Original Article

SPIROMETRY AND X-RAY FINDINGS IN CASES OF INTERSTITIAL LUNG DISEASES

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ABSTRACT

Background: There are very few studies are done on spirometry and X-ray findings in interstitial lung diseases (ILD) in India.

Methods: Pulmonary function tests were performed on computerized spirometer, through Kit Microsystems in 30 patients of high resolution computed tomography (HRCT) proven interstitial lung diseases in tertiary care centre.

Results: Majority were in age group 40-49 years (mean age-45.23 years) and 66.5% male patients. Restrictive pattern (96.57%) was present in majority patients in spirometry. Most of patients (60%) of ILD showed reticular-nodular in X-ray chest.

Conclusion: Restrictive pattern were observed regardless of smoking status in ILDs. Availability of non-invasive investigations like HRCT chest has increased our early recognitions of ILDs. Reticular-nodular pattern in X-ray chest is very important for suspecting ILD.

Key words: interstitial lung disease, pulmonary function test, spirometry.

INTRODUCTION

Hamman and Rich (1935) originally described a 'fulminate, diffuse, interstitial fibrosis of lungs'[1]. However as more and more cases appeared in the literature, it become apparent that the original cases of Hamman and Rich manifested only part of spectrum of a group of disorder. Some of these diseases present acutely whereas other have sub acute or chronic course. Spirometry provides a noninvasive quantitative measure of severity of the disorder and repeated testing to monitor the disease course. Spirometry cannot diagnose a specific ILD and cannot distinguish between active

lung inflammation versus fibrosis, but are critically important in the objective assessment of respiratory symptoms as well as in paring the differential diagnosis, grading the severity of disease, and monitoring response to therapy or progression[2]. Spirometry is a powerful tool that can be used to detect, follow, and manage patients with lung disorders. Technology advancements have made spirometry much

more reliable and relatively simple to incorporate into a routine office visit.[3]

Basic functional defect in lungs of patient with interstitial lung diseases is a decrease in their distensibility. Thus the lungs are stiffer than normal and resist inflation. Residual volume being largely independent of lung mechanical properties is only slightly reduced. The FEV1 is typically increased. The FEV1/FVC ratio is normal or increased due to elevated airflow rates because of the increased static elastic recoil. Cigarette smoking alters measurements of lung function. Schwarts and colleagues [4] showed a significant increase in lung volumes in patients with ILDs who smoked, suggesting that higher volume in these patients may falsely suggest less severe ILD. The present study conducted with a purpose to find out different x-ray chest pattern in confirmed ILDs patients. Our aim was to find out FVC% of predicted and FEV1/FVC ratio in ILDs and compare it with other studies.

MATERIALS AND METHODS

The present study was a retrospective, observational study conducted on randomly selected 30 ILDs patients. Patients initially suspected to have Interstitial Lung Diseases, undergo high resolution computed tomography (HRCT) chest. Patients who were confirmed ILDs by HRCT [5] were included in this study.

Pulmonary function tests are performed on computerized spirometer, through Kit Microsystems. Both height and weight were recorded. All patients were tested in a sitting position. Before testing, the procedure was explained and demonstrated to each patient. Minimum three times spirometry done and average of 3 tests calculated. Forced vital capacity (FVC), forced expiratory volume in one second (FEV1), forced expiratory volume ratio in one second (FEV1%), FEV1/FVC ratio and peak expiratory flow rate (PEFR) recorded in all patients. Values of FEV1 and FVC are measured in liters and are also expressed as a percentage of the predicted values for that individual. Interpretation of spirometry done with following criteria.[6]

1. Normal spirometry- FVC% predicted above 80% and FEV1/FVC ratio above 0.7.
2. Restrictive- FVC% predicted below 80% and FEV1/FVC ratio normal - above 0.7.
3. Obstructive- FEV1 below 80% predicted, FEV1/FVC ratio less than 0.7.

RESULTS

Thirty patients of ILDs confirmed by HRCT (20 males, 10 females) selected. The mean age of patients was 43.57 years (range-16 years to 65 years). All patients presented before 5 years of duration of illness. Ten (33.33%) patients presented between 1-3 years duration of illness. 14 (46.66%) patients presented before 1 year duration.

Table-1: Patients distribution according to radiological features

X-ray chest finding	Patients (%)
Reticular-nodular	18 (60.0)
Reticular	05 (16.65)
Honey-Combing	04 (13.32)
Ground glass appearances	03 (10.0)
Total	30 (100)

Majority of patients shows reticulonodular (60%) or reticular (16.65%) patterns on chest X-ray. Ground glass and honey-combing founds in small number of patients. These finding may be related that most patients are referred after alveolitis stage (ground glass appearance) and before honey combing appearance found on lungs.

Table-2 -Distribution of spirometry patterns

Age	FVC% of predicted			FEV1/FVC%	
(years)	>=60%	30-59%	<30%	>=60%	30-59%
<=24	-	01	01	02	-
25-49	06	09	02	16	01
>=50	06	05	00	11	-
Total	12 (40)	15(50)	03(10)	29(96.57)	01(3.33)

Figures in parenthesis indicate percentage

In more than half of patients (60%) FVC% of predicted was less than 60%. FEV1/ FVC ratio was normal (20%) or increased (76.6%). Decrease in FVC may be because of more stiffness of lungs due to fibrosis and resistance to inflation.

DISCUSSION

Table 3 shows comparison of chest X ray appearance of present study with Johnston et al [7]. Honey combing appearance in present study was 13.32% that resemble to Johnston et al study (15.10%). Incidence of Reticular & Reticulonodular patterns were 76.65% in present study as compared to 51% in Johnston et al study.

Table-3: Comparison of chest-X-ray appearance with another study.

Chest X-ray finding	Present study	Johnston et al [7]
Normal	-	2.40
Ground glass	10.00	5.10
Reticular & reticulonodular	76.65	51.00
Honey combing	13.32	15.10
Ill defined patchy confluent	-	26.30

Slight less percentage in Johnston et al may be because in the present study selection of patient done mainly on typical X ray chest finding while Johnston et al study patient with normal and ill defined opacities on chest X ray also included.

Table-4: Comparison of spirometry results with another study.

	Present study (%)	Mahashur et al[8] (%)
FVC% of predicted		
>=60%	40	11
30-59%	50	62
<30%	10	27
FEV1/FVC %		
>=60%	96.57	94
30-59%	3.33	06

Table-3 shows spirometry results of present study and Mahashur et al study. Majority of patients have FVC% of predicted between 30-59% in both studies. In Mahashur et al[7] study, FVC% of predicted below 30% was found in 27% as compared to 10% in present study, which may be related to early refers or early diagnoses of interstitial lung diseases due to more advance in non-invasive investigation of interstitial lung diseases. FEV1/FVC ratio was more than 60% in most cases in present study (96.57%) and also in Mahashur et al studies (94%).

Table-5: Comparison of spirometry results with another study

	Present study	Jindal et al [9]
FVC*		
<80%	93.24	86.85
>=80%	6.76	13.15
Mean FVC#	53.28	60.90
FEV1/FVC %	Normal or increased	Normal

*% of expected value #% of predicted

Table 5 shows result of spirometry of present study comparing with Jindal et al study. It shows that Mean FVC was 53.28% in present study and closely resemble to Jindal et al study. FEV1/FVC % was normal in in Jindal et al study while in our study normal or increased.

CONCLUSIONS

In summary, functional abnormalities in ILDs are typical, but not specific. Despite the fact that different lung function patterns have been described among ILDs, they overlap and their practical application to differentiate ILDs is poor. PFTs cannot diagnose a specific ILD and cannot distinguish between active lung inflammation versus fibrosis, but are critically important in the objective assessment of respiratory symptoms as well as in paring the differential diagnosis, grading the severity of disease, and monitoring. A diffusely abnormal chest radiograph often is the initial finding that alerts the physician to the possibility of ILD.

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