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Research Article

Cardiopulmonary Affection in Patients with Systemic Lupus Erythematosus

Mohammed Mahmoud Nussier, Mohamed Elwan Sayed[1*] and Hosni Abd-Elkareem Younus

[1]Departments of Internal Medicine, Rheumatology and Rehabilitation, Assuit Faculty of Medicine, Al-Azhar University, Egypt

*Corresponding author: Mohamed Elwan Sayed, Department of Internal Medicine, Rheumatology and Rehabilitation Assuit Faculty of Medicine, Al-Azhar University, Egypt; E-mail: drelwan77@yahoo.com

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Background and study aim

Systemic Lupus Erythematosus (SLE) is a systemic autoimmune disease that can affect any part of the body. Early detection and quantification of pathological changes are important for assessing the benefits of Cardiopulmonary prevention in SLE management. The aims to study the effect of SLE on cardiopulmonary system, and its early detection.

Methods

Fifty patients selected from those attending the outpatient clinics and in patients, who admitted to Internal Medicine Department of Al-Azhar Assuit University Hospital, from May 2017 to May 2018, fulfilled the American College of Rheumatology (ACR) 1982 revised criteria for classification of SLE. All patients were subjected to complete history taking, clinical examination, routine investigations, transthoracic echocardiography (Echo) and computed tomography (CT) of the chest. The damage was measured using the SLICC (Systemic Lupus International Collaborating Clinics)/ACR damage index (SDI). The disease flare was defined by the increase in the SLE Disease Activity Index (SLEDAI).

Results

The most common Echo finding was pericardial effusion seen in 20 patients (40%), followed by mitral regurgitation in 14 patients (28%), Mitral valve prolapse was seen in 13 patients (26%).The most common CT chest findings was ground glass opacity seen in 15 patients (30%) followed by pleural effusion seen in 14 patients (28%) and pleural thickening in 10 patients (20%).There was non- significant correlation between EF% and SLEDAI ($p=0.95$) , but a negative significant correlation between disease duration and EF% ($p=0.02$).

Conclusion

All SLE patients even who clinically inactive disease should be screened for the presence of structural cardiac and chest abnormalities. Echocardiography and CT chest can be helpful as a noninvasive diagnostic tool for early detection of such abnormalities.

Keywords: Cardiac changes; pulmonary changes; Systemic Lupus Erythematosus

Introduction

SLE is a systemic autoimmune disease that can affect any part of the body. As occurs in other autoimmune diseases, the immune system attacks the body`s cells and tissue, resulting in inflammation and tissue damage [1]. The course of the disease is unpredictable, with periods of activity alternating with remissions. The disease occurs nine times more often in women that in men, especially in women in child-bearing years ages 15 to 35 [2]. Patients with SLE have a high risk of cardiovascular disease. Coronary artery disease, myocarditis, endocarditis, valvular disease and pericarditis are major manifestations of cardiac involvement in SLE patients. Multiple SLE-specific mechanisms, such as autoimmune responses, altered autoantibody and cytokine levels, and lipid dysfunctions can accelerate the progression of overall atherosclerotic burden. Therefore, early detection and quantification of pathological changes are important for assessing the benefits of cardiovascular prevention in SLE management [3]. The respiratory system is more commonly affected in SLE than in any other systemic autoimmune disease and that all its components may be affected. Pleuro-pulmonary involvement was defined as the presence of one or more of the following manifestations: pleuritis, pneumonitis, pulmonary arterial hypertension, shrinking lung syndrome, pulmonary fibrosis, pulmonary hemorrhage, pulmonary thrombosis and lung infarction [4]. Disease activity varies over time and, at onset, symptoms are nonspecific and may include unexplained fever, extreme fatigue, muscle and joint pain and skin rash. SLE can presented by arthritis, nephritis, heart and lung inflammation, central nervous abnormalities and blood disorders [5].

The aims to study the effect of SLE on cardiopulmonary system, and its early detection.

Patients and methods

This study was carried out on 50 patients (44 females and 6 males), aged 16–56 years, and the mean age was 31.12 ± 10.32 years. The mean disease duration was (11.50 ± 7.054). The study was approved by local ethical committee of Assuit Faculty of medicine, Al- Azhar University to evaluate and publish information gained data. All patients fulfilled the American college of rheumatology (ACR) 1982 revised criteria for classification of SLE. These patients were selected from those attending outpatient clinics and inpatients who admitted to the Internal Medicine Department of Al- Azhar Assuit University Hospital, from May 2017 to May 2018. Informed and written consent was taken from all patients.

Exclusion criteria: Diabetic patients, patients with associated rheumatic diseases and pregnant women.

All patients will be subjected to the following:

A. History taking and Clinical examination:

1. Socio-demographic data including age, sex, occupation, residence, marital status and special habits. History of deep venous thrombosis.
2. If married female: history of recurrent abortion.
3. History of fever, skin rash, purpuric eruption, ecchymotic patches, oral ulceration, photosensitivity, hair loss, arthralgia or arthritis and myalgia.
4. Full physical examination.

B. Laboratory Investigations: Complete blood picture, ANA, Anti double stranded DNA, CRP, ESR.

C. Transthoracic echocardiographic examination at rest: To assess the following parameters: left ventricular Ejection Fraction (EF), Diastolic function, Valvular state. Pericardial state and pulmonary hypertension.

D. Computed Tomography (CT) of the chest to assess the following: Pulmonary parenchymal changes, pulmonary interstitial changes, pulmonary vascular changes and Mediastinal and pleural changes.

E. Measurement of activity index: The damage was measured using the SLICC (Systemic Lupus International Collaborating Clinics)/ACR damage index (SDI). The disease flare was defined by the increase in the SLE Disease Activity Index [6].

Statistical analysis

Data were analyzed using Statistical Program for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done: 1. Independent-samples t-test of significance was used when comparing between two means. 2. Chi-square (X2) test of significance was used in order to compare proportions between two qualitative parameters. 3. Pearson's correlation coefficient (r) test was used for correlating data. 4. Probability (P-value).

Results

This study was carried out on 50 patients (44 females and 6 males), aged 16–56 years, and the mean age was 31.12 ± 10.32 years. The mean disease duration was (11.50 ± 7.054) [table 1]. All patients fulfilled the American college of rheumatology (ACR) 1982 revised criteria for classification of SLE. These patients were selected from those attending outpatient clinics and inpatients who admitted to the Internal Medicine Department of Al- Azhar Assuit University Hospital, from May 2017 to May 2018. Of the 50 patients, 45 were positive for antinuclear antibody and 30 patients were positive for anti-DNA antibody. [Figures 9 and 10]

Echocardiography was done in all patients of whom 20 had normal echo findings. The most common finding was pericardial effusion seen in 20 patients, followed by mitral regurgitation in 14 patients, Mitral valve prolapse was seen in 13 patients. The other echocardiography findings were aortic regurgitation in 3 patients, tricuspid regurgitation in 4 patients, pulmonary hypertension in 4 patients, systolic dysfunction and diastolic dysfunction in 5 patients each. Regional hypokinesia was seen in 6 patients. [Tables 2 &3 and figures 5- 8]

As regard CT chest, there was 13 patients (26%) had normal CT chest. The most common CT chest findings was ground glass opacity seen in 15 patients (30%) followed by pleural effusion seen in 14 patients (28%), pleural thickening in 10 patients (20%), interlobular septal thickening in 9 patients (18%) & mediastinal lymph node enlargement, pulmonary artery trunk broadening ,bronchiectasis ,consolidation in 5 patients(10%) each, honey comb opacity in 4 patients (8%) and emphysema in one patient (2%). [table 4 and figures 1-4]

There was a significant correlation between disease duration and EF% (p=0.02) figure (12). But There was non-significant correlation between disease duration and SLEDAI (p=0.55) figure (11). Also, there was non-significant correlation between EF% and SLEDAI (p=0.95) figure [15].

There was a significant correlation between CRP and SLEDAI (p=0.01) figure (14). But There was non-significant correlation between ESR and SLEDAI. (p=0.92) figure (13).

Table 1: Distribution of study patients as regard clinical parameters.

Parameter	Minimum	Maximum	Mean	Std. Deviation
Age (years)	16	56	31.12	10.323
Disease duration (years)	2	25	11.5	7.054
SBP (mmHg)	100	180	138.6	21.854
DBP (mmHg)	60	110	83.7	13.99
HR (beats/min.)	66	120	89.8	15.413
SLEDAI Score	6	22	12.88	4.601

Table 2: Echocardiographic findings among study patients.

Percent	Frequency	Echocardiographic findings
20%	10	LVH
10%	5	Diastolic dysfunction
12%	6	Regional hypokinesia
8%	4	Pulmonary HTN
8%	4	TR
6%	3	AR
26%	13	MVP
28%	14	MR

Table 3: CT findings among study patients.

C T Findings	Frequency	Percent
Mediastinal lymph node enlargement	5	10%
Pleural effusion	14	28%
Pleural thickening	10	20%
Pulmonary artery trunk broadening	5	10%
Bronchiectasis	5	10%
Emphysema	1	2%
Interlobular septal thickening	9	18%
Honeycomb opacity	4	8%
Ground glass opacity	15	30%
Consolidation	5	10%

Table 4: Pericardial effusion among study patients.

Pericardial effusion		
	Frequency	Percent
No	30	60%
Mild	7	14%
Moderate	8	16%
Severe	5	10%

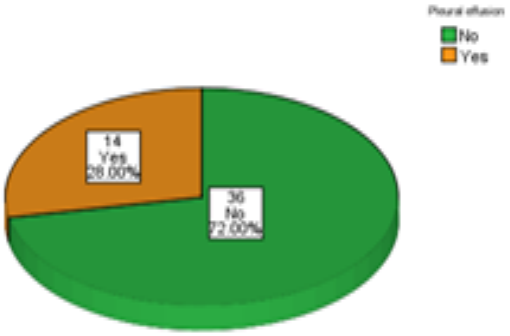

Figure 1: Pleural effusion among study patients.

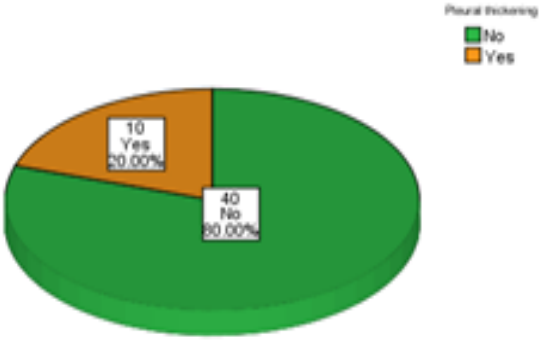

Figure 2: Pleural thickening among study patients.

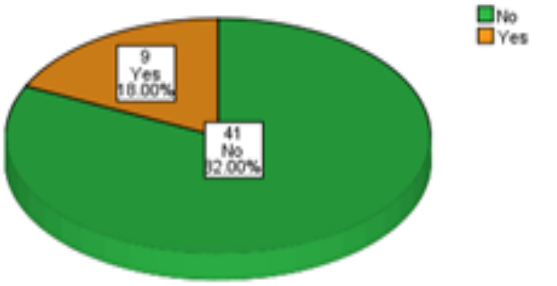

Figure 3: Interlobular septal thickening among study patients

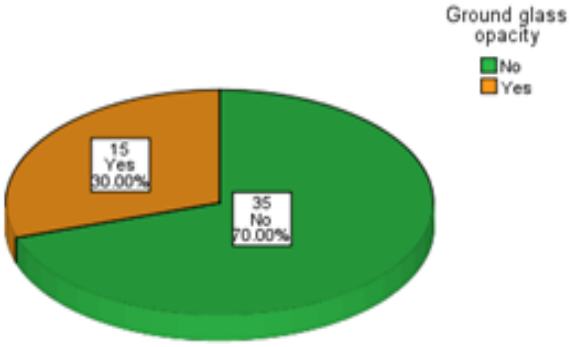

Figure 4: Ground glass opacity among study patients.

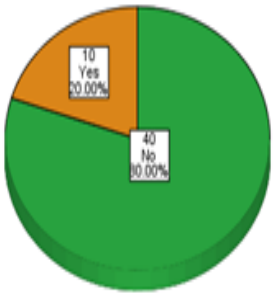

Figure 5: LVH among study patients.

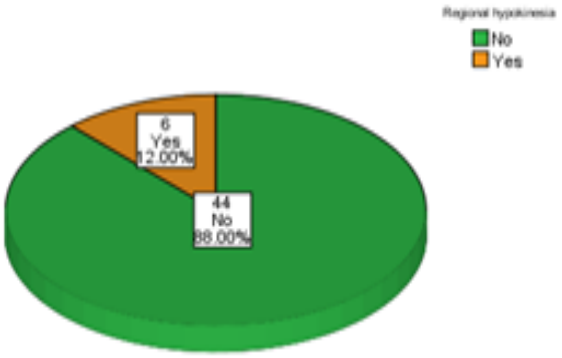

Figure 6: Regional hypokinesia among study patients.

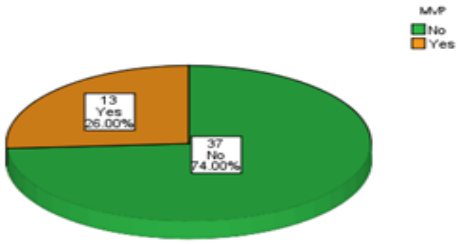

Figure 7: MVP among study patients.

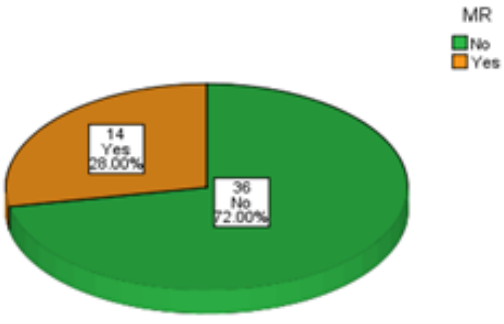

Figure 8: MR among study patients.

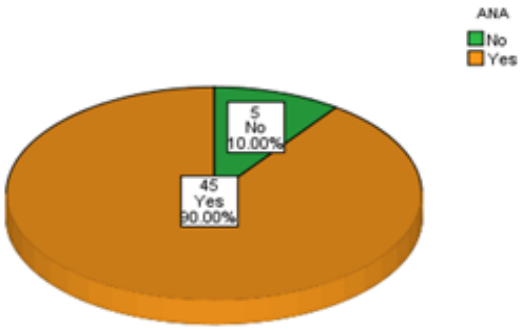

Figure 9: ANA among study patients.

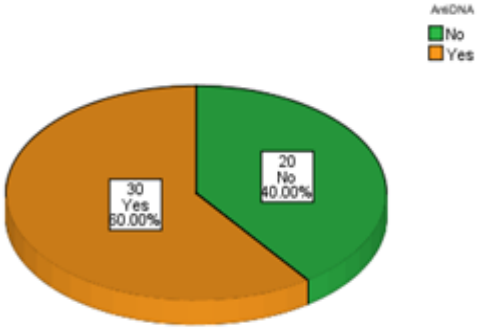

Figure 10: Anti DNA among study patients.

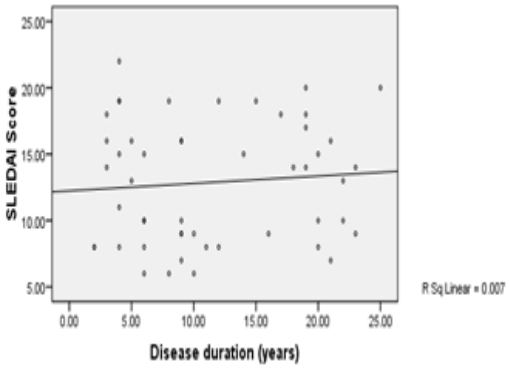

Figure 11: Correlation between disease duration and SLE-DAI.

There was non-significant correlation (r= 0.08 p= 0.55).

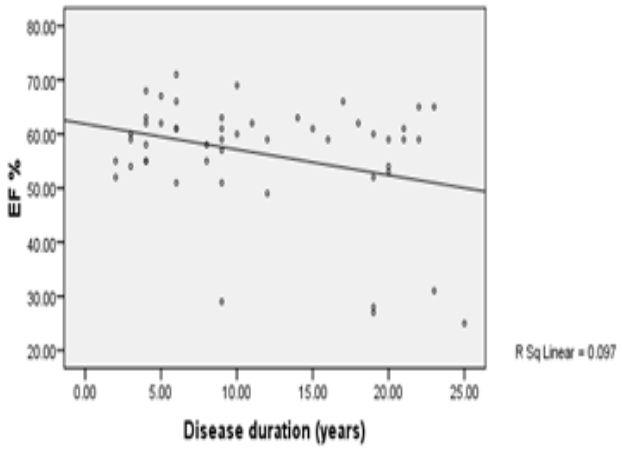

Figure 12: Correlation between disease duration and EF%.

There was a significant correlation (r= -0.31p=0.02).

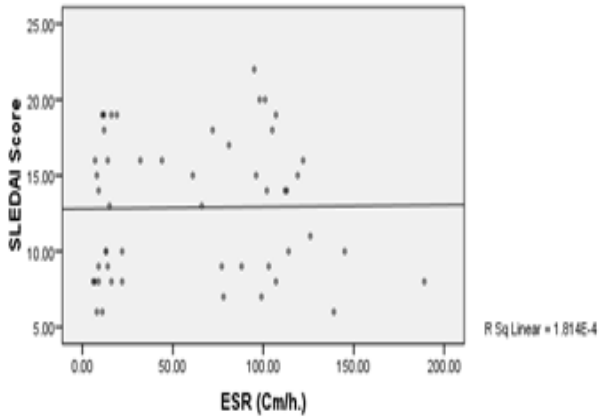

Figure 13: Correlation between ESR and SLEDAI.

There was non-significant correlation (r= 0.01 p= 0.92).

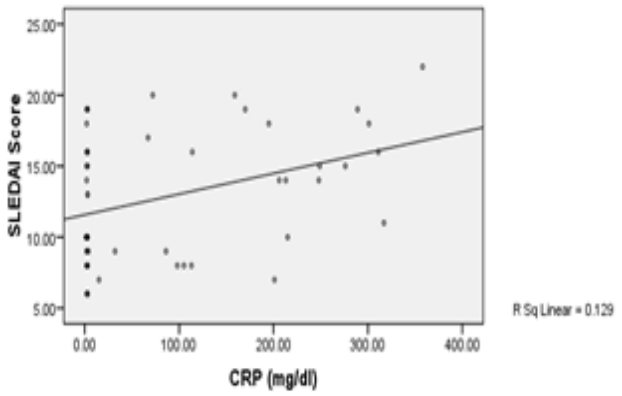

Figure 14: Correlation between CRP and SLEDAI.

There was a significant correlation (r= 0.35 p= 0.01).

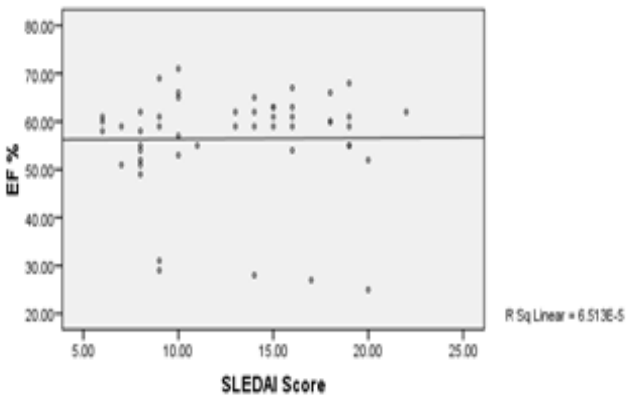

Figure 15: Correlation between EF% and SLEDAI.

There was non-significant correlation (r= 0.008 p= 0.95).

Discussion

Patients with SLE have a high risk of cardiovascular disease. Multiple SLE-specific mechanisms, such as autoimmune responses, altered autoantibody, cytokine levels, and lipid dysfunctions can accelerate the progression of overall atherosclerotic burden. Therefore, early detection and quantification of pathological changes are important for assessing the benefits of cardiovascular prevention in SLE management [3]. Transthoracic echocardiography can be helpful as a noninvasive diagnostic tool for early detection such abnormalities, resulting in earlier treatment and reduction in mortality and morbidity rates [7]. Also, the respiratory system is more commonly affected in SLE than in any other systemic autoimmune disease and that all its components may be affected [4]. Currently, CT is the best imaging technology in diagnosing the chest lesions in SLE patients. Chest lesions occur with high frequency, and the CT manifestations are complex and various, a pulmonary interstitial change is the most common [8].

In the present study, the most common Echocardiography finding was pericardial effusion seen in 40% of patients, followed by mitral regurgitation in 28% of patients; Mitral valve prolapse was seen in 26% of patients. The other echocardiography findings were aortic regurgitation in 6% patients, tricuspid regurgitation and pulmonary hypertension in 8% of patients, each. Systolic dysfunction and diastolic dysfunction in 10% of patients, each. Regional hypokinesia was seen in 12%of patients.

This was in agreement with [9] who did a study included 50 patients of Systemic Lupus Erythematosus of whom 44 patients were females and 6 patients were males. Majority of patients were between the age group 20 to 40 years. The maximum prevalence of Systemic Lupus Erythematosus was seen in the age group of 31 to 50 years. Echocardiography was done in all patients and found the same results as in our study. Furthermore, they found one patient had Libman –Sacks endocarditis and MVP with mitral regurgitation seen in 10 patients.

In another study by [10], fifty lupus patients were enrolled in the study and were evaluated by standard echocardiography with color Doppler. SLEDAI was applied for assessment of disease activity. Out of 50 patients 80% had abnormal echocardiographic findings. Pericardial thickening was found in 19 patients(38%), pericardial effusion in 10 patients (20%), diastolic dysfunction in 36 patients (72%), hypokinesia of ventricular wall in 4 patients (8%), overall valvular abnormalities 20%, commonest being aortic regurgitation in 6 patients (12%), followed by mitral regurgitation in 4 patients (8%), pulmonary hypertension in 3 patients(6%).

In our study, there was a significant correlation between disease duration and EF %(p=0.02). This was in agreement also with [10], as they found significant relationship between disease duration and cardiac abnormalities ($p<0.01$). As regard CT chest in our study, there was 13 patients (26 %) had normal CT chest. The most common CT chest findings was ground glass opacity seen in 15 patients (30 %) followed by pleural effusion seen in 14 patients (28 %), pleural thickening in 10 patients (20%), interlobular septal thickening in 9 patients (18 %) & mediastinal lymph node enlargement, pulmonary artery trunk broadening, bronchiectasis, consolidation in 5 patients (10 %) each, honey comb opacity in 4 patients (8 %) and emphysema in one patient (2%).

This was in agreement with [8] who did a study included 39 patients (34 females and 5 males), aged from 19 to 74 years old, the mean age was (44.13 ± 12.17) years old. HRCT chest was done for all patients and found the same results as in our study. Furthermore, they found Funicular opacity in 20 patients, Sub-pleural line in 9 patients and Mosaic sign in 3 patients.

In other study by [11], 38 lupus patients, were enrolled in the study and were evaluated by HRCT chest. The age of the patients ranged from 12 to 60 years (mean age 26.18 yrs.) with maximum incidence between 16 to 25 years of age & 3 patients (7.89%) were males. Pleural effusion seen in 4 patients (10.53%), pleural thickening seen in one patient (2.63%), Sub-pleural bands seen in 2 patients (5.26%) , Lymphadenopathy seen in 2 patients (5.26%) ,Bronchiectasis seen in 3 patients (7.89%), interlobular septal thickening seen in 15 patients (39.47%) ,Parenchymal bands seen in 14 patients (36.84%) , Air space consolidation seen in 2 patients (5.26%), Ground glass opacification seen in 10 patients (26.32%), Parenchymal micronodules seen in 3 patients (7.89%), Bullae seen in 2 patients (5.26%).

Conclusion

It is common to find cardiac and chest involvement in SLE patients. All SLE patients even who clinically inactive disease should be screened for the presence of structural cardiac and chest abnormalities. Trans-thoracic Echocardiography and CT chest can be helpful as a noninvasive diagnostic tool for early detection of such abnormalities, resulting in earlier treatment and reduction in mortality and morbidity rates.

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