

Clinical and prognostic features associated with anti-Ro52 autoantibodies in connective tissue diseases patients with interstitial lung disease

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Abstract

Objective

To define the clinical and prognostic features associated with anti-Ro52 autoantibodies in patients with connective tissue diseases with interstitial lung disease (CTD-ILD).

Methods

A total of 238 patients with CTD-ILD were included in this single-centre retrospective cohort study. Patients with positive anti-Ro52 antibodies were selected as the study group, and those with negative anti-Ro52 antibodies were included in the control group. Clinical and follow-up data were analysed.

Results

Among 238 patients, 145 (60.92%) were positive for the anti-Ro52 antibody. These patients were more likely to have respiratory symptoms at baseline, with more organising pneumonia (OP) patterns and worse forced vital capacity (FVC). Follow-up data were obtained for ILD progression in 170 patients. Varying degrees of progression in pulmonary function (PF) or imaging were found in 48 patients (28.24%) with CTD-ILD. A dichotomous logistic analysis based on the presence or absence of progress showed no correlation with anti-Ro52 antibodies. During the follow-up of 170 patients, there were 35 deaths: 24 in the anti-Ro52 antibody positive group and 11 in the anti-Ro52 antibody negative group. Kaplan-Meier survival curves were used to describe the difference in survival between the two groups (mortality 17.14% vs. 12.5%, log-rank $p=0.287$). The multivariate logistic analysis showed that ILD progression was associated with older age, worse FVC and diffusion capacity for carbon monoxide at baseline, higher levels of C-reactive protein, serum ferritin, immunoglobulin G and lower absolute lymphocyte count.

Conclusion

Anti-Ro52 antibodies may predict more severe lung damage in CTD-ILD; however, anti-Ro52 antibodies were not correlated with progression and death in patients with ILD.

Key words

anti-Ro52 antibody, anti-TRIM21 antibody, connective tissue diseases, interstitial lung disease

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Received on November 17, 2022; accepted
 in revised form on April 17, 2023.

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 EXPERIMENTAL RHEUMATOLOGY 2023.

*Funding: this research was supported
 by The Second Affiliated Hospital of
 Jiaxing University Hospital level
 Foundation (no. Y2021-Y107) and
 Jiaxing Science and Technology
 Plan Project (no. 2022AD30018).*

Competing interests: none declared.

Introduction

Connective tissue diseases (CTD) are a heterogeneous group of chronic systemic autoimmune diseases, including systemic lupus erythematosus (SLE), primary Sjögren's syndrome (pSS), systemic sclerosis (SSc), idiopathic inflammatory myopathies (IIMs), rheumatoid arthritis (RA), mixed connective tissue disease (MCTD), systemic vasculitis, and similar. The prognosis of patients with CTD is determined by main visceral complications, especially interstitial lung disease (ILD) (1). Moreover, the presence of various autoantibodies is of great significance for the diagnosis, classification, and prognosis of CTD (2). For example, anti-TRIM21/Ro52 autoantibodies represent one of the most frequently encountered autoantibodies in patients with CTD. Anderson *et al.* were the first to discover anti-Ro52 antibody in the serum of patients with SS in 1961 (3). A similar unknown antibody named Ro was subsequently detected in patients with SLE (4). Early studies suggested that SSA/Ro antigen is the same macromolecular complex composed of two peptides with similar molecular weight (52 Ku and 60 Ku) (5). Yet, later on, studies confirmed that the natural anti-SSA antibody was actually an anti-Ro60 antibody (6, 7).

Due to the lack of specific nuclear or cytoplasmic fluorescence staining, the anti-Ro52 antibody is still controversial among clinicians and immunologists. The Ro52 antigen belongs to the tripartite motif proteins (TRIMs) family and is also known as an anti-TRIM21/Ro52 antibody (8-10). In recent years, a series of studies on IIMs and SSc reported that anti-Ro52 antibodies were correlated with the occurrence of ILD (11). However, this phenomenon may also be selective, as the risk of anti-Ro52 antibody and ILD was not highlighted in earlier studies of SLE and SSc. Moreover, a lot of IIM-ILD was attributed to pSS-ILD due to the lack of myositis-specific antibodies, which led to research bias and diagnostic error in recent studies. In this study, we analysed the clinical features, progression severity, and prognosis of CTD-ILD with and without anti-Ro52 antibodies.

Materials and methods

Patient selection

This study is a single-centre, mixed retrospective and prospective cohort study. The study protocol was validated by the local ethics committee of the Second Affiliated Hospital of Jiaxing University in China. We reviewed ILD hospitalised adult patients in respiratory and rheumatology departments at a single tertiary medical centre between June 2017 and December 2020. Initial 455 ILD items were obtained through diagnostic information recorded in an electronic medical record system and chest high-resolution computed tomography (HRCT) screening, based on which 342 patients with a CTD-ILD diagnosis were identified. Exclusion criteria were the following: patients with idiopathic pulmonary fibrosis (IPF), definite infection, and undetermined ILD; patients with incomplete clinical data [especially lung function and myositis-specific antibodies (MSA)]. Ultimately, 238 patients with CTD-ILD were selected. All CTD-ILD patients with positive anti-Ro52 antibodies were categorised as the study group and ILD patients with negative anti-Ro52 antibodies as the control group. The study flow chart is shown in Figure 1.

Patients whose follow-up outcomes could not be determined from an electronic medical record search were interviewed by telephone and invited for an outpatient visit. They were required to sign an informed consent. Patients who did not attend the outpatient visit received oral consent over the telephone, and written consent was waived. If verbal consent was not obtained, the data was deleted.

Definition of clinical data

Each type of CTD was defined in accordance with the updated international classification criteria as follows: 2019 American College of Radiology and European League Against Rheumatism (ACR/EULAR) criteria for SLE (12), 2013 ACR/EULAR criteria for SSc (13), 2010 ACR/EULAR criteria for RA (14), 2016 ACR/EULAR criteria for SS (15), 2012 CHCC nomenclature for antineutrophil cytoplasmic antibodies associated vasculitis (AAV) (16),

2015 American Thoracic Society and European Respiratory Society (ATE/ERS) criteria for interstitial pneumonia with autoimmune features (IPAF) (17), 1975 Peter and Bohan criteria for polymyositis (PM) and dermatomyositis (DM) (18), anti-synthetase syndrome (ASS) was based on the 2019 proposed criteria (19). MCTD was defined when at least one of the three following criteria was met: modified Sharp, Alarcon-Segovia, or Kasukawa criteria (20).

Disease duration was defined as the time from symptom onset to baseline. Demographic information, clinical characteristics, laboratory data, and high-resolution computed tomography (HRCT) were obtained by reviewing the medical records. Laboratory data included complete blood count, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), immunoglobulin G (IgG), serum ferritin (SF), lactate dehydrogenase (LDH), antinuclear antibody (ANA) spectrum, and anti-MSA spectrum. In the anti-MSA spectrum, each strip of the assay corresponded to 16 autoantibodies (anti-Ro52, anti-MDA5, anti-NXP2, anti-Mi-2 α , anti-Mi-2 β , anti-TIF1 γ , anti-SRP, anti-SAE, anti-Jo-1, anti-EJ, anti-OJ, anti-PL-7, anti-PL-12, anti-Ku, anti-PM-Scl75, anti-PM-Scl100) and was performed by using a EUROLINE autoimmune inflammatory myopathies antigen (IgG) test kit (EUROIMMUN, Germany) according to the manufacturer's instructions. Finally, immunopositive bands were scanned and qualitatively defined as -, +, ++, and +++. In the designation of anti-Ro52 antibodies, +++ and ++ were considered positive, while others were considered negative.

Information on the survival and progression of ILD was obtained during the follow-up period from January to December 2021. First, telephone interviews were conducted to determine the duration of survival or cause of death for all patients who were followed for at least 12 months. Patients whose outcomes were obtained by electronic medical records retrieval did not require an outpatient visit. Patients for whom it was impossible to establish a definite outcome from the electronic medical record system were invited to an out-

patient visit, during which HRCT and pulmonary function (PF) were established. In combination with progressive pulmonary fibrosis defining (21), meeting one of the following conditions was recognised as ILD progression: 1) 5% decrease in absolute forced vital capacity (FVC); 2) 10% decrease in absolute carbon monoxide (DLCO) diffusion capacity; 3) PF no longer compatible with the examination; 4) HRCT showed increased ILD; 5) death due to respiratory failure. Patients who did not meet the progression definition were categorised as stable.

Identification of ILD

HRCT, which was performed at baseline, generally occurred during hospitalisation or within 1 month prior to admission. ILD was diagnosed based on HRCT, and PF (FVC, DLCO, etc.) was included as an important reference index for ILD evaluation. Normal PF recorded by HRCT imaging was defined as a change in restrictive pulmonary ventilation and diffusion function, not fulfilling ILD. Distinguishing ILD from infection-triggered ILD and pulmonary infection is sometimes difficult in the context of IIM disease and immunosuppressive therapy. Therefore, patients with infections were not systematically excluded from the study. HRCT scan patterns were classified as definite UIP, probable UIP, non-UIP, inconsistent with UIP, non-specific interstitial pneumonia (NSIP), and organising pneumonia (OP) on review by experienced radiologists according to the 2002 ATS/ERS policies, which were updated in 2013 by the ATS/ERS (22, 23). Mixed patterns were also accepted. All HRCT images were reviewed by two observers with 10 years of experience in chest HRCT imaging evaluation who were blinded to the patients' outcomes. A respiratory specialist was invited when the opinions were inconsistent.

Statistical analysis

Dichotomous variables are expressed as absolute frequencies (percentages) and were compared using chi-square or Fisher's exact test. Continuous variables are described using medians [interquar-

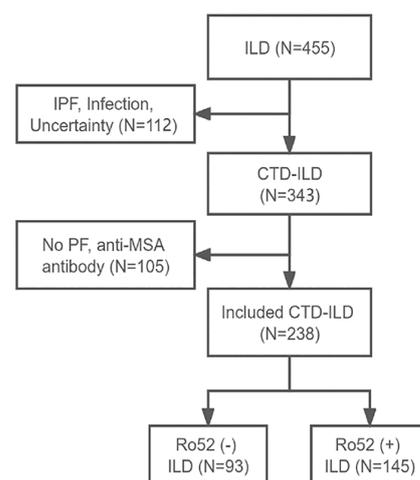


Fig. 1. Study flow chart of patient selection. ILD: interstitial lung disease; IPF: idiopathic pulmonary fibrosis; CTD: connective tissue disease; PF: pulmonary function; MSA: myositis-specific antibodies.

tile range (IQR) or range], and statistical comparison between the groups was performed with the Mann-Whitney non-parametric U-test. Multivariate logistic regression analysis was conducted by fitting a logistic regression model about univariate analysis. Multivariate analysis was performed by adjusting age. Survival analysis was estimated using the Kaplan-Meier method, and the differences between groups were assessed using the log-rank test. p -values <0.05 were considered to be statistically significant. All statistical calculations were performed using SPSS software (IBM SPSS v. 19), and graphs were plotted with GraphPad Prism v. 8.0.

Results

Study population

A total of 238 adult patients with CTD-ILD were enrolled. There were 187 female (78.57%) and 51 male (21.43%) patients with a total mean age of 54.46 ± 13.73 years and a median disease duration of 3 (2–6) months. Sixty-one patients (25.63%) had no respiratory symptoms at baseline and were diagnosed with ILD by adjuvant examination. All CTD types were analysed, including 11 specific subtypes; the distribution of diseases is shown in Figure 2A. Different CTD types accompanied with anti-Ro52 antibodies also had different antibody titres, as shown in Figure 2B. All patients with CTD-ILD

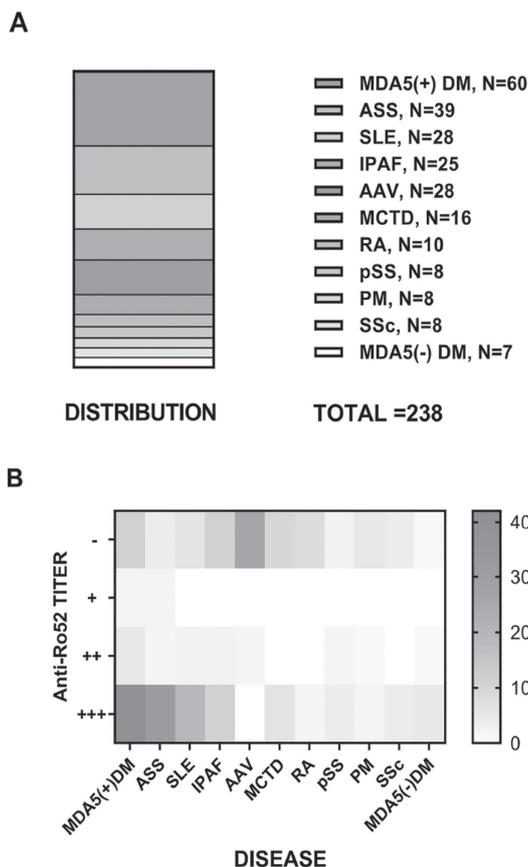


Fig. 2. All CTD types including 11 specific subtypes and the distribution of diseases.

A: Distribution of diseases.
B: Distribution of different CTD types according to anti-Ro52 antibodies levels.

MDA5: anti-melanoma differentiation-associated Pprotein-5; ASS: antisynthetase syndrome; SLE: systemic lupus erythematosus; I-PAF: interstitial pneumonia with autoimmune features; AAV: anti-neutrophil cytoplasmic antibodies associated vasculitis; MCTD: mixed connective tissue disease; RA: rheumatoid arthritis; PM: polymyositis; SS: Sjögren’s syndrome; SSc: systemic sclerosis.

time of the remaining patients was 21.5 months; the median follow-up time was comparable between the two groups (all $p>0.05$), as shown in Table I.

Comparison of clinical features

The comparison revealed significant differences in FVC% ($p<0.004$) between the two groups with or without anti-Ro52 antibodies; however, this difference was not seen for DLCO% ($p=0.296$). In the anti-Ro52-positive group, more CTD-ILD patients had respiratory symptoms at baseline ($p>0.001$) compared to patients with ILD identified by HRCT findings alone. In terms of chest HRCT manifestation pattern, more CTD-ILD patients with positive anti-Ro52 antibodies showed OP pattern ($p=0.015$). Some biomarkers may be associated with the activity of CTD-ILD, and serum LDH levels were higher in anti-Ro52 positive patients (Table I).

Correlation analyses

Consistent with univariate difference analysis, the univariate logistic analysis showed that respiratory symptoms at baseline, lower FVC%, and OP pattern in HRCT were associated with anti-Ro52 antibodies. After adjusting for age, gender, and duration of disease, multivariate Logistic regression analysis also showed an independent correlation between these three variables and anti-Ro52 antibody (Table II).

Predictor for CTD-ILD

progression after 12 months

Follow-up data were obtained for ILD progression in 170 out of 238 patients through outpatient visits and medical records retrieval. According to the previously defined progression criteria, 48 patients (28.24%) with CTD-ILD showed varying degrees of progression in PF or imaging, with 31 patients (27.68%) progressing in the anti-Ro52-positive group and 17 patients (29.31%) progressing in the anti-Ro52-negative group. No significant differences were observed between the two groups (all $p>0.05$). A dichotomous logistic analysis based on the presence or absence of progress showed significant associations be-

Table I. General features of CTD-ILD patients with or without anti-Ro52 antibodies.

Features	Total (n=238)	anti-Ro52 antibody positive (n=145)	anti-Ro52 antibody negative (n=93)	p-value
Age (years), mean±SD	54.66 ± 13.73	54.54 ± 12.42	54.83 ± 15.61	0.877
Gender, F (%)	187 (78.57)	116 (80)	71 (76.34)	0.521
Duration (months), median (IQR)	3 (2, 6)	3 (2, 6)	3 (1.5, 6)	0.463
Presence of respiratory symptoms at baseline, n (%)	177 (74.37)	120 (82.76)	57 (61.29)	<0.001*
FVC, median (IQR)	66.5 (55.75, 76)	65 (51, 75)	72 (60, 78)	0.004*
DLCO, median (IQR)	55 (45, 68.25)	54 (44.5, 67.5)	57 (45.5, 69.5)	0.296
Probable UIP pattern, n (%)	18 (7.56)	7 (4.83)	11 (11.83)	0.076
NSIP pattern, n (%)	223 (93.7)	138 (95.17)	85 (91.4)	0.28
OP pattern, n (%)	62 (26.05)	46 (31.72)	16 (17.2)	0.015*
LIP pattern, n (%)	5 (2.1)	0	5 (5.38)	...
SF, median (IQR)	393.5 (119, 925)	405 (112.5, 920.2)	358 (141, 932)	0.919
LDH, median (IQR)	279 (223, 402)	311 (229, 410.5)	260 (205, 371.5)	0.019*
Follow-up (months), median (IQR)	21.5 (13, 27)	21 (14, 27)	22 (13, 26)	0.87
All-cause mortality, n (%)	35 (15.35)	24 (17.14)	11 (12.5)	0.344
Extrapulmonary mortality, n (%)		4 (2.76)	4 (4.3)	0.783
Progressive ILD, n (%)	48 (28.23)	31 (27.67)	17 (29.31)	0.823

SD: standard deviation; F: female; IQR: interquartile range; ILD: interstitial lung disease; FVC: forced vital capacity; DLCO: diffusion capacity of the lung for carbon monoxide; UIP: usual interstitial pneumonia; NSIP: non-specific interstitial pneumonia; OP: organising pneumonia; LIP: lymphocytic interstitial pneumonia; SF: serum ferritin; LDH: lactate dehydrogenase.

Significant difference confirmed by the Fisher’s exact tests or Mann-Whitney non-parametric U-test.

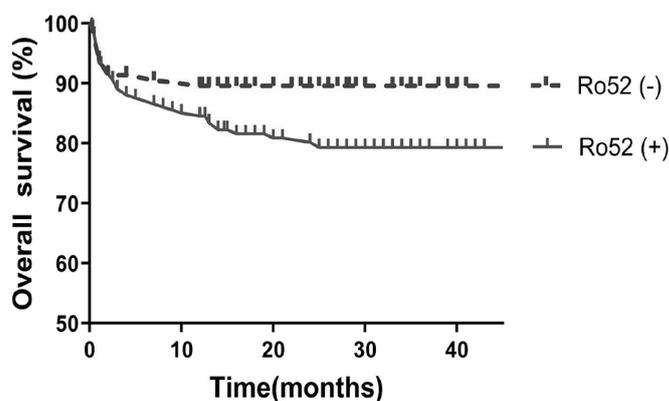
were divided into two groups based on the presence or absence of concomitant anti-Ro52 antibodies: 145 patients were with positive anti-Ro52 antibodies and 93 patients were with negative

anti-Ro52 antibodies. There was no difference in sex, age, or duration of disease at baseline between the two groups (all $p>0.05$). Nine patients were lost to follow-up, and the median follow-up

Table II. Univariate and multivariate logistic regression analysis of anti-Ro52 antibody correlation.

Variables	Univariate		Multivariate	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age (years), mean±SD	0.998 (0.979-1.017)	0.801	0.997 (0.979-1.017)	0.79
Gender, F (%)	1.239 (0.661-2.322)	0.503	1.232 (0.657-2.31)	0.515
Duration (months), median (IQR)	1.001 (0.994-1.008)	0.711	1.001 (0.994-1.008)	0.717
Presence of respiratory symptoms at baseline, n (%)	3.032 (1.664-5.523)	<0.001*	3.042 (1.668-5.549)	<0.001*
FVC, median (IQR)	0.979 (0.961-0.996)	0.018*	0.977 (0.959-0.995)	0.013*
DLCO, median (IQR)	0.989 (0.974-1.005)	0.187	0.988 (0.972-1.004)	0.152
Probable UIP pattern, n (%)	0.378 (0.141-1.014)	0.053	0.362 (0.131-0.999)	0.05
NSIP pattern, n (%)	1.855 (0.649-5.301)	0.248	1.896 (0.656-5.486)	0.238
OP pattern, n (%)	2.236 (1.177-4.25)	0.014*	2.262 (1.187-4.311)	0.013*
LIP pattern, n (%)
SF, median (IQR)	1 (1-1)	0.534	1 (1-1)	0.547
LDH, median (IQR)	1.001 (0.999-1.002)	0.409	1.001 (0.999-1.002)	0.384

SD: standard deviation; F: female; IQR: interquartile range; ILD: interstitial lung disease; FVC: forced vital capacity; DLCO: diffusion capacity of the lung for carbon monoxide; UIP: usual interstitial pneumonia; NSIP: non-specific interstitial pneumonia; OP: organising pneumonia; LIP: lymphocytic interstitial pneumonia; SF: serum ferritin; LDH: lactate dehydrogenase.

**Fig. 3.** The cumulative survival rate at 12 months in CTD-ILD patients with and without anti-Ro52 antibody.

tween some variables at baseline. After further adjustment for age, duration of disease, and sex, the multivariate logistic analysis showed that ILD progression was associated with older age, worse FVC% and DLCO% at baseline, higher levels of CRP, SF, IgG, and lower absolute lymphocyte count. These variables were independent predictors of CTD-ILD progression. However, by focusing on an anti-Ro52 antibody, no correlation of CTD-ILD progression was found by binary classification or quaternary classification analysis based on antibody titre (Table III).

Survival analysis

Nine patients were lost to follow-up, and survival information was obtained for 229 patients, with a median follow-up of 21.5 (13, 27) months. Median survival from onset to death or last follow-up was 25.5 (18, 34.7) months. During follow-up, 35 deaths occurred: 24 in the anti-Ro52 antibody positive group and 11 in the anti-Ro52 antibody negative group. Kaplan-Meier survival curves were used to describe the difference in survival between the two groups. An elevated trend toward mortality was found in the anti-Ro52 antibody-positive group, although this difference was not statistically significant (mortality 17.14% vs. 12.5%, log-rank $p=0.287$). The survival curve is shown in Figure 3. There were 35 deaths: 27

Table III. Logistic regression was performed to determine the factors associated with ILD progression.

Variables	Stable (n=122)	Progressive (n=48)	p-value	Multivariate OR (95% CI)	p-value
Age	54 (45, 62.25)	59 (50.5, 66)	0.012*	1.038 (1.007-1.07)	0.015*
Gender, F (%)	98 (80.33)	40 (83.33)	0.652	1.04 (0.421-2.572)	0.932
Duration (months), median (IQR)	3 (2, 6)	2 (1, 6)	0.556	1.001 (0.991-1.011)	0.837
FVC% at baseline, median (IQR)	65 (55, 75)	60 (37.5, 75)	0.067	0.97 (0.947-0.993)	0.01*
DLCO% at baseline, median (IQR)	53.5 (45, 65)	46.5 (32, 57)	0.008*	0.967 (0.944-0.99)	0.005*
Probable UIP, n (%)	7 (5.74)	4 (8.33)	0.377	1.122 (0.293-4.303)	0.867
NSIP, n (%)	117 (95.9)	45 (93.75)	0.403	0.72 (0.156-3.32)	0.674
LIP, n (%)	2 (1.64)	0
OP, n (%)	36 (29.51)	17 (35.42)	0.454	1.422 (0.688-2.943)	0.324
CRP (mg/L), median (IQR)	3.28 (0.7, 11.48)	11.05 (1.63, 28.5)	0.012*	1.01 (1.000-1.02)	0.052*
SF (ng/ml), median (IQR)	315 (95.5, 765.25)	932 (352, 1500)	<0.0001*	1.001 (1.001-1.002)	<0.001*
LDH (IU/L), median (IQR)	290.5 (223, 400.5)	345.5 (237.25, 453)	0.047	1.000 (0.999-1.002)	0.541
IgG (g/L), median (IQR)	14.05 (11.13, 17.43)	15.995 (12.73, 19.65)	0.056	1.0631 (1.006-1.122)	0.028*
Lymphocyte count, median (IQR)	1.005 (0.70, 1.46)	0.795 (0.50, 1.22)	0.009*	0.363 (0.174-0.76)	0.007*
Anti-Ro52, positive n (%)	81 (66.39)	31 (64.58)	0.823	0.991 (0.48-2.042)	0.979

F: female; IQR: interquartile range; FVC: forced vital capacity; DLCO: diffusion capacity for carbon monoxide; UIP: usual interstitial pneumonia; NSIP: non-specific interstitial pneumonia; OP: organising pneumonia; LIP: lymphocytic interstitial pneumonia; CRP: C-reactive protein; SF: serum ferritin; LDH: lactate dehydrogenase; IgG: immunoglobulin G.

from respiratory failure, 3 from sepsis, 3 from heart disease, 1 from gastrointestinal bleeding, and 1 from breast cancer. In the CTD-ILD, the results of mortality rates referred successively to disease anti-MDA5-DM (28.33%), SLE (25%), and AAV (14.29%).

Discussion

The clinical significance of anti-Ro52 antibodies in CTD is controversial (24–26, 31). Over the past decade, some authors have reported an association between anti-Ro52 antibodies and some clinical features – particularly ILD – and survival in patients with CTD. Patients with ASS and high titres of anti-Ro52 antibodies had more symptomatic ILD and more severe muscle and joint impairment (28). In a large sample study of SSc, anti-Ro52/TRIM21 antibodies were independently associated with the presence of ILD and poor survival (29). In patients with juvenile myositis, those with anti-Ro52 antibodies were more likely to have ILD; furthermore, patients with anti-Ro52 antibodies have been reported to have more severe disease and a poorer prognosis (30). However, these pairs were all conducted on CTD or a certain type of CTD. The present study explored the clinical and prognostic features associated with anti-Ro52 autoantibodies in patients with CTD-ILD.

Patients with CTD-ILD with positive anti-Ro52 antibodies had a statistically significant reduction in FVC% and were more likely to have respiratory symptoms at baseline than those with ILD detected on the HRCT scan alone. These differences could imply that anti-Ro52 antibodies may be linked to more severe lung impairment. Both FVC and DLCO are important and common methods for diagnosing ILD and evaluating its severity. In general, they are synchronised. In fact, our data did not show a difference in DLCO%, which may be due to the influence of other factors, such as alveolitis, ventilator-perfusion mismatch, vascular involvement, fibrosis, etc. (32). In addition, our study confirmed that lung HRCT of CTD-ILD predominantly manifested by NSIP and/or OP, where anti-Ro52 antibody-positive CTD-ILD

was more likely to have OP patterns. This phenomenon has also been reported in a small group of patients with isolated anti-Ro52 antibodies (33, 34). The results of these univariate comparisons are perfectly consistent with the results of the further multivariate logistic analysis. Since its discovery, the anti-Ro52 antibody has been recognised as a serological marker of pSS. In the present study, no such close association was observed in pSS-ILD, which may be because our study only focused on pSS patients with ILD; another reason is that strict screening for MSA antibodies results in a small sample size for pSS inclusion, although this makes the diagnosis more definitive. Therefore, screening for anti-MSA antibodies in SS-ILD is highly recommended.

Furthermore, our data suggested an association of anti-Ro52 antibodies with CTD-ILD progression or death. Based on some research evidence on prognostic, some scholars have proposed that anti-Ro52 antibodies could represent valuable biological prognostic markers in clinical practice (35, 36), which is consistent with the main idea of the present study. As outlined previously, these differences could imply that anti-Ro52 antibodies may be linked to more severe lung impairment. However, no correlation of CTD-ILD progression could be found by binary classification or quaternary classification analysis based on antibody titre. Furthermore, there were no clearly observable differences between the survival curves. This unexpected result could be due to the following reasons: (1) the risk effects of Ro-52 antibodies on survival may be selective for confounding CTDs of different heterogeneities, such as the combination of MDA5+Ro52 (37), while other types of CTD-ILD remain to be studied; (2) treatment with glucocorticoids and immunosuppressants improves prognosis.

The present study has a few limitations. First, this was a single-centre study. In addition, all cases were hospitalised patients with relatively serious illnesses. Secondly, as CTD-ILD is a class of diseases, conducting research without considering specific disease types is a somewhat controversial approach con-

sidering that CTD cannot be matched, and prognostic analysis is affected by the inherent characteristics of the disease. Third, we could not provide data on the final treatment effect.

Conclusion

Our data suggest that anti-Ro52 antibodies may predict more severe lung damage in CTD-ILD; however, anti-Ro52 antibodies were not correlated with progression and death in patients with ILD. These findings could lead clinicians to integrate anti-Ro52 testing in the future evaluation, monitoring, and management of patients with CTD, which could have certain clinical significance.

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