Pulmonary Arterial Hypertension Associated With Systemic Lupus Erythematosus Results From the French Pulmonary Hypertension Registry

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Pulmonary Arterial Hypertension Associated With Systemic Lupus Erythematosus

Results From the French Pulmonary Hypertension Registry

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BACKGROUND: Pulmonary arterial hypertension (PAH) is a rare complication of systemic lupus erythematosus (SLE).

METHODS: We identified all patients with SLE and PAH (SLE-PAH) who were enrolled in the French Pulmonary Hypertension Registry with a diagnosis confirmed by right heart catheterization (RHC). A control group of 101 patients with SLE without known PAH was selected from SLE expert centers participating in the Pulmonary Hypertension Registry. Survival was estimated by the Kaplan-Meier method. Hazard ratios associated with potential predictors of death were estimated using Cox proportional hazard models.

RESULTS: Of the 69 patients with SLE-PAH identified in the French Pulmonary Hypertension Registry, 51 were included in the study. They did not differ from the control group regarding age, sex, or duration of SLE at the time of the analysis but had a higher frequency of anti-SSA and anti-SSB antibodies. The delay between SLE diagnosis and PAH diagnosis was 4.9 years (range, 2.8-12.9) years. The 3- and 5-year overall survival rates were 89.4% (95% CI, 76.2%-96.5%) and 83.9% (95% CI, 68.8%-92.1%), respectively. The survival rate was significantly better in patients with anti-U1-RNP antibodies ($P = .04$).

CONCLUSIONS: Patients with SLE-PAH have an overall 5-year survival rate of 83.9% after the PAH diagnosis. Anti-SSA/SSB antibodies may be a risk factor for PAH, and the presence of anti-U1-RNP antibodies appears to be a protective factor regarding survival.

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KEY WORDS: pulmonary arterial hypertension; survival; systemic lupus erythematosus

ABBREVIATIONS: CTD = connective tissue disease; ILD = interstitial lung disease; mPAP = mean pulmonary artery pressure; NYHA = New York Heart Association; PAH = pulmonary arterial hypertension; PAWP = pulmonary artery wedge pressure; PFT = pulmonary function test; PH = pulmonary hypertension; PVR = pulmonary vascular resistance; RHC = right heart catheterization; SLE = systemic lupus erythematosus; SSc = systemic sclerosis; TLC = total lung capacity

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Pulmonary arterial hypertension (PAH) associated with connective tissue disease (PAH-CTD) is the second most common cause of pulmonary hypertension (PH) (ie, group 1 of the European Society of Cardiology/European Respiratory Society pulmonary hypertension classification) after idiopathic/heritable PAH.[1] In the American REVEAL registry,[2] patients with PAH-CTD account for approximately 34% of all PAH group 1 patients (systemic sclerosis [SSc]-PAH composes 21% of all patients in group 1, and systemic lupus erythematosus [SLE]-PAH composes 5.8% of all patients in group 1). SLE is the second most frequent cause of PAH-CTD after SSc.

PAH is a rare complication of SLE. The prevalence of PAH in SLE is < 4% when the PAH diagnosis is based on the gold standard, namely, right heart catheterization (RHC).[3,4] In a prospective screening program for PAH based on echocardiography conducted in a population of 152 patients with SLE, Pérez-Peñate et al[5] found no new cases of SLE-PAH. In a cohort of 245 patients with SLE who underwent a screening program based on echocardiography, Ruiz-Irastorza et al[6] found no cases of PAH-SLE. Given its low prevalence, the European Society of Cardiology and the European Respiratory Society do not recommend systematic screening for PAH in patients with SLE.[7,8] SLE-PAH case series are rare, and even rarer are SLE-PAH series in which the PAH diagnosis was based on RHC.[2,9-13] This prompted us to study the characteristics and survival rates of patients with SLE-PAH proven by RHC who were enrolled in the French Pulmonary Hypertension Registry between June 2003 and June 2013 and compare them with those of patients with SLE without PAH.

Methods

Patients With SLE-PAH

Patients with SLE-PAH were identified from the French Pulmonary Hypertension Registry, a prospective longitudinal registry involving 26 expert centers. This retrospective study complied with the Declaration of Helsinki. French law did not require ethics committee approval or informed consent for retrospective data collection. The data were anonymized, and they complied with the requirements of the Commission Nationale Informatique et Libertés, the organization responsible for ensuring the ethical use of data collected for scientific purposes in France. The Commission Nationale Informatique et Libertés approved the methods used to collect and analyze data from the French Pulmonary Hypertension Registry on May 24, 2003 (approval No. 842063). All patients with SLE-PAH met the European Society of Cardiology/European Respiratory Society definition criteria: mean pulmonary artery pressure (mPAP) ≥ 25 mm Hg at rest, mean pulmonary artery wedge pressure (PAWP) ≤ 15 mm Hg, and pulmonary vascular resistance (PVR) > 240 dyn/s/cm^{-5} (3 Wood units).[7,8] All patients met the 1997 updated American College of Rheumatology criteria for the diagnosis of SLE.[14] Patients with overlapping syndromes (SLE associated with another CTD, mainly SSc) were excluded from the analysis. Patients with interstitial lung disease (ILD) based on a thoracic CT scan with an altered pulmonary function test (PFT), namely, FVC < 70% or total lung capacity (TLC) < 70%, or both, or a missing PFT were also excluded. None of the patients analyzed presented signs of a thromboembolic process based on a ventilation/perfusion lung scan.

Patients Without SLE-PAH

A population comprising 101 patients with SLE without known PAH followed in participating CTD centers was selected for a comparative study with the SLE-PAH population. All had undergone echocardiography (this is common practice to rule out associated pericarditis or valvulopathy) within the 12 months before selection, with an estimated systolic PAP < 40 mm Hg, indicating they were at low risk of PAH. Eligibility criteria mirrored those of the patients with SLE-PAH.

Data Collection

For all patients with SLE, the following data were collected: demographic data and American College of Rheumatology SLE criteria, date of SLE diagnosis, presence of Sjögren syndrome or antiphospholipid syndrome, immunologic status, cardiovascular risk factors (hypertension, diabetes, hypercholesterolemia, smoking habits), history of myocardial infarction or ischemic cardiomyopathy, SLE damage to target organs, and disease-modifying antirheumatic drugs. For patients with SLE-PAH, the clinical data obtained at PAH diagnosis were as follows: New York Heart Association (NYHA) functional class, systemic arterial pressure, date of onset of dyspnea, signs of right-sided heart failure, and SLE disease activity index score. The RHC data were recorded. For these patients, the following data were also collected, if available: echocardiography, chest high-resolution CT to detect ILD or signs of veno-occlusive disease at the closest time to the PAH diagnosis,[15] ventilation-perfusion lung scan, angiographic CT, PFTs, 6-min walk test, and autoantibodies. Data documented at each follow-up consultation were recorded for patients with SLE-PAH, including details of disease-modifying drugs used for SLE and PAH.

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Statistical Analysis

The characteristics of patients with SLE-PAH and patients with SLE without PAH are summarized as mean (SD), median (first and third quartiles), or number (percentage). Given the retrospective collection of data and the observational nature of the study, some data were incomplete. Missing data were not imputed. The number of nonmissing data is reported for each variable, and percentages were calculated on the number of documented data. The characteristics of patients with SLE-PAH and those with SLE without PAH were compared using unpaired Student *t* tests for continuous variables or the χ^2 test for categorical variables. The delay between the diagnosis of SLE and the diagnosis of PAH was estimated using the Kaplan-Meier method. For patients with SLE-PAH, the survival cumulative probability was estimated by the Kaplan-Meier method, with the date of PAH diagnosis as the date of origin. Data were right-censored at the date of last available information or 10 years, whichever occurred earlier. Patients with lung transplantation were right-censored at the date of surgery. Patients were also stratified according to the date of SLE-PAH diagnosis (before or after September 2003, as this was the date of the commercial availability of bosentan, the first oral PAH drug) and survival was compared using a log-rank test. Hazard ratios associated with potential predictors of death were estimated using Cox proportional hazard models. As antimalarial drugs could have a beneficial effect on PAH prognosis,[16] the characteristics of patients receiving hydroxychloroquine at PAH diagnosis or within 6 months after PAH diagnosis were compared with those not receiving hydroxychloroquine.

Results

As of June 1, 2013, 69 patients with SLE-PAH were identified in the French National Pulmonary Hypertension Registry. Of these 69 cases, 18 were excluded for the following reasons: absence of hemodynamic data (n = 2); postcapillary PH (n = 3); ILD with FVC < 70% or TLC < 70% or missing PFTs (n = 8); or the postcapillary component of PH could not be ruled out (n = 5) (Fig 1). The demographic data of the patients with SLE-PAH and the patients with SLE without PAH are presented in Table 1. The two groups did not differ regarding age, sex, or duration of SLE at the time of data collection; the differences were related to immunologic status, since patients with SLE-PAH had a higher frequency of anti-Sm, anti-SSA, and anti-SSB antibodies (despite similar frequency of Sjögren syndrome), and 60% had native anti-DNA antibodies. The time from SLE diagnosis to PAH diagnosis was 4.9 years (range, 2.8-12.9 years). At the time of PAH diagnosis in the SLE-PAH group, only one patient was receiving cyclophosphamide, no patients were receiving azathioprine or mycophenolate mofetil, and 39 patients were being treated with oral glucocorticosteroids. In the 6 months following PAH diagnosis, 25 patients (49.0%) were taking cyclophosphamide, three patients (5.9%) were taking azathioprine, two patients (3.9%) were taking mycophenolate mofetil, and 20 patients (39.2%) were taking corticosteroids. None received rituximab or other biologic agents.

Twenty-five patients with SLE were diagnosed with PAH before September 2003, and 26 patients were diagnosed from September 2003 onward. Among the 25 patients diagnosed before September 2003, 16 of 25 (64.0%) continued to receive or began to receive cyclophosphamide during the 6 months after PAH diagnosis, compared with 21 of 26 (80.9%) of those diagnosed in September 2003 or later ($P = .18$). After PAH diagnosis and during the follow-up, nine of 25 of the patients diagnosed before September 2003 (36.0%) received epoprostenol and 12 of 25 (48.0%) received

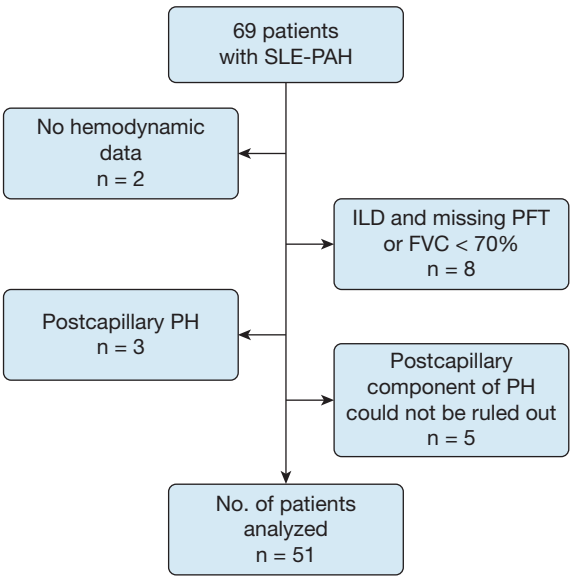


Figure 1 – *Flowchart of the SLE-PAH population studied, which was identified in the French Pulmonary Hypertension Registry. ILD = interstitial lung disease; PAH = pulmonary arterial hypertension; PFT = pulmonary function test; PH = pulmonary hypertension; SLE = systemic lupus erythematosus.*

TABLE 1] Demographic Data of the SLE-PAH and SLE Control Population

Characteristics	SLE-PAH n = 51	Patients With SLE Without PAH n = 101	*P* Value
Age, y, mean ± SD	47.6 ± 12.2	46.9 ± 16.2	.78
Male sex, No. (%)	4 (8.2)	8 (7.9)	1.00
Female sex, No. (%)	45 (91.8)	93 (92.1)	
Age at SLE diagnosis, mean ± SD	27.2 ± 12.6	31.2 ± 14.8	.10
APLS, No. (%)	10 of 44 (22.7)	31 of 100 (31.0)	.31
Involvement, No. (%)			
Articular	32 of 50 (64.0)	91 of 100 (91.0)	< .0001
Cutaneous	29 of 51 (56.9)	62 of 99 (62.6)	.49
Neurologic	5 of 50 (10.0)	12 of 99 (12.1)	.70
Cardiac[a]	11 of 50 (22.0)	32 of 99 (32.3)	.19
Pulmonary	7 of 50 (14.0)	15 of 99 (15.2)	.85
Renal	19 of 51 (37.3)	37 of 100 (37.0)	.98
Sjögren syndrome	10 of 34 (29.4)	9 of 40 (22.5)	.50
Thrombosis[b]	8 of 50 (16.0)	31 of 99 (31.3)	.04
Anticardiolipin Ab IgG	13 of 42 (31.0)	25 of 100 (25.0)	.46
Lupus anticoagulant	7 of 35 (20.0)	13 of 98 (13.3)	.34
Anti β2GP1 Ab IgG	2 of 27 (7.4)	8 of 84 (9.5)	.74
Antinuclear Ab > 1 of 80	48 (100)	100 (100)	…
Native anti-DNA Ab,[c]	30 of 50 (60.0)	89 of 101 (88.1)	.0001
Anti-Sm	11 of 37 (29.7)	14 of 99 (14.1)	.04
Anti-RNP	14 of 38 (36.8)	31 of 99 (31.3)	.54
Anti-SSA	26 of 42 (61.9)	40 of 100 (40.0)	.02
Anti-SSB	10 of 37 (27.0)	8 of 100 (8.0)	.003

Ab = antibody; APLS = antiphospholipid syndrome; PAH = pulmonary arterial hypertension; RHC = right heart catheterization; SLE = systemic lupus erythematosus.
[a]Cardiac involvement = myopericarditis (n = 1), pleuropericarditis (n = 3), pericarditis (n = 4), and valvulopathy (n = 1).
[b]Thrombosis = arterial thromboses (n = 4) and venous thromboses (n = 34).
[c]DNA antibodies were obtained at the time of PAH diagnosis based on the RHC for the SLE-PAH population but were considered for the patients with SLE without PAH population as a classification criterion.

bosentan after September 2003. Eight of these 25 patients (32%) diagnosed before September 2003 never received specific PAH treatment. Among the 26 patients diagnosed after September 2003, 23 received PAH-specific treatments (bosentan [n = 22], sildenafil [n = 9], and epoprostenol [n = 5]); the remaining three patients (11.5%) never received specific PAH treatment.

Clinical and hemodynamic data at PAH diagnosis in patients with SLE-PAH are given in Table 2. All patients were nonresponders to acute vasodilator testing using nitric oxide or prostacyclin carried out at RHC. Two patients underwent lung transplantation: one died the day after transplantation and the other died 97 months after transplantation; they were right-censored at the date of surgery for the survival analysis. Eleven patients died during the 10-year follow-up period. Cardiopulmonary complications were the cause of death in nine patients, and two other patients died of infection. Three- and 5-year overall survival rates were 89.4% (95% CI, 76.2%-96.5%) and 83.9% (95% CI, 68.8%-92.1%), respectively (Fig 2). No difference was found regarding survival between patients diagnosed before September 2003 and those diagnosed from September 2003 onward ($P = .58$).

Table 3 shows predictive factors of death analyzed using univariate analysis. Presence of lupus nephritis and elevated PVR impaired survival. There was a trend toward better survival in patients who received hydroxychloroquine (at the time of PAH diagnosis or during the following 6 months) than in those who did not, but these results should be interpreted cautiously due to the small number of patients who did not receive hydroxychloroquine (hazard ratio,

TABLE 2] Clinical and Hemodynamic Data From the 51 Patients With SLE-PAH at PAH Diagnosis

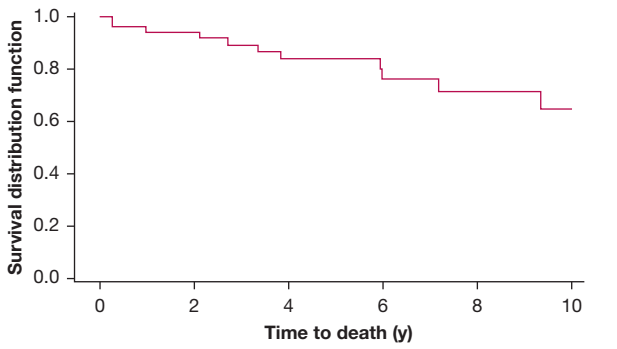
Characteristics	Value
NYHA I/II, No. (%)	14/49 (28.6)
NYHA III/IV, No. (%)	35/49 (71.4)
SLEDAI	5.1 ± 4.2 (n = 39)
Pulmonary function tests (n = 42)	
Pao_2, mm Hg	78.7 ± 13.7 (n = 31)
$Paco_2$, mm Hg	33.4 ± 4.9 (n = 29)
FVC, % expected	78.3 ± 22.7 (n = 28)
TLC, % expected	87.8 ± 21.3 (n = 30)
DLCO, % expected	54.9 ± 18.4 (n = 26)
FEV_1, % expected	72.8 ± 21.0 (n = 31)
6-min walk distance, m	343.2 ± 114.2 (n = 31)
Right heart catheterization (n = 51)	
Mean PAP, mm Hg	47.6 ± 12.2 (n = 51)
Systolic PAP, mm Hg	74.1 ± 19.0 (n = 49)
Diastolic PAP, mm Hg	30.2 ± 11.2 (n = 48)
PAWP, mm Hg	6.3 ± 3.4 (n = 51)
Cardiac output, L/min	4.7 ± 1.7 (n = 46)
Cardiac index, L/min/m^2	2.9 ± 1.1 (n = 49)
PVR, dyn/sec/cm^{-5}	796 ± 402 (n = 45)
Mixed venous oxygen saturation, %	57.9 ± 14.4 (n = 24)
Acute vasodilator response, No. (%)	0/40 (0)

All data are given as mean ± SD unless specified. DLCO = diffusing capacity for carbon monoxide; NYHA = New York Heart Association; PAP = pulmonary artery pressure; PAWP = pulmonary artery wedge pressure; PVR = pulmonary vascular resistance; SLE = systemic lupus erythematosus; SLEDAI = systemic lupus erythematosus disease activity index; TLC = total lung capacity. See Table 1 legend for expansion of other abbreviations.

0.31; 95% CI, 0.09-1.11; $P = .07$). The characteristics of these two groups were not different and included PAH severity, PAH-targeted treatments, and immunosuppressive drugs. No patients with anti-U1-RNP died during the 10-year follow-up (0 of 14 patients), whereas there were six deaths among the 24 patients without anti-U1-RNP ($P = .04$). The small number of events precluded any multivariate analysis.

Discussion

Our study included 51 patients with SLE-PAH proven by RHC who were identified in the French National Pulmonary Hypertension Registry. In half of these cases, PAH was diagnosed within the first 5 years after SLE diagnosis, and in seven of 51 cases, PAH was diagnosed within 1 year after the SLE diagnosis.



Years	0	1	2	3	4	5	6	7	8	9	10
No. at risk	51	47	44	35	30	27	20	17	14	13	10

Figure 2 – *Overall survival of the SLE-PAH population. x axis = time to death (y); y axis = survival distribution function. See Figure 1 legend for expansion of abbreviations.*

About three-quarters of the patients were in NYHA functional class III/IV at the time of PAH diagnosis, a proportion similar to that reported in SSc[17] and PAH in general.[1] The patients were nonresponders to an acute vasodilator challenge with nitric oxide or prostacyclin carried out during RHC.

In a study by Huang et al[13] that was conducted in an Asian population, multivariate analysis indicated that the presence of anti-U1-RNP antibodies was associated with an increased risk of PAH (OR, 12.399; 95% CI, 3.581-42.934). The presence of anti-U1-RNP antibodies was not significantly more frequent in the patients with SLE-PAH than in the patients with SLE without PAH ($P = .54$). It cannot be ruled out that the relationship between PAH and anti-U1-RNP antibodies is linked to ethnicity. In contrast, we found that anti-SSA/SSB antibodies were more frequent in patients with SLE-PAH than in patients with SLE without PAH. Other studies are needed to confirm whether the presence of anti-SSA/SSB antibodies is a risk factor for PAH in patients with SLE.

Table 4 compares our cohort with previously published cohorts in which PAH diagnosis was exclusively based on RHC criteria.[2,9-13,18] As some data were not mentioned in the publications of Huang et al,[13] Shirai et al,[9] and Sobanski et al,[11] each author was contacted to obtain the missing data. Although the age at PAH diagnosis in our population was comparable to that reported in the US and UK series, it appeared to be lower in the Japanese and Chinese populations, which might also suggest an involvement of genetic or ethnic factors. The younger age of patients in the two Chinese series[10,12] most likely explains the better performance on the 6-min walk test. Unfortunately we could not, in our study, retrieve data on

TABLE 3] Predictive Factors of Death in Patients With SLE and PAH (n = 51)

Variable	HR	95% CI	*P* Value
Lupus nephritis	12.71	2.07-60.52	.001
Cardiac involvement[a]	1.92	0.49-7.46	.35
IgG anticardiolipin antibodies	1.48	0.43-5.01	.53
Anti-U1-RNP antibodies[b]	…	…	.04
Anti-SSA antibodies	0.34	0.08-1.44	.14
Anti-SSB antibodies[c]	…	…	.17
NYHA III/IV	0.80	0.25-2.93	.80
6-min walk distance (per 10 m)	0.97	0.90-1.05	.47
D_{LCO} (% predicted)	0.98	0.92-1.03	.36
mPAP (mm Hg)	1.02	0.98-1.07	.36
PVR (80 dyn/s/cm^{-5})	1.23	1.08-1.41	.002
Treatment with hydroxychloroquine	0.31	0.09-1.11	.07

HR = hazard ratio; mPAP = mean pulmonary artery pressure. See Table 1 and 2 legends for expansion of other abbreviations.
[a]Cardiac involvement = myopericarditis (n = 1), pleuropericarditis (n = 3), pericarditis (n = 4), valvulopathy (n = 1).
[b]HRs are not calculable, since there were no deaths in the group of patients with anti-U1-RNP antibodies.
[c]HRs are not calculable, since there were no deaths in the group of patients with anti-SSB antibodies.

the percentage of the performance predicted by a patient's sex, age, and height. Regarding hemodynamics, PAH severity was similar in the various series. Only PVR was slightly higher in the Japanese series reported by Shirai et al.[9]

Overall, the survival rate in our cohort was high, with 89.4% survival at 3 years. Survival appeared to be substantially better than that still observed today in SSc-PAH, in which estimated 3-year survival is about 50%.[19-21] Our survival rates are comparable to those reported by Sobanski et al[11] in the recently published study for the UK SLE-PAH cohort (85% at 5 years).

The risk factors for death found in our study were renal involvement and elevated PVR. Renal disease is commonly recognized as an important predictor of a poor outcome in patients with SLE, decreasing the 10-year survival in SLE from 85% to 75% without any PAH context.[22] PAH and high PVR may increase the risk of death. As found in the Chinese population of Huang et al[13] and the UK SLE-PAH cohort of Sobanski et al,[11] the presence of anti-U1-RNP antibodies appears to be a protective factor regarding survival. We have also shown a trend for better survival in patients who were receiving hydroxychloroquine at the time of PAH diagnosis or who were given hydroxychloroquine during the following months. These findings must be interpreted with caution due to the small number of untreated patients and require further investigations in other cohorts. Some arguments, however, may explain the favorable impact of hydroxychloroquine. Synthetic antimalarial drugs could have a beneficial effect on PAH prognosis by inhibiting autophagy and blocking lysosomal degradation of the BMPR-II receptor.[16] They could also help to achieve better control of SLE. Hydroxychloroquine has already been shown to improve survival in patients with SLE without PAH.[23] Patients with SLE-PAH are commonly treated with a combination of cyclophosphamide and glucocorticoids, which is recommended by the French Referral Centre for PAH.[24] After 6 months using this immunosuppressive regimen, 50% of patients may improve or even normalize their hemodynamic parameters on RHC.[24] Given the observational nature of our study and the amount of missing data and given the heterogeneity of the immunosuppressive drugs used in patients and the lack of information about their exact indication (for PAH or for other simultaneously involved organs), it was not possible to analyze their potential benefit on PAH. Based on our results of the potential effect of hydroxychloroquine, this treatment might be used in association with the immunosuppressive strategy for patients with SLE-PAH. Interestingly, we did not observe a difference regarding survival in patients with SLE-PAH diagnosed before September 2003, when only epoprostenol was available as first-line treatment, and those diagnosed after, demonstrating that in the oral PAH treatment era, survival is not impaired.

The main limitations of our study are its observational character, the retrospective nature of the data collection, and the relatively small sample size.

TABLE 4] Main Clinical, Hemodynamic, and Survival Data From Patients With SLE-PAH From the Present Study and the Literature

	Present Study (n = 51)	Condliffe et al[18] (n = 28)	Chung et al[2] (n = 110)	Shirai et al[9] (n = 20)	Hao et al[10] (n = 62)	Sobanski 2016[11,a] (n = 23)	Qian et al[12] Huang et al[13,a] (n = 111)
Country	France	UK	USA	Japan	China	UK	China
Age at diagnosis, y/ % female	47.6 ± 12.2 91.8	42.0 ± 12.9 96	45.5 ± 11.9 94.5	32 ± 12 100	37.2 ± 12.2 98.4	42.32 ± 11 91.6	34.6 ± 8.6 97.3
NYHA I-II/III-IV, %	28.6/71.4	15/85	30.2/69.8	30/70	56.7/43.3	28/72	46/54
6MWD, m	343.2 ± 114.2	340 ± 194	324 ± 121.3	ND	394.7 ± 98.3	358.5 ± 113.5	423.2 ± 92.4
mPAP, mm Hg	47.4 ± 12.3	48.0 ± 16	46.6 ± 9.2	48 ± 11	49.6 ± 11.9	48.4 ± 13.9	46.4 ± 11.4
PAWP, mm Hg	6.3 ± 3.4	≤ 15	8.1 ± 3.3	≤ 15	≤ 15	11 ± 3.57	6.49 ± 3.18
Cardiac index, L/min/m^2	2.9 ± 1.1	2.63 ± 0.63	2.4 ± 0.8	…	2.8 ± 0.9	2.64 ± 0.93	2.7 ± 0.8
PVR, Wood units	9.94 ± 5.02	8.93 ± 4.71	10.7 ± 5.6	12.2 ± 5.2	9.8 (7.2-15.2)	9.5 ± 6.87	10.5 ± 4.8
Survival, %, y							
1	94.1	78	94	Not available	91	91	94.6
2	94.1	…	…	…	…	…	…
3	89.4	74	…	…	88	85	84.6
5	83.9	…	…	…	…	85	72.5

6MWD = 6-min walk distance; ND = not done. See Table 1 and 2 legends for expansion of other abbreviations.

[a]The authors of these 2 studies were contacted to obtain additional information on the survival of their patients, which was not detailed in their articles.

Given the retrospective nature of the study, data may be lacking, especially for specific autoantibody testing. Missing data may hamper some conclusions. Caution is therefore needed when analyzing risk factors for death and the effects of therapies. However, the data regarding survival are robust (51 patients over a 10-year period) and were not affected by the study design.

Conclusions

PAH is a rare complication of SLE, occurring within the first 5 years of SLE onset in roughly half of all cases. The overall 5-year survival rate of patients with SLE-PAH was relatively good (83.9%). Anti-SSA/SSB antibodies may be a risk factor for PAH in patients with SLE. The presence of anti-U1-RNP antibodies appears to be a protective factor regarding survival.

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