The association of echocardiographic parameters with mortality in Chinese patients with lupus nephritis

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BACKGROUND

The higher all-cause mortality in patients with lupus nephritis (LN) is being acknowledged. A major proportion of the mortality risk in these patients is attributable to cardiac diseases. Echocardiography provides a valid measure of cardiac structure and function.

The aim of this study was to investigate the relationship between echocardiographic parameters and mortality in LN patients.

Figures and Tables

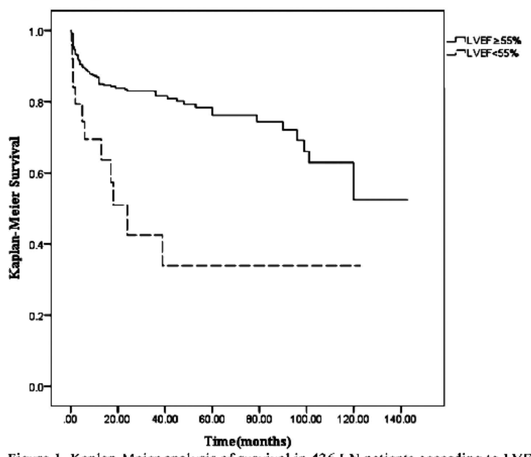

Figure 1. Kaplan-Meier analysis of survival in 436 LN patients according to LVEF.
Solid line represents the cohort with LVEF ≥55%, while the dashed line represents the cohort with LVEF <55% (Log-rank: P<0.001).

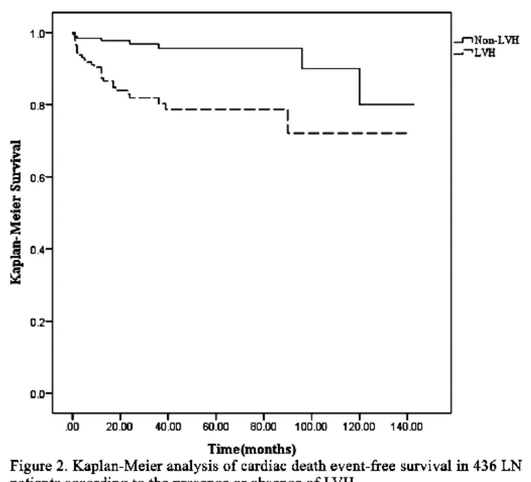

Figure 2. Kaplan-Meier analysis of cardiac death event-free survival in 436 LN patients according to the presence or absence of LVH.
Solid line represents the cohort with no LVH, while the dashed line represents the cohort with LVH (log-rank: P<0.001).

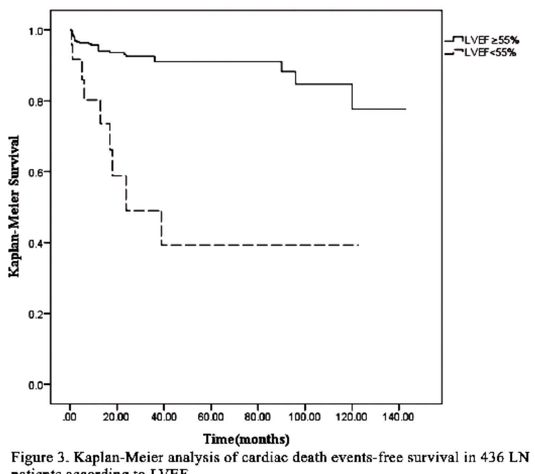

Figure 3. Kaplan-Meier analysis of cardiac death events-free survival in 436 LN patients according to LVEF.
Solid line represents the cohort with LVEF ≥55%, while the dashed line represents the cohort with LVEF <55% (Log-rank: P<0.001).

Table 1 Predictors of all-cause mortality using Cox proportional hazards model

Characteristics	Univariate HR (95% CI)	*P*	Multivariate (forward) HR (95% CI)	*P*
Echocardiographic data				
Pericardial effusion (%)	1.612 (1.058-2.455)	0.026		
Valvular abnormalities (%)	1.928 (1.206-3.080)	0.006		
Valvular calcification (%)	4.228 (1.033-17.306)	0.045		
AAO (mm)	2.710 (1.420-5.175)	0.003		
LAD (mm)	2.255(1.492-3.407)	<0.001		
LVDd (mm)	1.265 (0.820-1.951)	0.288		
RVDd (mm)	1.394 (0.741-2.620)	0.303		
LVMI (g/m²)	1.012(1.007-1.017)	<0.001		
LVEF (%)	0.947(0.920-0.974)	<0.001	0.967 (0.939-0.996)	0.028
E/A<1	1.170 (0.701-1.952)	0.549		

Table 2. Predictors of cardiac mortality using Cox proportional hazards model

Characteristics	Univariate HR (95% CI)	*P*	Multivariate (forward) HR (95% CI)	*P*
Echocardiographic data				
Pericardial effusion (%)	2.375 (1.250-4.513)	0.008		
Valvular abnormalities (%)	2.562 (1.300-5.050)	0.007		
Valvular calcification (%)	5.717 (0.772-42.366)	0.088		
AAO (mm)	2.770 (1.018-7.536)	0.046		
LAD (mm)	3.070 (1.677-5.623)	<0.001		
LVDd (mm)	1.974 (1.066-3.655)	0.031		
RVDd (mm)	1.953 (0.786-4.852)	0.149		
LVMI (g/m²)	1.020 (1.014-1.027)	<0.001	1.011 (1.003-1.020)	0.010
LVEF (%)	0.916 (0.883-0.950)	<0.001	0.953 (0.913-0.994)	0.025
E/A<1 (%)	1.083 (0.487-2.404)	0.846		

AAO, aortic root diameter; LAD, left atrial diameter; LVDd, left ventricular internal diameter in diastole; RVDd, right ventricular internal diameter in diastole; LVEF, left ventricular ejection fraction; E/A, peak early transmitral filling wave velocity/peak late transmitral filling wave velocity ratio.

METHODS

A total of 436 LN patients that underwent echocardiography at Sun Yat-sen Memorial Hospital (Sun Yat-sen University, China), in the period between 1st January, 2000 and 31st December, 2014, served as the study population. Potential association between echocardiographic parameters, and the all-cause and cardiac mortality, was examined using the Cox proportional hazards model. Differences amongst the study subjects, with respect to demographic factors, laboratory variables, medication history and echocardiographic parameters were accounted for in the analysis.

RESULTS

The median duration of follow-up of patients was 18 months (range, 6 to 44 months). Among 436 LN patients, 88 patients (20.2%) died during the follow-up period. Of them, 38 patients (43.2%) died of cardiac disease. On multivariate analyses, decreased left ventricular ejection fraction (LVEF) (Hazard ratio (HR), 0.967; 95% confidence interval (CI), 0.939 to 0.996, *P*=0.028) as shown in Table 1, as well as the presence of cardiac signs, high systolic blood pressure, high serum levels of C-reactive protein, low serum albumin, low estimated glomerular filtration rate (eGFR) were found to be independently associated with increased all-cause mortality. Kaplan-Meier survival curves of 436 LN patients were categorized by left ventricular systolic function (long rank, *P*<0.001) as shown in Figure 1. Furthermore, increased left ventricular mass index (LVMI) (HR, 1.011; 95% CI, 1.003 to 1.020, *P*=0.010) and decreased LVEF (HR, 0.953; 95% CI, 0.913 to 0.994, *P*=0.025) (Table 2), as well as the presence of cardiac signs, low eGFR independently correlated with an increased cardiac mortality risk. Kaplan-Meier curves for event-free survival from cardiac death in 436 LN patients categorized by left ventricular hypertrophy (LVH) (long rank, *P*<0.001) or left ventricular systolic function (long rank, *P*<0.001) were shown in Figure 2 and 3.

CONCLUSION

In this study, decreased LVEF was associated with increased all-cause and cardiac mortality in LN patients. Further, increased LVMI was an independent risk factor for cardiac mortality in these patients. Our findings suggest that a wider application of echocardiography as diagnostic modality in the routine care of LN might confer significant benefits. Based on our findings, further studies are necessary to indentify whether interventions targeting left ventricular systolic dysfunction or LVH could improve the clinical outcomes in LN patients.

REFERENCES

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