symptoms for those who had PH was 4.40 ± 2.67 years which was higher as compared to those who were not having PH i.e. 1.95 ±1.29 years. When occurrence of pulmonary hypertension was correlated with duration of symptoms it appears that as duration of symptom increases chances of developing pulmonary hypertension also increases. This was found to be statistically significant for trend (p - <0.01) In this study mean duration of symptoms was 4.40 ± 2.67 years which was higher than R Agrawal *et al* who noted mean (±SD) duration of illness of those who had PH as 3.1±3.1 years.[10] In our study 88.46% of patient who had PH had moderate to severe restriction which is similar to as reported by R Agrawal *et al* who had mean % FVC(±SD) of those who developed PH as 43.7±8.910 (moderate to severe restriction) and Lettieri *et al*.(2006) who had mean [± SD] FVC (% predicted) of those who had PH as 49.3±11.011 (Moderate to severe restriction). All cases with severe restriction were found to have pulmonary hypertension. This occurrence of pulmonary hypertension is well corelated with severity of restriction. It was found that as severity of restriction increases chances of developing pulmonary hypertension also increases. This trend was found to be statistically significant (p - <0.01).

CONCLUSION

In this study, cardiac involvement in patients of ILD was found to be quite common (66%). Cardiac involvement is not affected by gender but as the duration of symptoms increase cardiac involvement in patients of ILD increases. In this study all the patients having duration of symptom more than 5 years had cardiac involvement. This will add to symptom of breathlessness and inspite of disease specific optimum treatment and management of exacerbation and secondary infection, symptomatic improvement may not be satisfactory in this cases due to development of PH. Though mortality and cardiac involvement co-relation was not the objective of this study, during study period 7 patients expired and all were having cardiac involvement. Hence, we recommend that all patients who are diagnosed as a case of ILD should also be evaluated by ECG and 2D ECHO which are non invasive tests for cardiac evaluation which will further aid in better management of patients with ILD.

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