Clinical Features of Systemic Lupus Erythematosus-related Interstitial Lung Disease-a Clinical Retrospective Study

Qian Niu (476839887@qq.com)
Union Hospital of Tongji Medical College of Huazhong University of Science and Technology https://orcid.org/0000-0001-8685-3263
Xiaonan Tao
Union Hospital of Tongji Medical College of Huazhong University of Science and Technology

Research

Keywords: Systemic lupus erythematosus-related interstitial lung disease, Autoantibody, Correlation, Receiver operating curve, Binary Logistic regression analysis

Posted Date: August 5th, 2020

DOI: https://doi.org/10.21203/rs.3.rs-52550/v1

Abstract

Background: There is no conclusion about the correlation between autoantibodies in SLE patients and ILD. In order to help early diagnosis of SLE-ILD, here we will compare the differences in clinical data of SLE-ILD and SLE-NILD patients and explore the clinical features of SLE-ILD and the value of indicators related to the diagnosis of SLE-ILD and independent risk factors.

Methods: A clinical retrospective study. Select 89 SLE-ILD patients and 187 SLE-NILD patients, collect all patients' age of onset, smoking history, sex, and autoantibodies, and compare the differences between the two. Additionally collect respiratory manifestations, pulmonary auscultation signs, pulmonary computer tomography and pulmonary function of SLE-ILD patients. Rely on the above clinical data to carry out relevant summary and statistical analysis, and explore the correlation between pulmonary function and autoantibodies in SLE-ILD patients, the value of autoantibodies in the diagnosis of SLE-ILD and the independent risk factors of SLE-ILD.

Results：SLE-ILD patients have a higher ANA positive rate than SLE-NILD patients. There is no correlation found between pulmonary function indexes and autoantibodies in SLE-ILD patients. The diagnostic sensitivity of ANA for SLE-ILD is 97.8%, specificity only 3.2%. The diagnostic sensitivity and specificity of Ro-52 are 61.8% and 52.9%. Age, ANA, SM, and Ro-52 are independent risk factors for the onset of SLE-ILD.

Conclusions: Age, ANA, SM, and Ro-52 are meaningful and notable indicators for SLE patients when in doubt whether they are accompanied by ILD.

Background

Systemic lupus erythematosus（SLE） is a diffuse autoimmune disease that often involves multiple organs and multiple systems. The ratio of male to female is about 1:10 [1]. The overall incidence of lung involvement is relatively high [2], and the incidence of lung involvement has been reported to be 24% to 70% [3,4], which can manifest as pleural effusion, pleurisy, interstitial lung disease（ILD）, pulmonary hypertension , diffuse alveolar hemorrhage, pulmonary embolism, etc. The incidence of pleurisy is the highest, ranging from 23% to 50% [5]. ILD is also a common comorbidity of SLE. A study have reported that its incidence is 10% to 15% [3], which seriously affects the quality of life and prognosis of patients [6]. So far, the mechanism of lung involvement and the pathogenesis of ILD in SLE patients remain unclear. Due to the hidden onset of ILD and the lack of specific serum markers, irreversible pulmonary fibrosis has often occurred at the time of diagnosis. This study hopes to help early diagnosis of the disease through the research of the clinical characteristics of systemic lupus erythematosus-related interstitial lung disease（SLE-ILD）.

Methods

Inclusion criteria

SLE patients were hospitalized in our hospital from september 2017 to march 2019, and they met the SLE classification criteria recommended by the American Academy of Rheumatology in 1997 [7]. The diagnostic criteria for ILD patients are shown in Table 1.

Table 1
Diagnostic criteria for ILD

（1）coughing without a clear cause, shortness of breath after slight activity, or Velcro rales
（2）HRCT shows interstitial changes, such as strand shadows, ground glass shadows, consolidation shadows, patch shadows, honeycomb changes, etc.
（3）pulmonary function test shows restrictive pulmonary ventilation dysfunction and/or diffusion dysfunction
（4）pathological examination confirmed by lung biopsy

with 2 of (1) (2) (3) or (4), except for tuberculosis and emphysema, ILD can be diagnosed

Exclusion criteria

Medical records are incomplete or examinations are imperfect, and corresponding clinical data cannot be provided according to the needs of this study; clearly defined as infectious diseases, neurogenic diseases, endocrine system diseases, interstitial lung injury aroused by drug, occupational or environmental exposure, and other connective tissue diseases, idiopathic interstitial pneumonia, granulomatous diffuse lung disease, alveolar proteinosis, pulmonary hemorrhage-nephritis syndrome, pulmonary lymphangiomyomatosis, Langerhans cell histiocytosis, chronic eosinophilic pneumonia, idiopathic pulmonary hemosiderinosis, etc.

Research objects

This study is a clinical retrospective study. According to the inclusion and exclusion criteria, 89 patients with a definite diagnosis of systemic lupus erythematosus-related interstitial lung disease who were hospitalized in the Department of Rheumatology and Immunology of our hospital from

september 2017 to march 2019 were selected. 187 patients diagnosed as systemic lupus erythematosus not accompanied by interstitial lung disease during the same period were selected. The age of onset of all patients was between 12 and 78 years old, with the average age of onset (38.67±13.12) years old and 14 cases (5.07%) having a history of smoking. 32 cases (11.59%) were male patients, and the age of onset was between 12 and 78 years old. Among them, the average age of onset was (36.50±15.63) years old, and 13 cases (4.71%) had a history of smoking. 244 cases (88.41%) were female patients. The age of onset was between 13 and 73 years old, and the average age of onset was (38.95±12.76) years old. There was 1 case (0.36%) with a history of smoking.

Clinical data

We collected all patients' age of onset, smoking history, gender, autoantibodies (checked by our hospital's inspection system, including antinuclear antibody, anticardiolipin antibody, anti-nRNP antibody, anti-Sm antibody, anti-SS-A antibody, anti Ro-52 antibody, anti-SS-B antibody, anti-SCL70 antibody, anti-JO-1 antibody, anti-centromere protein B antibody, anti-dsDNA antibody, anti-nucleosome, anti-histone, anti-ribosomal P protein) and additionally collected the respiratory tract clinical manifestations, pulmonary auscultation signs, pulmonary computer tomography (because the selected samples were all from the rheumatology and immunology department, only a few patients having perfected high resolution computer tomography, the image data included in this study were all ordinary spiral computer tomography), and pulmonary function indicators (including DLCO, DLCO/VA, VC, FVC, FEV1, FEV1/FVC, in order to exclude the influence of confounding factors such as gender, age, height, weight, etc., pulmonary function indicators were selected as the percentage of the actual measured value to the predicted value) of SLE-ILD patients.

Statistics

We used SPSS 22.0 statistical software for statistical analysis of the data. Measurement data were described by mean ± standard deviation and counting data were described by frequency and percentage. We adopted two independent sample t-test for the measurement data conforming to normality and homogeneity of variance and Wilcoxon rank sum test for not satisfing normal distribution. Chi-square test was used for counting data. Pearson correlation coefficient was used to reflect the correlation between data. The receiver operating curve and the area under the curve were used to explore the value of autoantibodies in the diagnosis of SLE-ILD. Binary Logistic regression was used to analyze the independent risk factors of SLE-ILD. In this study, $P<0.05$ was considered statistically significant.

Results

Comparison of general conditions (age of onset, smoking history, gender) and autoantibodies between SLE-ILD group and SLE-NILD group

In the SLE-ILD group, the age of onset was between 21 and 78 years old, the average age of onset was (43.19±12.07) years old, and 7 cases (7.87%) had a history of smoking. 9 cases (10.11%) were male, the age of onset was between 21 and 78 years old, the average age of onset was (46.78±15.88) years old, and 6 cases (6.74%) had a history of smoking. 80 cases (89.89%) were female, the age of onset was between 23 and 67 years old, and the average age of onset was (42.79 ±11.63) years old, 1 case (1.12%) with a history of smoking.

In the SLE-NILD group, the age of onset was between 12 and 73 years old, the average age of onset was (36.51±13.08) years old, and 7 cases (3.74%) had a history of smoking. 23 cases (12.30%) were male, the age of onset was between 12 and 62 years old, the average age of onset was (32.48±13.86) years old, and 7 cases (3.74%) had a history of smoking. 164 cases (87.70%) were female, the age of onset was between 13 and 73 years old, and the average age of onset was (37.08 ±12.90) years old, all non-smokers.

Two independent sample t-test was performed on the age of onset, smoking history, and gender of the two groups, and the chi-square test was performed for autoantibodies. The results are shown in Table 2. It can be seen that there are significant differences in age of onset and ANA positive rate between SLE-ILD patients and SLE-NILD patients($P<0.05$). While there are no significant differences on smoking history, gender, and the positive rates of ACA, NRNP, SM, SSA, Ro-52-Ab, SSB, RA-54, DM-53, DE, ADA, JO1, SCL70, CENPB($P>0.05$).

Table 2
Comparison of general conditions and autoantibodies between SLE-ILD and SLE-NILD

comparing items	results	SLE-ILD	SLE-NILD	t/χ^2	*p*-value
age of onset （y）		43.19±12.07	36.51±13.08	t=4.181	0.001
smoking history （n）	yes	7	7	t=-1.459	0.146
	no	82	180		
gender（n）	male	9	23	t=0.545	0.587
	female	80	164		
ANA（n）	≥1:3200	54	75	χ^2=15.122	0.004
	1:1000	13	64		
	1:320	9	25		
	1:100	11	17		
	-	2	6		
ACA（n）	+	28	45	χ^2=3.647	0.161
	±	3	16		
	-	58	126		
NRNP（n）	+	51	82	χ^2=5.537	0.063
	±	3	16		
	-	35	89		
SM（n）	+	20	29	χ^2=4.985	0.083
	±	5	25		
	-	64	133		
SSA（n）	+	46	88	χ^2=0.754	0.686
	±	7	13		
	-	36	86		
Ro-52-Ab（n）	+	48	74	χ^2=5.543	0.063
	±	7	14		
	-	34	99		
SSB（n）	+	6	15	χ^2=1.660	0.436
	±	1	7		
	-	82	165		
RA-54（n）	+	15	34	χ^2=0.084	0.959
	±	13	26		
	-	61	127		
DM-53（n）	+	16	42	χ^2=4.201	0.122
	±	7	28		
	-	66	117		
DE（n）	+	29	47	χ^2=1.715	0.424
	±	7	15		
	-	53	125		
ADA（n）	+	15	44	χ^2=4.779	0.092
	±	8	29		

	-	66	114		
JO1（n）	+	0	0	χ^2=0.291	0.590
	±	1	1		
	-	88	186		
SCL70（n）	+	2	1	χ^2=2.111	0.348
	±	0	1		
	-	87	185		
CENPB（n）	+	3	11	χ^2=1.285	0.526
	±	0	1		
	-	86	175		

+ for positive; ± for weak positive; - for negative

Clinical symptoms of patients in SLE-ILD group

The clinical symptoms of patients in the SLE-ILD group were: fever in 38 cases (42.70%), cough and sputum in 18 cases (20.22%), chest tightness in 18 cases (20.22%), dry cough in 12 cases (13.48%), shortness of breath in 10 cases (11.24%), asthma in 9 cases (10.11%), chest pain in 9 cases (10.11%), dyspnea in 3 cases (3.37%), hemoptysis in 1 case (1.12%), blood in sputum in 1 case (1.12%). 32 cases (35.96%) were asymptomatic.

Pulmonary auscultation signs of patients in SLE-ILD group

In the SLE-ILD group, 13 cases (14.61%) had fine wet rales on pulmonary auscultation, with 10 cases (11.24%), 1 case (1.12%) and 2 cases (2.25%) in both lungs, right lung and left lung, respectively, of which 7 cases (7.87%), 1 case (1.12%), and 2 cases (2.25%) heard Velcro rales in both lower lungs, right lower lung and left lower lung, respectively. There were 5 cases (5.62%) and 2 cases (2.25%) with weakened breath sounds in both lungs and right lung; 12 cases (13.48%) with thick breath sounds in both lungs; 1 case with dry sounds in both lungs and left lung (1.12% each). 67 cases (75.28%) had no positive signs.

Pulmonary computer tomograph findings of patients in SLE-ILD group

All 89 patients with SLE-ILD completed the conventional spiral pulmonary computer tomograph examination, suggesting that there were 43 cases (48.31%) with grid-like shadows, 41 cases (46.07%) with ground glass density shadows, 16 cases (17.98%) with thickened interlobular septa, 15 cases (16.85%) with streak shadows, 14 cases (15.73%) with subpleural line shadows, 12 cases (13.48%) with patchy high-density shadows, 5 cases (5.62%) with flaky light shadows, 4 cases (4.49%) with honeycomb changes, and 3 cases (3.37%) with traction bronchiectasis. Among them, 75 cases (84.27%) had lesions involving both lungs. The distribution of imaging abnormalities in each lung field is shown in Table 3.

Table 3
Pulmonary computer tomograph findings and distribution of patients in SLE-ILD group

imaging abnormalities	Upper lung field	Middle lung field	Lower lung field	Both lung	Right lung	Left lung
grid-like shadows	10	9	33	38	3	2
ground glass density shadows	5	4	35	36	3	2
thickened interlobular septa	-	2	12	15	-	1
streak shadows	1	8	14	14	-	1
subpleural line shadows	-	-	14	11	2	1
patchy high-density shadows	-	2	10	11	1	-
flaky light shadows	3	3	5	5	-	-
honeycomb changes	-	-	4	4	-	-
traction bronchiectasis	-	2	3	3	-	-

Table 3 Pulmonary computer tomograph findings and distribution of patients in SLE-ILD group

Pulmonary function of patients in SLE-ILD group

Of the 89 SLE-ILD patients, 28 had perfected lung ventilation and diffusion function test during hospitalization. Analyzing the DLCO SB%, DLCO/VA%, VC%, FVC%, FEV1%, FEV1/FVC of these patients, it was found that there were 16 cases (57.14%) with normal or roughly normal lung ventilation function; 8 cases (28.57%) with restrictive ventilatory dysfunction, including 3 cases (10.71%), 2 cases (7.14%), and 3 cases (10.71%) with mild, moderate, and moderately severe restrictive ventilatory dysfunction. 5 cases (17.86%) with obstructive ventilatory dysfunction, among them, 3 cases (10.71%), 1 case (3.57%), and 1 case (3.57%) with mild, moderate, and severe obstructive ventilatory dysfunction; 1 case (3.57%) with severe mixed ventilatory dysfunction. There were 10 cases (35.71%) with normal diffusion function, and 6 cases (21.43%), 9 cases (32.14%), and 3 cases (10.71%) with mild, moderate, and severe impaired diffusion function. Abnormal lung ventilation function is shown in Figure 1

In order to exclude the abnormal pulmonary function caused by small airway obstruction and injury induced by smoking, a total of 25 non-smokers in the SLE-ILD group were selected to compare pulmonary function indexes with all 28 SLE-ILD patients. The results suggest that there is no significant difference in pulmonary function indexes between the two. The results are shown in Table 4.

Table 4
Comparison of pulmonary function between SLE-ILD and non-smoker SLE-ILD

	SLE-ILD	SLE-ILD&non-smokers	*p*-value
DLCO SB %	60.89±20.11	60.31±20.77	0.918
DLCO/VA %	80.97±19.04	81.56±19.84	0.912
VC%	85.01±18.26	82.68±17.91	0.642
FVC %	85.01±18.26	82.68±17.91	0.642
FEV1 %	78.78±19.13	76.61±18.81	0.680
FEV1/FVC	78.41±9.52	78.59±9.80	0.947

Correlation between pulmonary function and autoantibodies of patients in SLE-ILD group

Pearson correlation coefficient was used to analyze the correlation between pulmonary function and autoantibodies in SLE-ILD patients. The analysis results indicate that in SLE-ILD patients, DLCO SB%, DLCO/VA%, VC%, FVC%, FEV1%, FEV1 /FVC have no correlation with the studied autoantibodies. Among them, SCL70 is always constant, so correlation analysis cannot be performed. The analysis results are shown in Table 5.

Exploring the value of autoantibodies in the diagnosis of SLE-ILD through ROC/AUC analysis

The receiver operating curve was used to describe the sensitivity and specificity of autoantibodies for the diagnosis of SLE-ILD. The results are shown in Table 6, and the ROC curves are shown in Figure 2 and Figure 3.

Binary Logistic regression analysis of independent risk factors for SLE-ILD

The binary Logistic regression analysis found that age, ANA, SM, and Ro-52 were independent risk factors for the onset of SLE-ILD. The results are shown in Table 7. The established regression model has a *P* value of <0.001, which is considered to be statistically significant. The prediction accuracy rate is 78.3%.

Table 5
Correlation between pulmonary function and autoantibodies of patients in SLE-ILD group

	ANA	ACA	NRNP	SM	SSA	Ro-52-Ab	SSB	RA-54	DM-53	DE	ADA	JO1	SCL70	CENPB
DLCO SB%														
r	-0.03	-0.325	-0.132	0.038	-0.071	0.064	0.198	0.005	0.054	-0.055	-0.151	-0.145	-	0.198
P	0.878	0.091	0.504	0.846	0.72	0.748	0.313	0.981	0.786	0.78	0.443	0.461	-	0.313
DLCO/VA%														
r	0.12	-0.206	0.062	-0.04	0.05	0.149	0.032	-0.016	-0.096	-0.135	-0.126	-0.164	-	0.032
P	0.542	0.292	0.755	0.841	0.802	0.451	0.871	0.934	0.626	0.494	0.523	0.403	-	0.871
VC %														
r	-0.077	-0.2	-0.065	0.179	-0.145	-0.068	0.26	-0.304	-0.131	-0.072	-0.301	-0.14	-	0.26
P	0.696	0.307	0.743	0.361	0.461	0.733	0.182	0.116	0.507	0.715	0.12	0.479	-	0.182
FVC %														
r	-0.077	-0.2	-0.065	0.179	-0.145	-0.068	0.26	-0.304	-0.131	-0.072	-0.301	-0.14	-	0.26
P	0.696	0.307	0.743	0.361	0.461	0.733	0.182	0.116	0.507	0.715	0.12	0.479	-	0.182
FEV1 %														
r	-0.126	-0.122	-0.026	0.182	-0.179	-0.113	0.253	-0.303	-0.209	-0.07	-0.345	-0.09	-	0.253
P	0.523	0.536	0.895	0.355	0.362	0.566	0.193	0.117	0.285	0.723	0.072	0.649	-	0.193
FEV1/FVC														
r	-0.067	0.193	0.205	0.133	-0.244	-0.231	0.009	-0.082	-0.216	0.086	-0.227	0.115	-	0.009
P	0.736	0.325	0.296	0.501	0.21	0.236	0.965	0.679	0.27	0.663	0.245	0.56	-	0.965

Table 6
ROC/AUC analysis

autoantibodies	AUC	95% CI	*p*-value	Yorden Index	sensitivity	specificity
ANA	0.577	0.502-0.652	0.039	0.01	97.8%	3.2%
Ro-52	0.578	0.506-0.65	0.035	0.147	61.8%	52.9%

Table 7
Binary Logistic regression analysis

factors	*p*-value	OR	95% CI
Age	0.001	0.958	0.934-0.982
ANA	0.001	4.639	1.905-11.298
SM	0.046	3.725	1.023-13.561
Ro-52	0.019	2.725	1.181-6.285

Discussion

In this study, the average age of onset of SLE-ILD patients was 43.19±12.07 years old, while the average age of onset of SLE-NILD patients was 36.51±13.08 years old. The difference in age of onset between the two groups is statistically significant (P<0.001). SLE-ILD on average occurs about 7 years after the diagnosis of SLE is established, which is consistent with the results of earlier studies. Toyoda et al. [8] retrospectively analyzed 69 SLE patients and found that SLE-ILD accounted for 29%, of which 70% were women. The average age of diagnosis of SLE-ILD in this study was 53.4 years old, which was significantly higher than the SLE-NILD in the study (38 years old), P = 0.003. Boddaert et al. [9] analyzed 714 late-onset SLE cases (diagnosed after the age of 50) and 47 early-onset cases and found that the incidence of ILD increased with age: early-onset cases 11.3% vs. late-

onset cases 21.2%. Cervera et al. [10] reported that 3% of patients with ILD were diagnosed at the same time with SLE, and 7% of patients gradually developed ILD during the course of SLE. The study of Boddaert et al. [9] found that the age-related gender ratio decreased: female: male = 4.4:1 in late-onset patients vs. female: male = 10.6:1 in early-onset patients. In our study, there is no difference in gender and smoking history between the two groups (P>0.05), and they are more common in women and non-smokers.

There is no conclusion about the correlation between autoantibodies in SLE patients and ILD. Studies have shown that in autoimmune diseases, patients with ILD have a higher ANA positive rate than patients without ILD [11]. Our study found that there was a significant difference in the positive rate of ANA between the SLE-ILD group and the SLE-NILD group. That is, SLE-ILD patients have a higher ANA positive rate than SLE-NILD patients, and ANA can be recommended as a screening index for the onset of SLE-ILD. Lin Bing et al. [12] pointed out in a study of 100 SLE-ILD patients that compared with SLE-NILD patients, SLE-ILD patients had lower levels of anti-dsDNA antibody known as a lupus specific serum marker. While Hedgpeth M T [13] meaned that the severity of ILD was not affected by anti-dsDNA antibody, and was less affected by anti-SS-A antibody. Anti-Sm antibody is the hallmark antibody of SLE. Studies [14] have shown that anti-Sm antibody was related to ILD. Lian et al. [15] found that anti-SS-A antibody, anti-SS-B antibody, and anti-SCL70 antibody were all related to SLE-ILD through multiple regression analysis. However, our study only found a significant difference in the positive rate of ANA between the two groups, while the other 13 autoantibodies studied were not significantly different. Data from a large random trial are needed to further verify whether each autoantibody is compatible with SLE-ILD and to clarify the mechanism of each correlation at cellular and molecular levels.

In the study, the common clinical symptoms of SLE-ILD patients were fever, cough, sputum, chest tightness, dry cough, and shortness of breath. However, progressive dyspnea after activities was relatively rare. We consider the above atypical symptoms of interstitial lung damage (Such as fever, cough and sputum) are mostly related to the long-term use of glucocorticoids, immunosuppressive drugs and other drugs after the diagnosis of SLE, which leads to the immune dysfunction and is likely to cause secondary infections.

The most common abnormal pulmonary auscultation sign in the SLE-ILD group was pulmonary rales. 76.92% of these patients had Velcro rales, typical of interstitial pneumonia. 75.28% of patients did not find positive pulmonary signs, suggesting that only relying on lung auscultation signs as the diagnostic basis for SLE with ILD may cause false negative and reduce the detection rate.

Lian et al. [15] reported that ground glass density shadow was the most common imaging change in SLE-ILD patients, accounting for about 84.4% and the remaining imaging changes are nodular shadows (21.1%), honeycomb shadows (15.6%) and traction bronchiectasis (12.8%). In this study, the common lung imaging abnormalities in SLE-ILD patients were grid-like shadows (48.31%), ground glass density shadows (46.07%), and interlobular thickening (17.98%). The lesions involving both lungs account for 84.27%. But SLE patients did not routinely undergo HRCT examination, the above mentioned data may be lower than the actual. In clinical work, we should not only pay attention to the typical imaging manifestations of interstitial pneumonia, but also not ignore some relatively rare abnormal manifestations such as subpleural line shadows, cellular changes, traction bronchiectasis, etc., especially cellular changes which often represent severe pulmonary fibrosis difficult to reverse. Previously report said that the most frequently observed change on HRCT in SLE-ILD patients was NSIP. Toyoda et al. [16] retrospectively analyzed 69 SLE patients, UIP accounting for 25% and NSIP accounting for 55% on HRCT. Long-term imaging follow-up showed that most patients' disease progressed slowly, and most of the lung function indexes could be maintained, and there was no significant difference in survival rate between ILD and NILD patients.

The abnormalities of pulmonary function in SLE-ILD patients were mainly restrictive ventilatory dysfunction and impaired diffusion function. Two independent sample t-tests found that the abnormal changes in pulmonary function in SLE-ILD patients were not affected by smoking history. That is, the effect of smoke on lung interstitial changes is far less than the effect of immune damage.

However, this study did not find a correlation between pulmonary function indexes (including ventilation function and diffusion function indexes) and autoantibodies in SLE-ILD patients. Considering the included study samples were only 28 cases, there may be selection bias affecting the analysis results. The receiver operating curve analysis found that ANA and Ro-52 were meaningful for the diagnosis of SLE-ILD. The diagnostic sensitivity of ANA is high to 97.8%, but the specificity is very low, only 3.2%. The diagnostic sensitivity of Ro-52 is 61.8%, specificity 52.9%. The results indicate that ANA and Ro-52 have a suggestive effect on the possibility of SLE-ILD, but differential diagnosis is still needed. Further binary Logistic regression analysis found that age, ANA, SM, and Ro-52 were independent risk factors for the onset of SLE-ILD. The above can provide certain guidance and decision-making significance for patients with clinically suspected SLE-ILD.

At present, there are few studies on the relationship between autoantibodies and SLE-ILD. In this study, the chi-square test of autoantibodies in SLE-ILD and SLE-NILD patients, the correlation analysis of pulmonary function indicators and autoantibodies in SLE-ILD patients, the receiver operating curve analysis of autoantibodies for the diagnosis of SLE-ILD and the binary Logistic regression analysis between autoantibodies and other factors and the onset of SLE-ILD reveal the value of some autoantibodies for the diagnosis and prognosis of SLE-ILD, which will definitely contribute to clinical work. However, due to the retrospective nature of this study, the implementation of HRCT and the acquisition of pulmonary function data have a strong passivity, it is impossible to further analyze and stratify the imaging data and pulmonary function, which affects subsequent statistics result and its accuracy.

Conclusion

Age, ANA, SM, and Ro-52 are meaningful and notable indicators for SLE patients when in doubt whether they are accompanied by ILD.

Abbreviations

SLE: systemic lupus erythematosus; ILD: interstitial lung disease; SLE-ILD: systemic lupus erythematosus-related interstitial lung disease; HRCT: high resolution computer tomography; DLCO: diffusion capacity of the lung for carbon monoxide; DLCO/VA:
diffusion capacity for carbon monoxide per liter of alveolar volume; VC: vital capacity; FVC: Forced vital capacity; FEV1:
forced expiratory volume in one second; FEV1/FVC: forced expiratory volume in one second/forced vital capacity; ANA: antinuclear antibody; ACA: anticardiolipin antibody; NRNP: anti-nRNP antibody; SM: anti-Sm antibody; SSA: anti-SS-A antibody; Ro-52-Ab: anti Ro-52 antibody; SSB: anti-SS-B antibody; SCL70: anti-SCL70 antibody; JO1: anti-JO-1 antibody; CENPB: anti-centromere protein B antibody; ADA: anti-dsDNA antibody; RA-54: anti-nucleosome; DM-53: anti-histone; DE: anti-ribosomal P protein.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable.

Authors' contributions

QN designed the study, collected all data, analysed the data and drafted the manuscript. XN revised it critically for important intellectual content. All authors read and approved the final manuscript.

Acknowledgements

Not applicable.

Authors' information

[1,2]Department of Respiratory and Critical Care Medicine, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, China. [2]Corresponding Author.

References

1. Cervera R, Khamashta M A, Font J, et al. Systemic lupus erythematosus: clinical and immunologic patterns of disease expression in a cohort of 1,000 patients. The European Working Party on Systemic Lupus Erythematosus. Medicine. 1993; 72: 113-124.
2. Vincze K, Odler B, Müller V. Pulmonary manifestations in systemic lupus erythematosus. Orv Hetil. 2016; 44:1154-1160.
3. Mathai S C, Danoff S K. Management of interstitial lung disease associated with connective tissue disease. Bmj. 2016; 352: h6819.

4. Fidler L, Keen K J, Touma Z, et al. Impact of pulmonary disease on patient-reported outcomes and patient-performed functional testing in systemic lupus erythematosus. Lupus. 2016; 25: 1004-1011.
5. Pego-Reigosa J M, Medeiros D A, Isenberg D A. Respiratory manifestations of systemic lupus erythematosus:old and new concepts. Best practice & research Clinical rheumatology. 2009; 23: 469-480.
6. Saketkoo L A, Matteson E L, Brown K K, et al. Developing disease activity and response criteria in connective tissue disease-related interstitial lung disease. The Journal of rheumatology. 2011; 38: 1514-1518.
7. Hochberg M C. Updating the American College of Rheumatology revised criteria for the classification of systemic lupus erythematosus. Arthritis & Rheumatism: Official Journal of the American College of Rheumatology. 1997; 40: 1725-1725.
8. Toyoda Y, Koyama K, Kawano H, et al. Clinical features of interstitial pneumonia associated with systemic lupus erythematosus. Respiratory Investigation. 2019; 57: 435-443.
9. Boddaert J, Amoura Z, Wechsler B, et al. Late-onset systemic lupus erythematosus: a personal series of 47 patients and pooled analysis of 714 cases in the literature. Medicine. 2004; 83: 348-359.
10. Cervera R, Khamashta M A, Font J, et al. Systemic lupus erythematosus: clinical and immunologic patterns of disease expression in a cohort of 1,000 patients. The European Working Party on Systemic Lupus Erythematosus. Medicine. 1993; 72: 113-124.
11. Ahmad K, Barba T, Gamondes D, et al. Interstitial pneumonia with autoimmune features: clinical, radiologic, and histological characteristics and outcome in a series of 57 patients. Respiratory medicine. 2017; 123: 56-62.
12. Bing Lin. Clinical analysis of 100 cases of systemic lupus erythematosus with lung damage. Journal of China-Japan Friendship Hospital. 2007; 21: 135-136.
13. Hedgpeth M T, Boulware D W. Interstitial pneumonitis in antinuclear antibody–negative systemic lupus erythematosus: a new clinical manifestation and possible association with anti–ro (ss-a) antibodies. Arthritis & Rheumatism. 1988; 31: 545-548.
14. Xiaofang Chen, Min Yang, Jinjun Zhao, et al. Analysis of clinical features and related risk factors of systemic lupus erythematosus with interstitial pneumonia. Chongqing Medicine. 2018: 8.
15. Lian F, Zhou J, Wang Y, et al. Clinical features and independent predictors of interstitial lung disease in systemic lupus erythematosus. Int J Clin Exp Med. 2016; 9: 4233-4242.
16. Toyoda Y, Koyama K, Kawano H, et al. Clinical features of interstitial pneumonia associated with systemic lupus erythematosus. Respiratory Investigation. 2019; 57: 435-443.

Figures

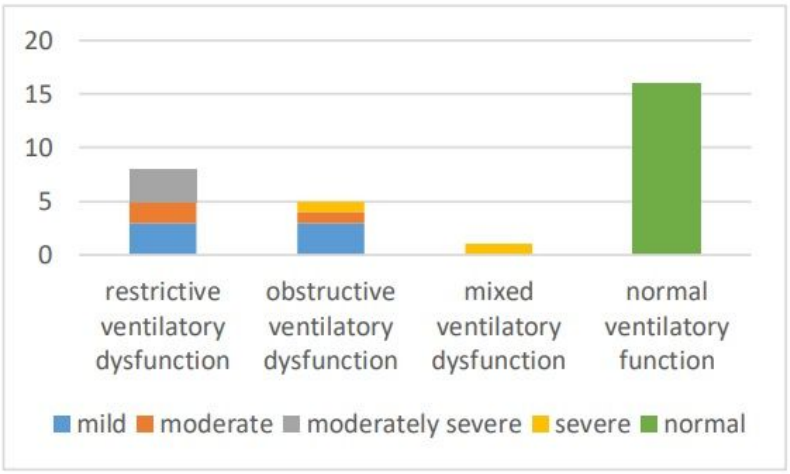

Figure 1

Pulmonary function of patients in SLE-ILD group

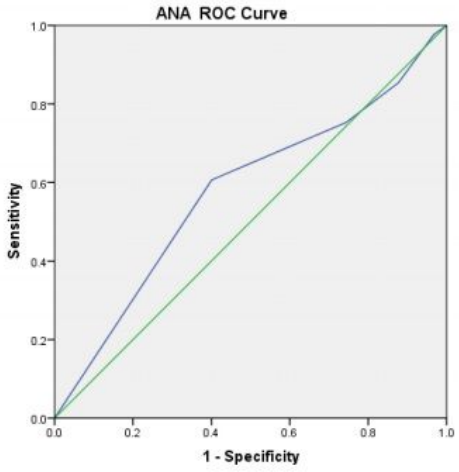

Figure 2

ANA–ROC

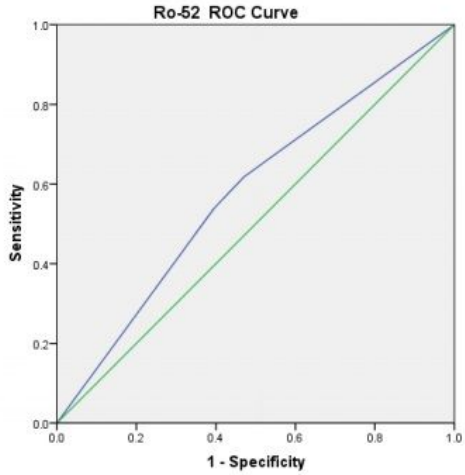

Figure 3

Ro-52–ROC