Pulmonary Function Test among Asymptomatic Rheumatoid Lung Disease Patients

IZAZ-UR-RAHMAN¹, HAMID JAVAID QURESHI², BUSHRA GOHAR SHAH³

ABSTRACT

Background: Among rheumatoid arthritis patients, extra-articular manifestations are common. Pulmonary disease is the second most common cause of death among rheumatoid arthritis patients after infections. There is a great lack of knowledge and awareness among rheumatoid arthritis patients regarding rheumatoid lung disease.

Aim: To compare the pulmonary function tests of asymptomatic rheumatoid lung disease patients with the pulmonary function test of healthy individuals.

Design: Cross-sectional analytical study.

Place & duration of study: Patients were recruited from Fatima Memorial Hospital, Lahore Rheumatology Outpatient Department, from January, 2010 to December, 2010. The research work was conducted at Department of Physiology and Cell Biology of University of Health Sciences, Lahore.

Methods: Pulmonary function test of 60 rheumatoid arthritis and 60 age, sex and BMI matched healthy individuals, having no pulmonary signs, symptoms or disease were compared. The data obtained was analyzed by using SPSS version 16.0.

Results: FEV1% in RA patients [84.50(77.0-92.9%)], was significantly less (p= <0.0001) than in healthy individuals [96.0(96.0-97%)]. FVC% in RA patients [85.0(77.0-93.50%)], was significantly less (p= <0.0001) than in healthy individuals [98.0(96.25-99%)]. There was a significant difference (p = 0.020) of FEV1/FVC ratio [85.15(78.6-88.5)] in RA patients and healthy individuals [84.0(83.0-88.95)].

Conclusion: Spirometry (Pulmonary function test) is a cost effective test to detect early pulmonary function decline among asymptomatic rheumatoid lung disease patients.

Keywords: Rheumatoid arthritis, rheumatoid lung disease, pulmonary function test.

INTRODUCTION

Rheumatoid arthritis (RA), is a systemic disease characterized by persistent inflammation of the diarthodial joints with synovial hyperplasia that if continues, results in progressive joint destruction. The prevalence of RA in general population world over ranges from 0.5% to 2%¹. Among rheumatoid arthritis patients, extra-articular manifestations are common. Pulmonary disease is the second most common cause of death among rheumatoid arthritis patients after infections. The first clinical report of pulmonary involvement in rheumatoid arthritis was published by Ellman and Ball (1948), describing three patients with polyarthritis and interstitial pneumonitis². Caplan described the classical observation of rheumatoid nodules in chest radiographs of coal miners suffering from rheumatoid arthritis³. The first case of rheumatoid lung disease was described by Cudkowicz et al, they not only describing the clinical picture but also the spirometric and histological findings. Rheumatoid Arthritis is frequently associated with pulmonary involvement, the most common manifestation being interstitial lung disease, rheumatoid nodules and pleural effusions, while less common include bronchiolitis obliterans and cricoarytenoid arthritis⁴. Interstitial fibrosis and airway diseases are detected in approximately 25% to 75% of patients with rheumatoid arthritis⁵,⁶. Rheumatoid arthritis associated interstitial lung disease (RA-ILD), has revealed itself as the true adverse clinical impact among the other pulmonary manifestations of rheumatoid arthritis⁷.

The main objectives of the study were to evaluate the outcome of pulmonary function test in asymptomatic rheumatoid lung disease patients and to compare the pulmonary functions of asymptomatic rheumatoid lung disease patients with the pulmonary functions of healthy subjects.

SUBJECTS AND METHODS

This was a comparative cross-sectional study, conducted at Physiology Department, University of Health Sciences, Lahore from January, 2010 to December, 2010. Sixty known Rheumatoid arthritis patients fulfilling the American College of Rheumatology criteria for RA⁸, aged 20-60 years,
having no pulmonary symptoms were taken from Rheumatology Outdoor Patient Department of Fatima Memorial Hospital, Lahore. Purpose non-probability sampling technique was used to recruit volunteers for the study. Control group comprised sixty (60) healthy subjects with matched age, sex and BMI who were attendants of the patients and from the residential areas near University of Health Sciences, Lahore. Exclusion criteria: Subjects with following conditions were excluded: Systemic pulmonary disorders, smokers and ex-smokers, chest wall and spinal column abnormalities, obesity, patients having BMI >30Kg/m², failure to produce acceptable and reproducible spiromgrams, other rheumatological conditions and any cardiac disease.

Written informed consent was taken from each study participant. Complete demographic information, history, physical and systemic examination were taken. Height, weight were recorded and BMI was calculated and the data was recorded on pre-designed data form. Blood samples were taken by aseptic technique.

Spirometry (Pulmonary Function Test): Pulmonary function was assessed by Spirometry. Spirogram was obtained from all participants according to the American Thoracic Society (ATS) criteria. A flow measuring type spirometer (Spirolab II, bidirectional digital turbine type; MIR srl, Rome, Italy) that meets the ATS accuracy criteria was used in this study.

Spirometric data: The measurements used in data analysis are (1) FVC% (2) FEV₁% and (3) FEV₁/FVC ratio. The FVC and FEV₁ are reported as both the measured volume in litres and as a percentage of the predicted or reference value for individual of that age, height, gender and ethnicity. FEV₁/FVC ratio was calculated from the measured volume in liters and then percentage was taken.

The data was entered and analyzed by SPSS 17.0. The data was expressed as mean±SD for normally distributed quantitative variables and median (IQR) for non-normally distributed quantitative variables. Frequencies, percentages or graphs were given for categorical variables. The data was non-normally distributed for the quantitative variables, so non-parametric statistics i.e., Mann-Whitney U test was applied. A p-value of < 0.05 was considered statistically significant for all purposes.

**RESULTS**

One hundred and twenty (120) subjects were recruited for this study, out of which 60 were rheumatoid arthritis patients and 60 were age and sex matched healthy individuals. In the RA group, there were 51 females and 9 males and in healthy individuals group, 51 were females and 9 were males. Mean±SD age of the RA group was 41.45±10.58 years while the mean±SD age of the healthy individuals group was 43.38±7.36 years.

Median disease duration of the RA patients was 5.50(4-8) years. 32(53.33%) patients had RA factor positive, while 28(46.66%) patients were RA factor negative. 10(16.66%) patients were having positive family history for RA, while 50(83.33%) had no family history of RA. 17(28.33%) had knowledge about RA, while only 03(5%) patients had knowledge about extra articular manifestations of RA. Median FEV₁/FVC% was 84.50(77.0-92.0%), median FVC% was 85(77.0-93.50%), median FEV₁: FVC was 85(76.87-88.51) (Table 1).

Among healthy group, 3 individuals were RA factor positive, while 57 were RA factor negative. 2 individuals had positive family history for RA, while 58 had no family history for RA. Median FEV₁/FVC% was 96.0(96.0-97.0%), median FVC% was 98(96.25-99%), median FEV₁: FVC was 84(81.0-87.77%).

FEV₁/FVC% in RA patients [84.50(77.0-92.0%)], was significantly less (p=0.001) than in healthy individuals [96.0(96.0-97%).] FVC% in RA patients [85(77.0-93.50%)], was significantly less (p=0.001) than in healthy individuals [98(96.25-99%)].

There was a significant difference (p=0.020) of FEV₁: FVC ratio [85.15(78.6-88.5)] in RA patients and healthy individuals [84.0(83.0-88.95)] (Table 2).

| Table 1: Data of the rheumatoid arthritis group. |
|-----------------------------|-----------------------------|
| Variables                  | Median (IQR)               |
| FEV₁%                      | 84.50(77.92%)              |
| FVC%                       | 85(77.93.50%)              |
| FEV₁/FVC                   | 85.15(78.6-88.5%)          |
| RA factor positive         | 32(53.33%)                 |
| Disease duration (years)   | 7.33±12.0                  |
| Positive family history    | 10(16.66%)                 |
| Knowledge about RA         | 17(28.33%)                 |
| Knowledge about extra articular manifestations of RA | 3(5%) |

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<th>Table 2: Comparison of pulmonary functions in study groups.</th>
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*Data presented as Median (IQR) *Significant at p < 0.05 level

**DISCUSSION**

It is very important to timely recognize the pulmonary involvement in RA, because respiratory involvement is the second leading cause of mortality in patients with RA. Pulmonary involvement or decline in its
function may not be routinely sought by physicians and rheumatologists in the absence of cost-effective and time-efficient means of screening.

In the present study, it has been demonstrated that PFTs, could screen-out pulmonary function decline in patients with RA and could identify patients, who were to be further worked up. A significant decline in FEV\textsubscript{1}% and FVC% among RA patients as compared to healthy subjects was observed. These results were present in those RA patients, who had no pulmonary signs and symptoms. So, it demonstrated early pulmonary decline in asymptomatic rheumatoid lung disease patients.

A lot of work has been done on the pre-clinical rheumatoid lung disease internationally, but most of the work is on detection of rheumatoid lung disease on HRCT, not on its detection by spirometry. Gochuico et al\textsuperscript{10} and Karazincir et al\textsuperscript{11} reported the pre-clinical decline in pulmonary functions in rheumatoid disease patients. Same results comparable to our results were observed by them, i.e., decline in FEV\textsubscript{1}% and FVC%. Similar results were also observed by other researchers among RA patients but they had selected all patients having RA, irrespective of pulmonary signs and symptoms. Banks et al\textsuperscript{12} reported a significant decline in FEV\textsubscript{1}% and FVC% in RA patients with normal FEV\textsubscript{1}/ FVC ratio. Mohd Noor et al\textsuperscript{13} reported FEV\textsubscript{1}% (85.8%), FVC% (83.4%). Sheianov et al\textsuperscript{14} observed a decline in both FEV\textsubscript{1}, (83%) and FVC% (78.7%). Pappas et al\textsuperscript{15} found FEV\textsubscript{1}% (85%), FVC% (71%) among RA patients.

In a retrospective study done by Bongartz et al\textsuperscript{16}, a decrease in both FEV\textsubscript{1}% and FVC% in patients with RA, with a more decline in FVC% was shown. Bilgici et al\textsuperscript{17} and Habibet al\textsuperscript{18} have reported obstructive, restrictive and mixed pattern of pulmonary involvement in patients with RA.

In a prospective study done by Linstow et al\textsuperscript{19}, a progressive decline in pulmonary functions over eight years was reported. Cortet et al\textsuperscript{20} observed a significant decline in FEV\textsubscript{1}% as compared to FVC% in their study. Zrouet et al\textsuperscript{21} showed decline in both FEV\textsubscript{1}% and FVC% among RA patients. In a 5 years prospective study done by Avon et al\textsuperscript{22}, a significant decline in pulmonary functions was observed and they noted small airways obstruction as well as restrictive pattern among RA patients.

Cortet et al\textsuperscript{20} showed an obstructive pattern in a cohort of RA patients, FEV\textsubscript{1}/ FVC ratio was 78.9%. Perez et al\textsuperscript{23} and Collins et al\textsuperscript{24} had also reported a decreased FEV\textsubscript{1}/ FVC ratio among RA patients, showing obstructive pattern of lung involvement. These results were contradictory to our results in which we observed a higher value of FEV\textsubscript{1}/ FVC ratio than healthy subjects, which shows a restrictive pattern among our RA patients. Similar results were observed by Pappas et al\textsuperscript{25}, i.e., 85%. Similarly in a prospective study done by Hyland et al\textsuperscript{26} a restrictive pattern in 155 RA patients as compared to 95 control subjects was observed. It becomes evident from our study that it is not the duration of the primary disease (RA) which affects the pulmonary functions of patients with RA; it is the aggressiveness of the rheumatoid arthritis disease, which affects the pulmonary function in rheumatoid arthritis patients.

It has been observed that only 17(28.33%) RA patients were having sound knowledge about their disease (diagnosis, management and prognosis). It clearly shows lack of awareness among our RA patients about their long life disease. Similarly, when we inquired from them about extra-articular manifestations of RA, only 03(05%) RA patients had satisfactory knowledge. This again shows unawareness of our RA patients about the extra-articular manifestations including pulmonary involvement, which can affect them in their future life and can have a high morbidity and mortality.

CONCLUSION

Pulmonary functions decrease early in rheumatoid arthritis patients, even when they have no pulmonary signs and symptoms. Detection of early rheumatoid lung disease can be done by spirometry, which is a cost effective test and can be done in routine clinical practice.

REFERENCES


