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## ORIGINAL ARTICLE

# Detection of pulmonary involvement in lupus patients with and without clinical pulmonary symptoms

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### KEYWORDS

Lupus erythematosus;  
HRCT;  
PFTs;  
Diffusing capacity for carbon  
monoxide in lungs

**Abstract** *Background:* Systemic lupus erythematosus (SLE) involves different body organs including lungs, however, there is limited information on silent pulmonary involvement in systemic lupus, so, the purpose of this study is to identify both occult and manifest pulmonary complication in patients with SLE and its correlation with disease activity parameters, and high resolution computed tomography (HRCT) findings.

*Method:* Fifty female patients fulfilling the ACR criteria for SLE were enrolled and evaluated using chest X-ray, echocardiography (Echo), pulmonary function tests (PFT) and HRCT of the chest to find out the pulmonary involvement.

*Results:* This study was carried out on 50 SLE female patients, 24 (48%) of them were with pulmonary manifestations and 26 (52%) of them were without pulmonary manifestations. HRCT showed abnormalities in 32 patients in contrast to chest X-ray which showed abnormalities only in 22 patients ( $P$ -value < 0.05). Mild pulmonary hypertension was found in 4 (8%) patients. Pulmonary function tests indicated that the majority of the patients (80%) presented with restrictive pattern with equal percentage of both symptomatic and asymptomatic patients. Diffusion defect was in 56% of all studied patients. Few patients showed obstructive pattern (4%). Residual volume was high in most of the patients.

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*Conclusion:* Pulmonary involvement is present in a significant number of SLE patients as detected by PFTs and HRCT, however, the majority of patients were asymptomatic. Decreased diffusing capacity of females with systemic lupus is prevalent.

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## Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease which involves many body organs [1]. Respiratory abnormality is a prevalent finding in patients with systemic lupus [1]. The most common pulmonary presentations in patients include pleuritis, acute pneumonitis, chronic pulmonary interstitial disease, diaphragm weakness, and alveolar hemorrhage [2,3]. Mild cases of pulmonary involvement without clinical presentation which can remain hidden from the patient and the physician are not rare [4]. Using more sensitive investigations including HRCT and tests of lung function is a valuable assessment method for investigating lung involvement without clinical symptoms [4].

The results of lung function tests in patients with systemic lupus demonstrate various disorders [4–6]; the previously conducted studies have generally focused on symptomatic patients and almost always examined simple spirometry with forced vital capacity, however. Only some recent studies have measured the capability of gas transfer in lungs with an emphasis on carbon monoxide (lung transfer factor) and its decrease in lupus patients with pulmonary symptoms [7]. However, few data are available that reported total lung capacity and residual air in lupus patients. In addition, there are contradictory pieces of evidence on the relationship between tests of lung function and serological and chronic findings in the lupus disease [8–10]. Lung investigations in patients suffering from lupus are always limited to a small number of patients which has, undoubtedly, affected the obtained results. Therefore, more studies on a large number of patients can be more revealing in terms of evaluating disorders through lung function tests, especially diffusing capacity of carbon monoxide in lungs.

Several studies have shown the increased sensitivity of HRCT of the chest compared with plain chest radiography in identifying interstitial lung disease. HRCT improves visualization of small parenchymal structures allowing evaluation and grading of the severity of diffuse infiltrative lung disease [11,12].

The aim of current study is to evaluate whether HRCT helps in early detection of pulmonary involvement in SLE, and to clarify the characterization of pulmonary function tests (PFT), especially carbon monoxide diffusion capacity (DLCO), and their correlation with clinical features and immunological markers in patients with SLE.

## Patients and methods

The study was carried out on fifty (50) female patients with SLE recruited from both outpatients and inpatient of Rheumatology, and Internal medicine departments in Al-Minya university hospital from August 2008 to September 2011.

Inclusion criteria: all patients were diagnosed according to 1982 revised criteria of the American College of Rheumatology

(ACR) for SLE [13]. The protocol was approved by the institutional ethics committee, and informed consent was obtained from the patients. Detailed history regarding cough (with or without expectoration), respiratory difficulty, chest pain and hemoptysis were recorded.

Exclusion criteria: patients were excluded if they were known to have interstitial lung disease (occupational hazard) or if they were pregnant.

The following were done for all patients:

- 1- Routine laboratory investigation, Immunological markers: antinuclear antibody (ANA), Anti-double strand DNA antibody (dsDNA), C – reactive protein, complements (C3 and C4).
- 2- Pulmonary function tests which include: static lung volumes, diffusion, and spirometric tests.
- 3- Imaging: chest radiograph and high resolution computed tomography (HRCT) of the chest.

Echo examination was done for all patients at rest. Echo was used to evaluate cardiac morphology and flow abnormalities. Pulmonary arterial hypertension (PAH), defined by a pulmonary artery systolic pressure (PASP) > 30 mmHg [14].

### *Pulmonary function tests*

Pulmonary function tests were done to all patients at the time of the examination setting and wearing nose clip using ZAN 300 co-diffusion (Germany).

Flow volume loop was performed in accordance with American Thoracic Society (ATS) [15] guidelines by one technician. The instrument met the accuracy criteria of the ATS. Spirograms were repeated until three acceptable tests or eight maneuvers were obtained [16]. Lung volumes were measured by the methane rebreathing method according to standardized techniques and gas transfer (DLCO) was measured using the single-breath technique. The DLCO was corrected for lung volumes and hemoglobin levels. Observed values were compared with those predicted for age, sex, and height for each individual. Results of the pulmonary function tests were expressed as a percentage of the predicted value (% pred.). Pulmonary function parameters were considered abnormal when they were below 80% of the predicted value according to standard of ATS [17].

The FEV1/FVC ratio was considered obstructive if it was less than 75 percent. Reduction in the FVC with a normal or elevated FEV1-to-FVC ratio should trigger further diagnostic workup to rule out restrictive lung disease. Measuring the TLC and residual volume (RV) can confirm restriction suggested by spirometry based on the criteria of the American Thoracic Society [17].

All patients underwent HRCT examination on the same day that they performed PFTs using CT general electric pro-

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