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Original Article

Cardiac Involvement in Systemic Lupus Erythematosus: Echocardiographic Evaluation

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ABSTRACT

Background: Cardiac involvement is common and usually silent in patients with systemic lupus erythematosus (SLE). Echocardiography can be a valuable diagnostic method for the detection of cardiac diseases in such patients. We sought to determine the frequency of the different types of cardiac conditions detected by echocardiography in SLE.

Methods: In this analytic cross-sectional study, 50 patients with SLE were consecutively included. The patients underwent transthoracic 2D, color Doppler, and tissue Doppler imaging echocardiography.

Results: Left ventricular (LV) systolic dysfunction was diagnosed in 9 (18%) patients and LV diastolic dysfunction was seen in 8 (16%). Tricuspid regurgitation (TR) was the most common valvular disease in that it was diagnosed in 29 (58%) patients, followed by mitral regurgitation (MR), detected in 27 (54%) patients. Six (12%) patients had regional wall motion abnormalities. Pulmonary artery hypertension was seen in 25 (50%) patients.

Conclusions: Valvular diseases, especially MR and TR, were common among our patients with SLE. Further, LV systolic and diastolic dysfunction was detected in about one-fifth of the patients. As cardiac involvement was common, we think that future studies should focus on 2 issues: firstly, long-term prognosis of subclinical echocardiographically-detected cardiac diseases and secondly, introduction of screening echocardiography into the routine care of patients with SLE. ***(Iranian Heart Journal 2017; 18(2):23-29)***

Keywords: Systemic lupus erythematosus, Echocardiography, Tissue Doppler, Myocardial contraction, Mitral regurgitation, Tricuspid regurgitation

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Systemic lupus erythematosus (SLE) is a chronic autoimmune inflammatory rheumatologic disease. Its exact etiology is unknown and it can affect several organs—including skin, joints, kidneys, and many other organs. One of the organs reported to be involved in SLE is the heart. [1] Although SLE is more famous among clinicians to involve organs such as joints, skin, and kidneys, cardiac disease is common among those afflicted with SLE, and it is estimated that more than 50% of patients with SLE have cardiac disease. [2] In fact, the American Heart Association includes patients with SLE, especially women, as a high-risk group for cardiovascular diseases. [3]

Pericardium, heart muscle (myocardium), valves, and coronary arteries all can be involved in patients with SLE. [4] Several cardiac conditions have been reported to be considerable in patients with SLE; these conditions include pericarditis (believed to be the most common cardiac involvement in SLE [5] and reported in 11% to 54% of patients), [2, 6] mitral regurgitation, tricuspid valve thickening and regurgitation, valvular vegetations (eg, Libman–Sacks endocarditis, which can be as prevalent as 11%), [7] myocardial dysfunction, [1, 8, 9] and coronary arteries diseases. [10]

Cardiac involvement in SLE was first reported a long time ago. Nonetheless, during the last decade, the application of sensitive imaging methods such as echocardiography has considerably augmented our understanding about the details of cardiac diseases in SLE. Echocardiography is a noninvasive and accessible method and, hence, several studies recently have used this imaging technique to study cardiac structure and function in rheumatologic diseases, especially SLE. [1, 8, 9, 11-13] Most cardiac diseases in SLE may be clinically silent, but they can cause significant morbidity and mortality. [14] Identifying these subclinical conditions, in particular myocardial dysfunction and valvular diseases, confers better management of patients suffering from SLE. In addition, some authors have suggested timely screening with echocardiography to prevent early mortality. [1] The frequencies and types of cardiac involvements are varied among studies, which may be in consequence of the severity of inflammation, diagnostic technique used, side effects of the drug consumed, and many other factors. Given the differences in the literature about the prevalence of cardiac involvement in patients with SLE, we decided to draw upon echocardiography to investigate this topic in our referral rheumatologic academic center.

METHODS

Fifty adult patients (39 females), at a mean (±SD) age of 32.64 (±7.30) years, whose SLE diagnosis had been confirmed by 2 rheumatologists were included consecutively. They presented to the rheumatology clinic for routine follow-up of their disease. The required data comprised demographic data, history of cardiac disease, duration of SLE, and type and duration of administered treatments. The patients underwent transthoracic 2D color Doppler, and tissue Doppler imaging (Vivid 7) by a single cardiologist. Morphological disorders; left ventricular (LV) function; valvular function, especially mitral valve function; volumes; pericardial effusion; myocardial diseases; and noninfective vegetations were assessed.

Statistical Analysis

Descriptive indices such as mean and its standard deviation as well as frequency and percentage were used to express the data. The normal distribution of the data in the 2 groups was assessed using the Kolmogorov–Smirnov test. The comparisons of the continuous variables between the 2 groups were done using the *t*-test or the Mann–Whitney *U* test.

The comparison of the categorical data between the 2 groups was done using the χ^2 test. A *P* value less than 0.05 was considered statistically significant. All the analyses were done using SPSS (version 20.0).

Ethics

The study protocol was approved by the ethics committee of our medical university. Written informed consent was obtained from the patients after the received explanation about the details of the study.

RESULTS

The LV dimensions were normal in 98% of the patients. The LV systolic function was normal in 82% of the patients. Left ventricular systolic dysfunction (LVSD) was detected in 9 (18%) patients in the form of mild LVSD (7 patients, 14%), moderate LVSD (1 patient, 2%), and severe LVSD (1 case, 2%). The mean (± SD) LV ejection fraction was 54.7% (± 6.10). The echocardiographic indices of the myocardial function are depicted in Table 1 and Table 2.

Regarding regional wall motion abnormalities, 6 patients had abnormal findings in the form of global abnormality (2 patients, 4%), lateral wall abnormality (1 patient, 2%), and septal wall abnormality (3 patients, 6%).

Apropos valvular diseases, tricuspid regurgitation (TR) was the most common finding in that it was detected in 29 (58%) patients, followed by mitral regurgitation (MR) in 27 (54%). Table 3 summarizes valvular diseases.

The mean (± SD) pulmonary artery pressure was 32.9 (±10.5) mm Hg (normal range = 15–25 mm Hg), and 25 patients (50%) had pulmonary artery pressure values more than 25 mm Hg.

The only echocardiographic parameter that was statistically different between the male and female patients was the posterior wall thickness at diastole, which was higher in the males than in the females (Table 4).

Table 1. Echocardiographic indices among the 50 patients with systemic lupus erythematosus (SLE)

	Mean (±SD)
Left atrial diameter, mm	28 (±4.2)
Left ventricular diameter, mm	47.39 (±5.47)
Interventricular septum diameter, mm	8.25 (±1.82)
Right ventricular diameter	25.62 (±3.35)
AO, mm	27.98 (±3.84)
Posterior wall thickness at diastole, mm	8.31 (±1.82)
Tricuspid annular plane systolic excursion, mm	24.02 (±3.20)

Table 2. Echocardiographic indices of the myocardial function in 50 patients with systemic lupus erythematosus (SLE)

	Frequency (percentage)
LV diastolic dysfunction	8 (16%)
LV hypertrophy	4 (8%)
RV hypertrophy Mild Severe	 1 (2%) 3 (6%)
RV dysfunction	3 (6%)
RA enlargement	1 (2%)
LA enlargement	1 (2%)

LV, Left ventricular; RV, Right ventricular; RA, Right atrial; LA, Left atrial

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Table 3. Valvular diseases detected by echocardiography among the 50 patients with systemic lupus erythematosus (SLE)

	N (%)
Mitral stenosis	1 (2%)
Mitral regurgitation	
Mild	20 (40%)
Moderate	6 (12%)
Severe	1 (2%)
Total	27 (54%)
Aortic stenosis	0
Aortic insufficiency	
Mild	4 (8%)
Moderate	2 (4%)
Total	6 (12%)
Tricuspid stenosis	0
Tricuspid regurgitation	
Mild	21 (42%)
Moderate	7 (14%)
Severe	1 (2%)
Total	29 (58%)
Pulmonary stenosis	0
Pulmonary insufficiency	2 (4%)

Table 4. Comparison of the echocardiographic parameters between the male and female patients with systemic lupus erythematosus (SLE)

	Males (N= 11)	Females (N= 39)	Sig.
Left atrial diameter, mm	19.1 (±2.48)	27.6 (±4.54)	0.2
Left ventricular diameter, mm	49.8 (±6.3)	46.7 (±5.1)	0.1
Interventricular septum diameter, mm	9.5 (±2.27)	7.9 (±1.5)	0.06
Right ventricular diameter	26.8 (±2.9)	25.3 (±3.4)	0.1
AO, mm	29.2 (±3.3)	27.6 (±3.9)	0.1
Posterior wall thickness at diastole, mm	9.6 (±2.2)	7.9 (±1.6)	0.04
Tricuspid annular plane systolic excursion, mm	23 (±3.1)	24.3 (±3.2)	0.2

LVSD was more common in the males than in the females (36.4% of the males had mild LVSD) (P = 0.02). Regional wall motion abnormalities were also comparable between the males and the females (27.3% vs 10.3%; P = 0.1). LV diastolic dysfunction was not different between the males and the females (27.3% vs 12.8%; P = 0.2). Whereas LV hypertrophy was not detected in the males, it was seen in 10.3% of the females (P = 0.2). No significant difference was seen between the males and females regarding right ventricular function, and nor was there any significant difference between the males and females with respect to the frequency of valvular diseases.

Significant correlations were seen between age and the echocardiographic parameters—comprising left atrial diameter (r = 0.4, P = 0.004), LV diameter (r = 0.32, P = 0.02), interventricular septum at diastole (r = 0.54, P = 0.02), right ventricular diameter (r = 0.42, P = 0.02), AO (r = 0.48, P = 0.001), and posterior wall thickness at diastole (r = 0.56, P = 0.001). The patients with diastolic dysfunction were older than those without diastolic dysfunction (mean [±SD] age = 41 ± 1.7 vs 31.05 ± 6.85; P = 0.001). Likewise, those with LV hypertrophy were older than those without LV hypertrophy (mean age = 42.2 y vs 31.8 y; P = 0.005). Age was not correlated with mitral, tricuspid, and aortic valve diseases. Those with pulmonary artery hypertension were older than those without it (34.9 y vs 30.3 y; P = 0.02).

DISCUSSION

Among our patients with SLE, TR and MR were common. Moreover, about one-fifth of our patients had LV systolic and diastolic dysfunction. Valvular abnormalities have been previously reported to have a high prevalence rate among patients afflicted with SLE. According to a study, patients with SLE have a fivefold increase in TR when compared to healthy controls. [15] The rate of TR is varied among studies. In a previous study, [8] TR was much higher (89%) than what we observed among our study population. On the other hand, in another study conducted on 70 patients with SLE, 44% had valvular diseases and 4 patients had TR. [16] Although valvular vegetations have been reported to occur more frequently in patients with SLE, we did not find such lesions. These vegetations are a common cause of valve regurgitation. In more recent studies, MR has been shown to be more prevalent than TR. Valvular regurgitation was detected in 25% of patients suffering from SLE in another study. [17] Mitral valve prolapse is also another important valvular abnormality in this population. In a study on 87 patients with SLE, 19 patients had mitral valve prolapse, [18] but we did not find mitral valve prolapse in our sample. Another implication is the association of valvular regurgitation with some disease-specific autoantibodies. [19] Here, as a limitation we did not gather data on autoimmune antibodies and as such were not able to correlate valvular diseases to these antibodies.

LV systolic and diastolic dysfunction was seen in about 20% of our patients. These abnormalities in echocardiography have been reported previously as important features of SLE. [15] The exact etiology of LV dysfunction has not been known, but several factors such as coronary artery disease have been cited. [20] Coronary artery disease, which is common in SLE patients, causes inflammation and endothelial damage. [15]

Another important finding in the current study was the prevalence of pulmonary artery hypertension, which was found in about 50% of the patients. Studies on pulmonary artery hypertension in patients with SLE are insufficient. This condition can occur irrespective of disease severity at any stage. [21] In a study on 65 patients suffering from SLE, 10 (8.2%) patients were found by echocardiography to have pulmonary hypertension. Thromboembolic disease, left-sided heart disease, and pulmonary artery hypertension were the most common causes of pulmonary hypertension in this study. [22]

Several newer imaging techniques such as cardiac magnetic resonance imaging, cardiac catheterization, nuclear techniques, and high resolution computed tomography angiography have been employed to study cardiac diseases in SLE. [13] However, echocardiography is still deemed an available and inexpensive imaging method which yields valuable information in this population. Hence, echocardiography is considered the cornerstone in the evaluation of patients with SLE, and many authors have recommended annual examinations of this group of patients using this modality.

CONCLUSIONS

Valvular diseases, in particular MR and TR, were common echocardiography findings in our patients with SLE. Furthermore, LV systolic and diastolic dysfunction was diagnosed in about 20% of our study population. We suggest that in future studies, the long-term prognosis of these cardiac abnormalities be sought with regard to possible correlation with disease severity and evolution. Also, it would be useful to consider screening echocardiography in the routine care of patients with SLE to find out whether or not this practice would be beneficial and cost-effective for patients.

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Conflict of Interest: None.

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