

Correlation of Pulmonary Function with Rheumatoid Arthritis Disease Activity

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ABSTRACT

Introduction: Pulmonary involvement is one of the most common extra-reticular manifestation of RA and the second cause of death by infection. Current research aimed to study the correlation between pulmonary function with the disease activity in Rheumatoid arthritis

Material and Methods: 30 rheumatoid arthritis patients and 15 controls are evaluated for lung involvement by spirometry. Those patients showing lung function abnormalities were evaluated for correlation with various RA disease characteristic like duration of disease, the severity of arthritis, etc. as well as respiratory symptomatology.

Results: High prevalence of pulmonary function abnormalities (36.6%) is seen in Rheumatoid arthritis. Small airway disease is observed in 20% of cases. Restrictive lung disease is seen in 10% of patients. Large airway disease is found in 6.6% of patients.

Conclusion: Lung function data can be used to stratify abnormalities in a clinically useful manner.

Keywords: Rheumatoid Arthritis, Pulmonary Function, Small Airway Disease

INTRODUCTION

Rheumatoid arthritis (RA) is a multisystem disease of unknown cause. It is a common inflammatory arthritis and an important cause of potentially preventable disability.¹ The characteristic feature of RA is persistent inflammatory synovitis usually involving peripheral joints both small and large in a symmetric distribution. The synovial inflammation has the potential to cause cartilage destruction and bony erosions. Subsequent changes in joint integrity lead to deformities.² RA is often associated with systemic disturbance. The clinical course is usually life long affliction with intermittent remissions and exacerbations. Despite the destructive potential, the course can be variable. Some patients have a mild disease – oligo articular illness of brief duration with minimal joint damage, whereas others have a relentlessly progressive polyarthritis with marked functional impairment. It is currently not possible to predict prognosis at presentation accurately. However irreversible joint damage occurs early in RA.³ Extraarticular manifestations are common in patients with a high titer of the Rheumatoid factor contributing to morbidity and may require management separately. Pulmonary involvement is one of the important extraarticular features of RA⁴ and occurs in the form of pleural diseases, pulmonary nodule, interstitial lung diseases, airway obstruction and pulmonary vascular disease apart from drug-induced lung injury.⁵ Pleural disease includes pleuritis, pleural effusion, pneumothorax, Bronchopleural

fistula, and empyema. Airway involvement occurs as airway obstruction, upper airway disease (Cricoaerytenoiditis), bronchiectasis, and Bronchiolitis obliterans.⁶ Lung involvement in RA carries a worse prognosis.⁷ Chest x-ray has the low sensitivity of identifying interstitial lung disease (ILD). High-resolution computerized tomography is a more sensitive means of detecting ILD.⁸ The spirometric analysis shows a restrictive or obstructive pattern in rheumatoid lung disease. The restrictive pattern is characterized by reduced total lung capacity and reduced vital capacity. The obstructive pattern is characterized by decreased FEV₁ / FVC ratio. Reduced mid-expiratory flow rate (FEF 25% - 75%) detects early small airway involvement.

So the study was done to record the correlation between pulmonary function with the disease activity in Rheumatoid arthritis

MATERIAL AND METHODS

This was a cross sectional, case control study conducted at tertiary care hospital. The study population was divided into two groups. Group I consists of 30 Rheumatoid arthritis patients who satisfied the revised American Rheumatological Association (ARA) criteria. Group II consisted of 15 age, sex matched patient with degenerative joint disease selected from medical OPD and served as controls. Inclusion Criteria: Patients who satisfied the revised American Rheumatological Association criteria, irrespective of whether respiratory signs or symptoms were present or not, were included in Group I. Exclusion criteria: Bronchial asthma / chronic obstructive Airway disease, Current / past pulmonary tuberculosis, patients with occupation prone to develop occupational lung disease, patients with radiological lesions in chest X ray, severe disease interfering with performance of pulmonary function test. The selected patients were evaluated with a detailed history regarding duration of disease, rheumatoid functional status, occupation history, smoking history, drug history and respiratory symptoms like breathlessness, cough with or without sputum production, pleuritic chest pain. Presence of joint swelling, tenderness, deformities,

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and number of tender joints were noted. Rheumatological functional status was assigned in clinical examination. A detailed respiratory system examination with special attention to chest expansion, pleuritis, pleural effusion, crepitations and wheeze. After assessing these baseline clinical and laboratory parameters, the patients and controls were subjected to computerized spirometric evaluations.

STATISTICAL ANALYSIS

Data are presented as mean, standard deviation, percentages, or number of cases. Continuous data were compared by Independent student t tests and Categorical data were compared with Pearson chi square tests. Significance was defined by P values less than 0.05 using a two-tailed test.

RESULTS

Age of RA patients varied between 24 – 66 years. The mean age was 43.2 years. The mean duration of the disease was 4.15 (2.63%) years. Out of the 30 patients 20 (66.66%)

had a disease duration less than 5 years, and 10 (33.34%) had a disease of 5 or more years. Among the 30 patients in Group I, 11 (36.6%) had PFT abnormalities; of them 6 (20%) had small airway disease; 3 (10%) had restrictive lung disease and 2 (6.6%) had large airway disease. There were 5 smokers and all were males. 3 out of 5 smokers had PFT abnormalities (60%) (table-1). Sex distribution was 7 males and 23 females (table-2). Among them 4 males (57.1%) and 7 females (30.4%) had abnormal PFT. Recurrent cough was found in 9 patients (30%) None had pleuritic pain / dyspnea. Wheeze and crepitations were found in one patient each. Of the extraarticular features, subcutaneous nodules were noted in 3 patients (10%); 1 patient had features of Sjogren syndrome; 1 had oral ulcers. 21 patients were taking chloroquine for a variable period. None of them had taken methotrexate. 22 patients had positive RF; among them 9 had abnormal PFT. Among the 8 RA patients with negative RF, 2 had abnormal PFT. In group II, only one patient had abnormal PFT (Restrictive variety); none of the 3 smokers had abnormal PFT. All the female patients in both groups were exposed to firewood smoke and / or kerosene fumes for a variable period (table 3,4).

DISCUSSION

One of the common extraarticular organ to be involved in RA is lung. Pulmonary dysfunction in RA is associated

Disease Parameters	Mean (S.D)	Range
Functional Class	1.63	I – IV
Tender Joint Count	5.97 (4.14)	0 – 28
Hb (gm/dL)	10.62(1.11)	8.4 – 12.6
ESR (mm/Hr)	54.93(27.93)	20 –130

Table-1: Rheumatoid Arthritis Activity Parameters

PFT Abnormality	Number of patients N = 30	Males (%) N = 7	Females (%) N = 23
Restrictive	3 (10%)	1	2
Large Airway Obstructive	2 (6.6%)	1	1
Small Airway Obstructive	6 (20%)	2	4
Total	11 (36.6%)	4 (57.1%)	7 (30.4%)

Table-2: Gender Distributions of Abnormal Pulmonary Function Tests

Spirometric parameter	RA patients		Control		P value
	Mean	S.D	Mean	S.D	
FVC	86.3	9.88	96.04	11.05	0.008
FEV 1	82.49	8.59	88.71	5.99	0.008
FEV1/FVC	96.54	13.29	93.87	9.07	0.433
FEF 50%	76.61	16.95	89.69	8.40	0.001
FEF 25-75%	78.84	19.11	92.63	8.82	0.002

Table-3: Pulmonary Function Tests

Clinical Feature		With Abnormal PFT (n=11)	With normal PFT (n=19)	P value (Chi square Test)
Age	> 40 years	3	12	0.058
	< 40 years	8	7	
Gender	Male	4	3	0.199
	Female	7	16	
Duration of disease	> 5 years	3	7	0.592
	< 5 years	8	12	
Functional Class	III and IV	9	15	0.850
	I and II	2	4	
Cough	Present	6	3	0.026
	Absent	5	16	
RF	Positive	9	13	0.424
	Negative	2	6	

Table-4: Clinical Features of Rheumatoid Arthritis Patients with PFT Abnormalities and Without PFT Abnormalities

with worse prognosis. In this study on 30 RA patients, 11 (36.6%) had abnormal lung function test. Among them, 6 patients (20%) had small airway obstruction; 3 patients (10%) had restrictive lung disease; and 2 patients (6.6%) had large airway disease. Provenzo⁴ et al in their study on 24 RA patients, found that 2 patients had obstructive pattern and 1 patient had restrictive pattern. 20% had pleural disease detected by HRCT. Thierry perez et al⁹ in their study of 50 RA patients found large airway obstruction in 18%; small airway disease in 8%; and restrictive lung disease in 8%. Malaviya et al¹⁰ in a study on North Indian RA patients found pulmonary dysfunction in 8%. In the present study, 4 out of 7 males had PFT abnormalities (57%); among the female patients 7 out of 23 (30%) had PFT abnormalities. This study shows a striking male preponderance. Eli Gabby et al.¹¹ found that the only risk factor in the development of ILD in RA is male gender. In the present study, there was no correlation between age of the patient and pulmonary dysfunction. There was no correlation between the duration of RA and lung involvement. Severity of RA also showed a negative association. Similar findings were also noted by Bernard cortet et al.¹² Eli Gabby et al.¹¹ have also shown a non association. But Vergnegeree et al¹³ have shown an association with duration and severity of RA with pulmonary dysfunction. In our study, among a total of 5 smokers with RA, 3 had PFT abnormalities. All smokers were males. This showed that 60% of smokers with RA had PFT abnormalities. However, the statistical significance could not be analyzed due to very small number of variables. Thierry perez et al⁹ have also found a decrease in FEV1 / FVC but not to a statistically significant degree. Geddes et al¹⁴ have found a significant association with smoking and airway obstruction. Collins et al¹⁵ have also concluded that the increased PFT abnormalities in RA can be explained by smoking alone. Saag KG et al¹⁶ reported that smoking is the most consistent independent risk factor predicting development of Interstitial lung disease. Davidson et al in their study of PFT in RA patients also have shown a positive correlation between smoking and decreased gas transfer (Dlco). In our study, since all smokers are males, the apparently increased prevalence of PFT abnormalities in smokers could be due to cumulative risk of male sex and smoking. In our study, among the respiratory symptoms, only cough was significantly associated with PFT abnormalities. Similar finding was also observed by Bernard cortet et al.¹² They found a high prevalence of cough and bronchitis and thought respiratory infection to play a role in pathogenesis of rheumatoid lung disease. Thierry perez et al⁹ have also found a significant correlation between respiratory symptoms (both cough and dyspnea), and airway disease diagnosed by PFT and HRCT. In the present study, RF positivity was not found to be significantly associated with lung function abnormalities. But various other studies have noted a positive correlation. Schernthaner et al¹⁷ on their study of 62 patients found a significant correlation between RF positivity and decreased diffusion capacity. Of the other extra articular features, subcutaneous nodules were found in 3 patients in our study; and one patient had oral ulcer and

one had Sjogren's syndrome. These extra articular features were not associated with PFT abnormalities. But all had positive RF. Bernard et al in their study of 68 RA patients have noted no association between Sjogren's syndrome and PFT abnormalities. In this study, 27 patients were taking chloroquine (DMARD) for a variable period of time. There was no significant difference in PFT abnormalities between patients taking chloroquine and those not. Cortet et al¹² and Thierry perez et al⁹ have also noted similar non association between DMARDs and PFT. G Provenzo et al¹⁸ in their study of 24 RA patients have found a reduction in DLco < 75% in 50% of patients. Bernard cortet et al¹² in their study of 68 RA patients have noted restricted lung disease in 12% by DLco. In our present study the non association between smoking / RF positivity / duration of RA and pulmonary dysfunction may be due to the small number of study population or due to the exclusion of patients with severe lung disease or due to lower sensitivity of spirometer to detect restrictive lung disease when compared with HRCT. A larger study evaluating lung function by spirometry, DLco and HRCT will help to identify the best diagnostic approach to detect early pulmonary functional alterations in this multifaceted disease.

CONCLUSION

High prevalence of pulmonary function abnormalities was seen in Rheumatoid arthritis. Male sex has an association with an increased risk of developing the rheumatoid pulmonary disease. No association between the other extraarticular features and development of rheumatoid lung disease. No association between severity / duration of Rheumatoid arthritis and rheumatoid lung disease. Lung function data can be used to stratify abnormalities in a clinically useful manner.

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