

Myositis-associated ILD: clinical manifestations and diagnosis

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Disclosures

- Advisory board: Boehringer Ingelheim, Puretech, Arcellx
- Authorship Fees: UpToDate, Dynamed
- Paid consultation: Vicore, Merck
- PI on clinical trials: Boehringer Ingelheim, Vicore



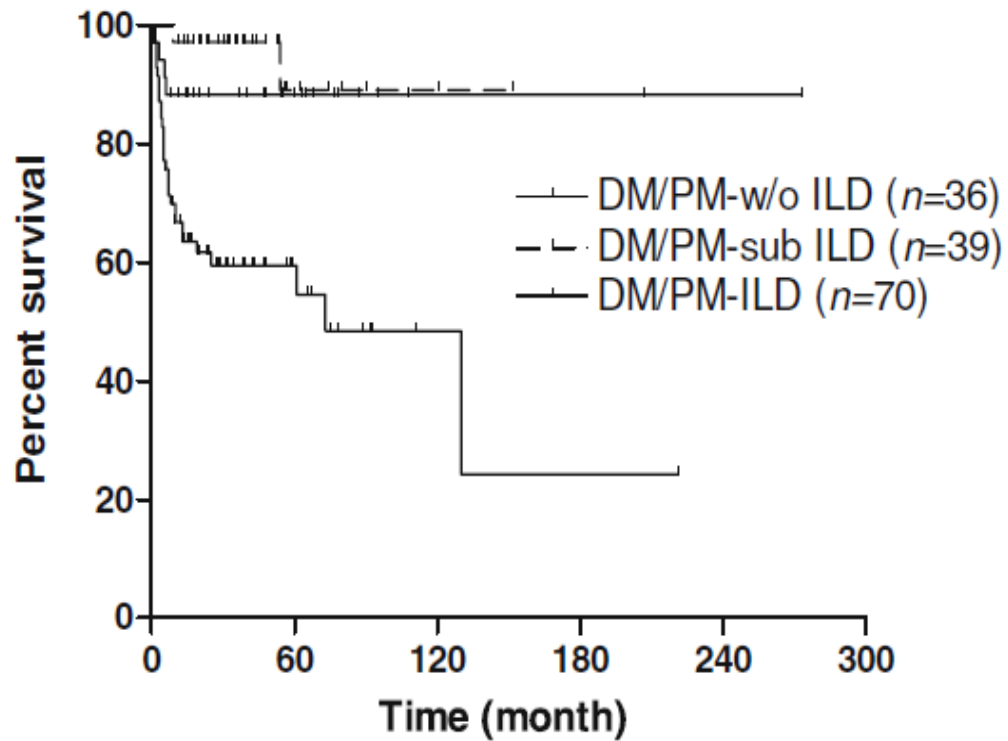
ILD is common in patients with myositis

- Reported prevalence in DM/PM is 20% -78%
- Reported prevalence with anti-synthetase antibodies is 71-100%
- **ILD precedes the diagnosis of myositis in 13% to 37.5% of patients**

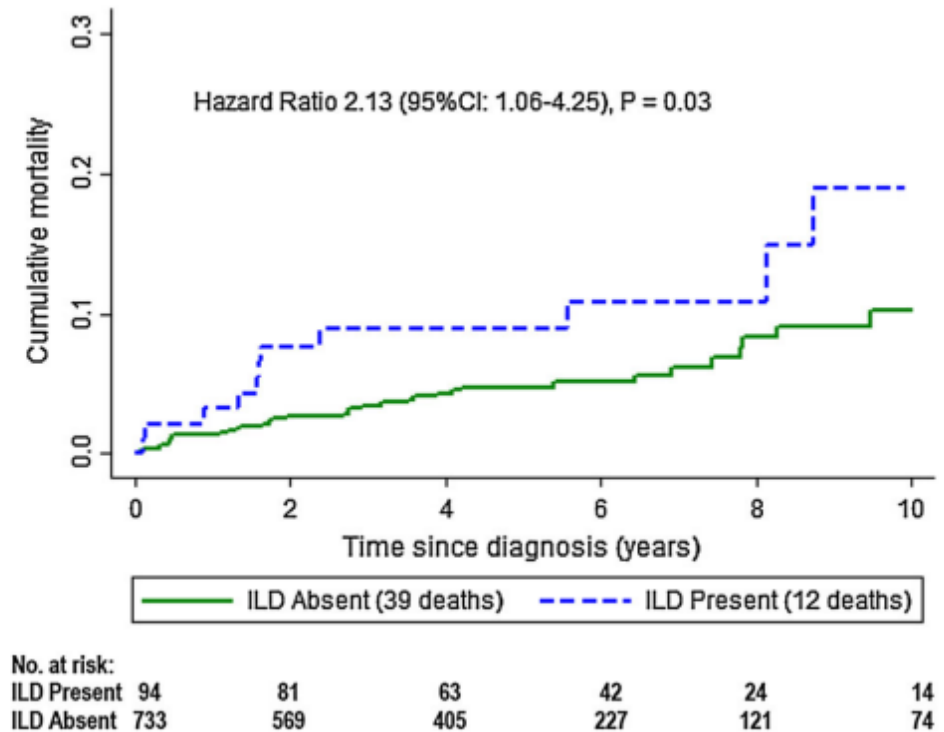
ILD is associated with death in myositis

- 145 patients with CADM, DM, PM
- Clinical ILD had an OR of death 4.2 (p=0.021)

- 831 patients, median f/u 4.5 years
 - 53 % PM; 43 % DM, 4 % CADM
- ILD had a HR for death 2.13 (p = 0.03)



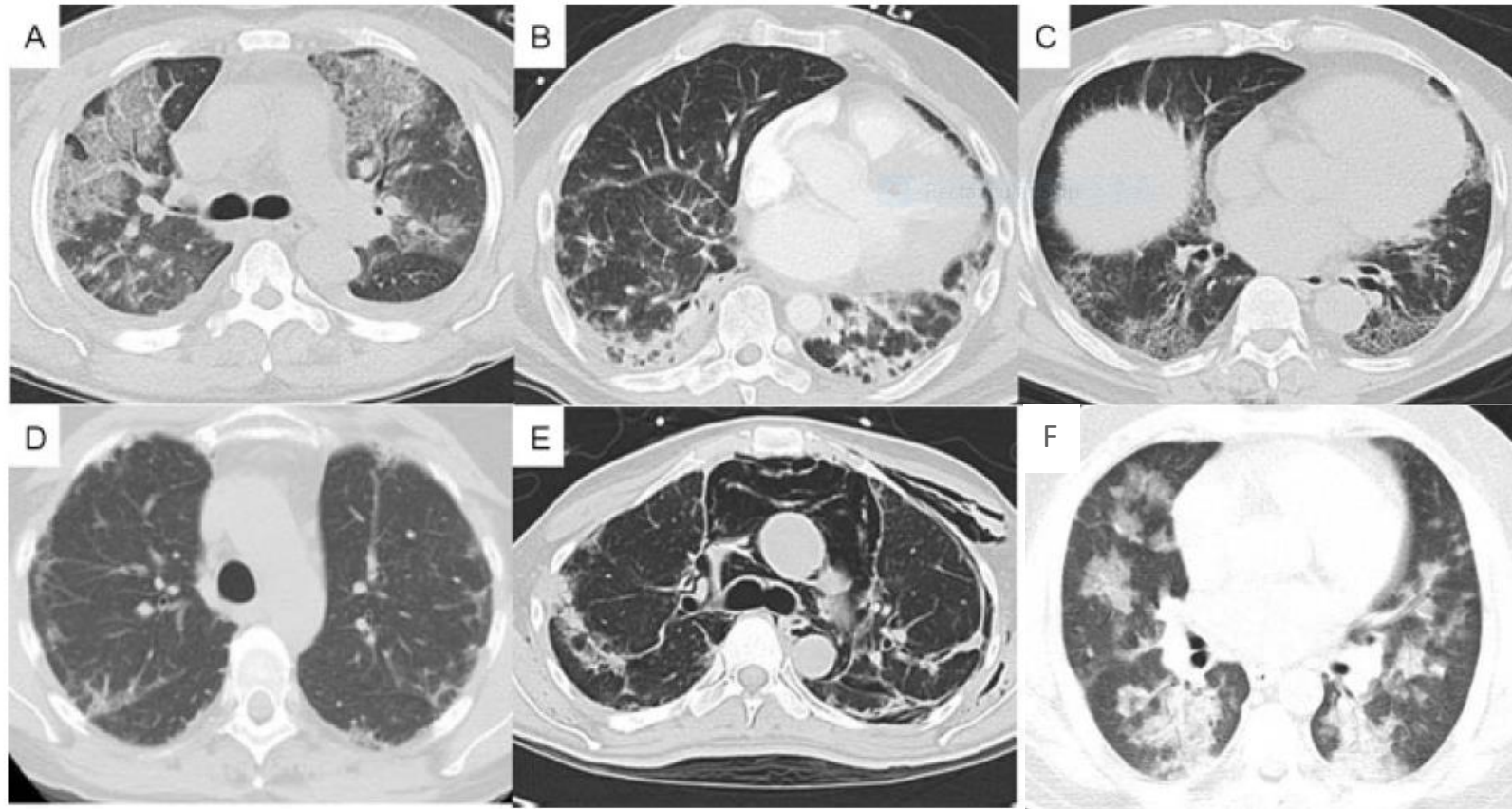
Ye et al. *Clin Rheumatol* (2007) 26:1647–1654



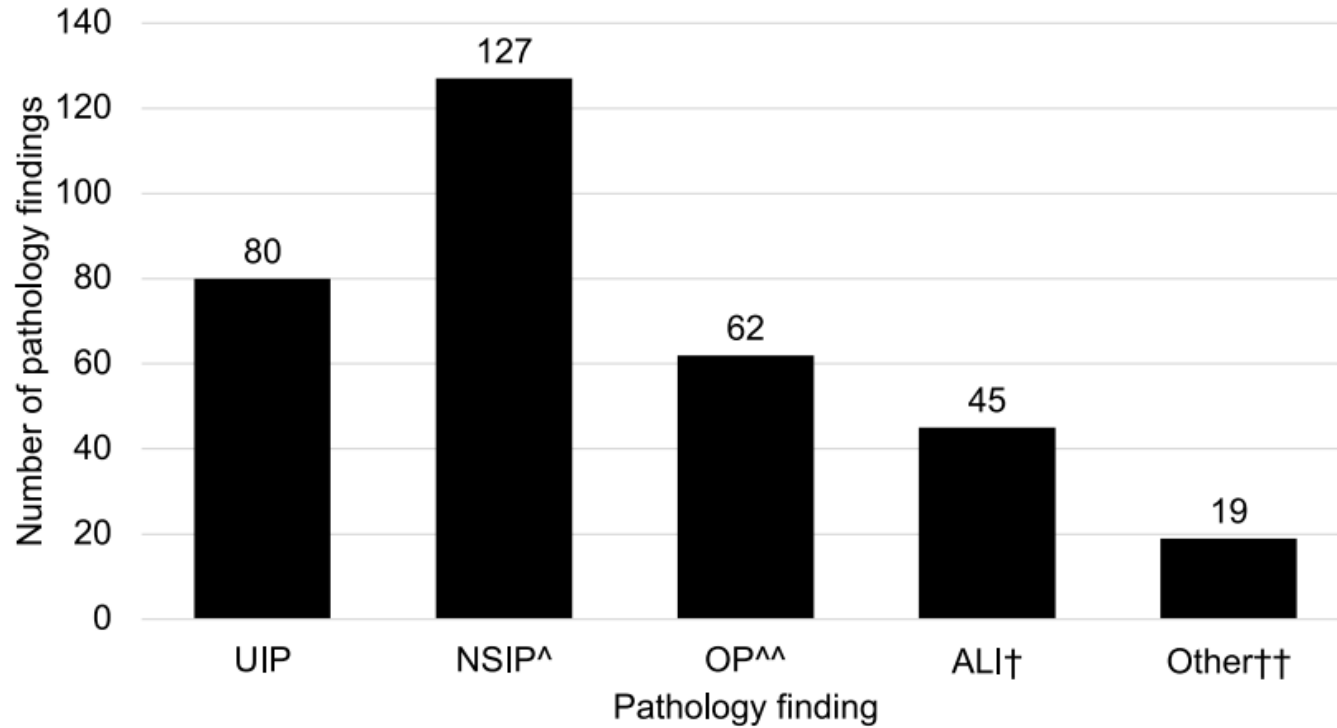
Johnson et al. *Lung* (2016) 194:733–737



Lung manifestations of the anti-synthetase syndrome/MDA5



Pathology of anti-synthetase positive patients



- Meta-review of the literature and BIDMC
- 310 anti-synthetase-positive ILD cases who underwent surgical lung biopsy



2017 EULAR/ACR Classification Criteria

Table 1 Score points for the European League Against Rheumatism/American College of Rheumatology classification criteria for adult and juvenile idiopathic inflammatory myopathies to be used when no better explanation for the symptoms or signs exists¹

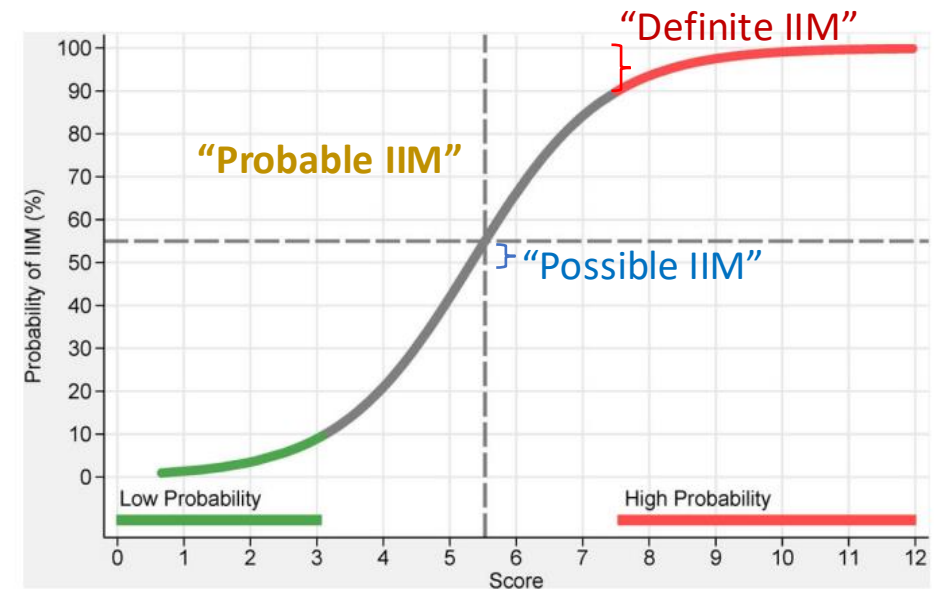
Variable	Score points	
	No biopsy	Biopsy
Age of onset of first related symptoms		
18–40	1.3	1.5
≥40	2.1	2.2
Muscle weakness		
Objective symmetric weakness, usually progressive, of proximal upper extremities	0.7	0.7
Objective symmetric weakness, usually progressive, of proximal lower extremities	0.8	0.5
Neck flexors are relatively weaker than neck extensors	1.9	1.6
In the legs, proximal muscles are relatively weaker than distal muscles	0.9	1.2
Skin manifestations		
Heliotrope rash	3.1	3.2
Gottron's papules	2.1	2.7
Gottron's sign	3.3	3.7
Other clinical manifestations		
Dysphagia or esophageal dysmotility	0.7	0.6
Laboratory measurements		
Anti-Jo-1 (anti-histidyl-tRNA synthetase) autoantibody positivity	3.9	3.8
Elevated serum levels of creatine kinase (CK)* or lactate dehydrogenase (LDH)* or aspartate aminotransferase (ASAT/AST/SGOT)* or alanine aminotransferase (ALAT/ALT/SGPT)*	1.3	1.4
Muscle biopsy features		
Endomysial infiltration of mononuclear cells surrounding, but not invading, myofibres		1.7
Perimysial and/or perivascular infiltration of mononuclear cells		1.2
Perifascicular atrophy		1.9
Rimmed vacuoles		3.1

*Serum levels above upper limit of normal.

- Cutoff for IIM classification is the 55% probability mark (scores of 5.5, 6.7)

With biopsy
Sensitivity: 93%
Specificity: 88%

Without biopsy
Sensitivity: 87%
Specificity: 82%



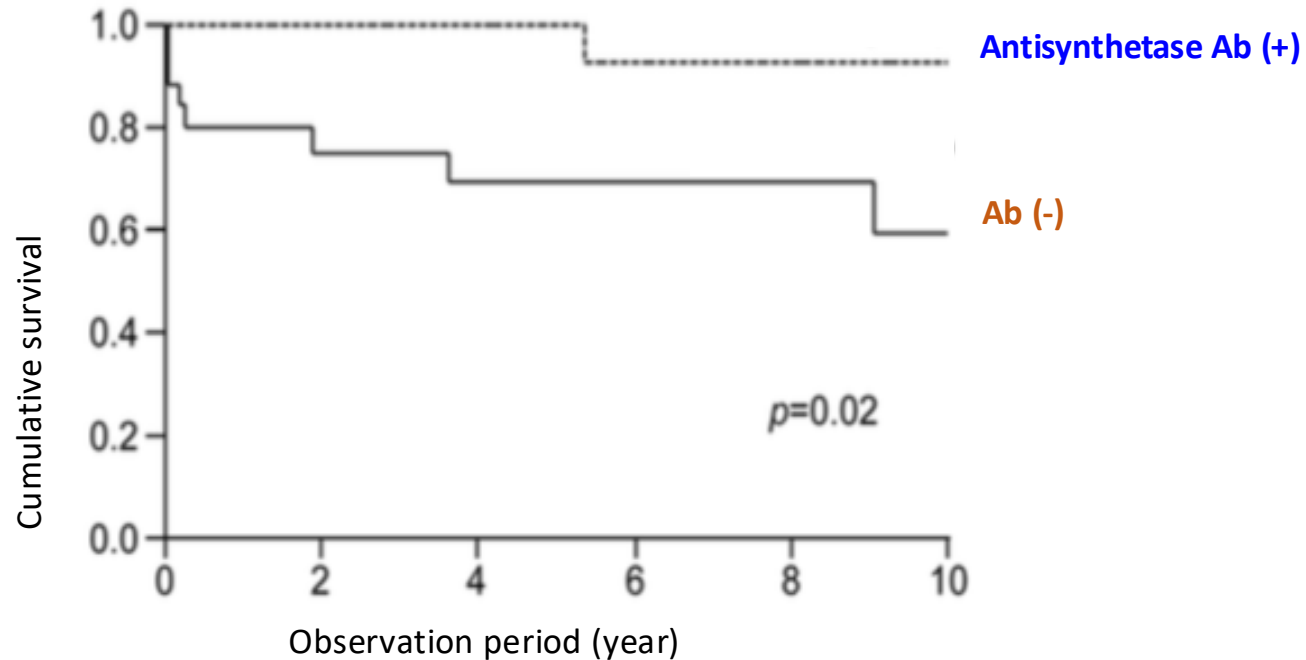
The Anti-synthetase Antibodies

Anti-synthetase antibody	Target tRNA synthetase	Prevalence in myopathy	% of ARS Abs detected	Clinical features
anti-Jo-1	Histidyl-	8-18%	36-88%	Myositis, Joint dz
anti-EJ	Glycyl-	5-10%	7-23%	Classic DM, CADM
anti-PL-7	Threonyl-	5%	9-25%	Classic DM, Worse ILD
anti-OJ	Isoleucyl-	3%	5-8%	Isolated ILD
anti-PL-12	Alanyl-	1%	2-11%	Isolated ILD, Worse ILD, CADM
anti-KS	Asparaginy-	1%	4-8%	Isolated ILD
anti-Zo	Phenylalanyl-	< 1%	< 1%	
anti-YRS	Tyrosyl-	< 1%	< 1%	

Additional Myositis antibodies

Antibody	Target antigen	Prevalence In Myositis	Clinical features
anti-MDA-5	MDA-5 RNA helicase	20-25%	Skin ulceration; CADM; Rapidly progressing ILD
anti-Ro-52	Extractable Nuclear Antigen (Ro-52)	13-26%	More severe ILD; worse outcomes
anti-PM-Scl	Complex of proteins in the nucleolus	5-24%	Scleroderma; PM/DM
anti-Ku	70-80 kDa proteins in the nuclei and nucleoli	3-23%	Increased risk of ILD
anti-155/140 (anti-TIF-1 γ)	155/140-kDa polypeptides	7-16%	Malignancy; Lower risk of ILD
anti-SRP	Cytoplasmic Signal Recognition Particle	5-6%	Severe myopathy; Malignancy
anti-SAE1	Small ubiquitin-like modifier-1 Activating Enzyme	1.5-8%	Increased risk of ILD; Malignancy

Anti-synthetase antibodies are associated with improved prognosis in myositis-ILD



48 patients with DM/PM-ILD
23 with antibodies
25 without antibodies

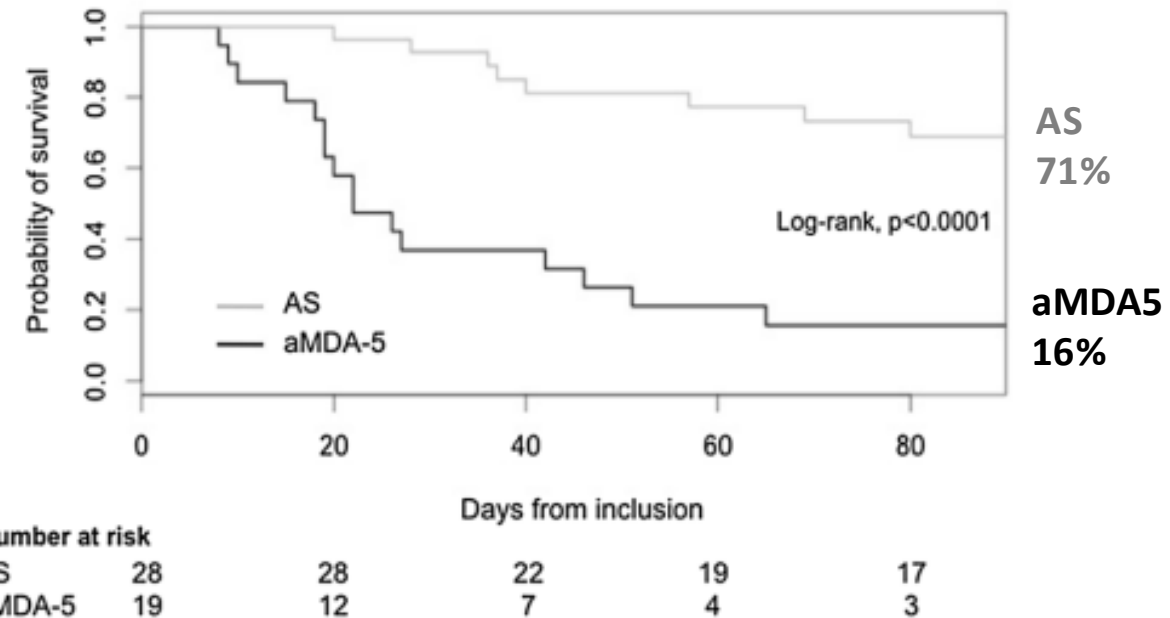
HR of mortality = 0.34 with antisynthetase antibodies
Mortality rate = 4% vs 32%

Dermato-pulmonary syndromes masquerading as ARDS

- 47 patients admitted with “idiopathic” respiratory failure
- Workup revealed positive AS or MDA-5 antibodies

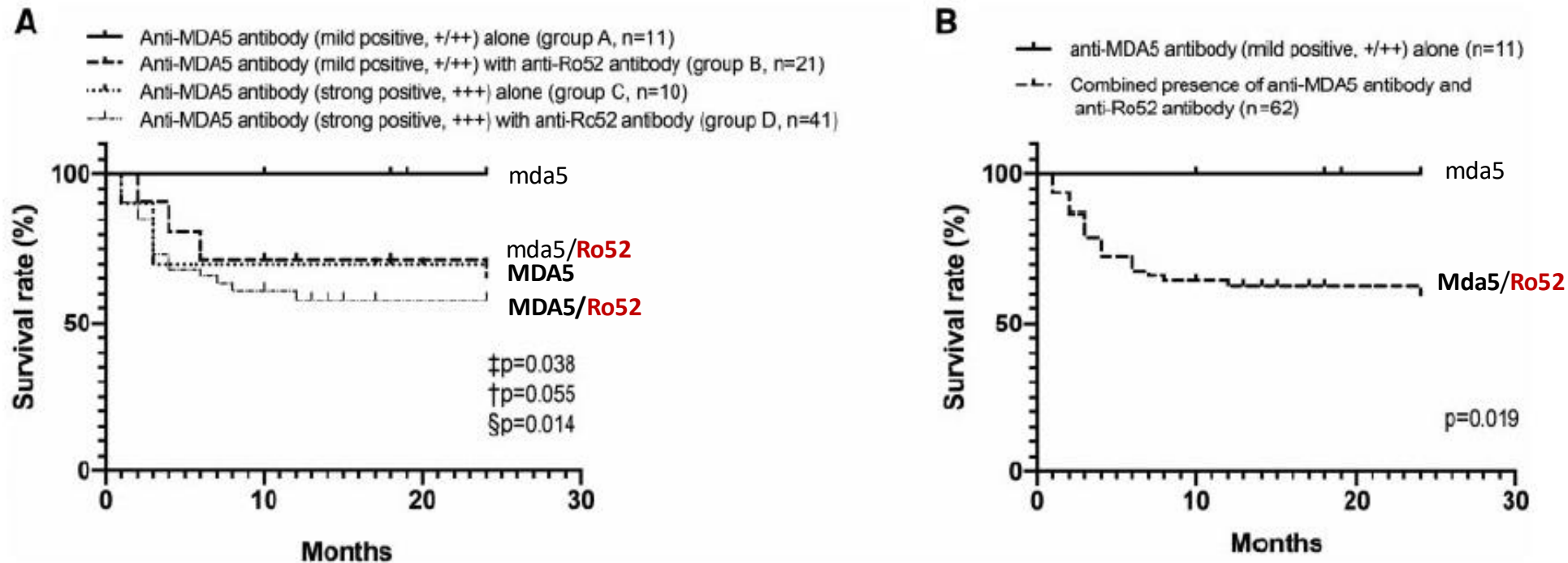
- Muscular manifestations (23%)
- Articular manifestations (30%)
- Cutaneous manifestations (43%)
- **No extrapulmonary manifestations (36%)**

	All patients N=47	aMDA-5 ARF N=19	AS ARF N=28	p
Treatment, n (%) or median [IQR]				
Antibiotics therapy at ICU admission	41 (89)	15 (79)	26 (96)	0.14
Immunosuppressive treatment	47 (100)	19 (100)	28 (100)	1.00
Delay ICU-IS treatment (days)	6 [3–12]	4 [1.5–11]	6 [4–16]	0.25
Corticosteroids pulses	47 (100)	19 (100)	28 (100)	1.00
Cyclophosphamide	34 (72)	16 (84)	18 (64)	0.24
<u>Rituximab</u>	7 (15)	<u>6 (32)</u>	<u>1 (4)</u>	0.01
Cyclosporine	2 (4)	2 (10)	0 (0)	0.16
Tacrolimus	2 (4)	2 (11)	0 (0)	0.16
Basiliximab	2 (4)	2 (11)	0 (0)	0.16
Intravenous immunoglobulins	10 (21)	5 (26)	5 (18)	0.50
<u>Plasma exchange</u>	8 (17)	<u>7 (37)</u>	<u>1 (4)</u>	0.005
Number of immunosuppressive treatments	2 [2, 3]	3 [2–4]	2 [1, 2]	<0.001



anti-MDA5 levels and the presence of anti-Ro52 influence prognosis

83 consecutive patients with CADM-ILD, anti-MDA5 +
-- 74% also had anti-Ro52

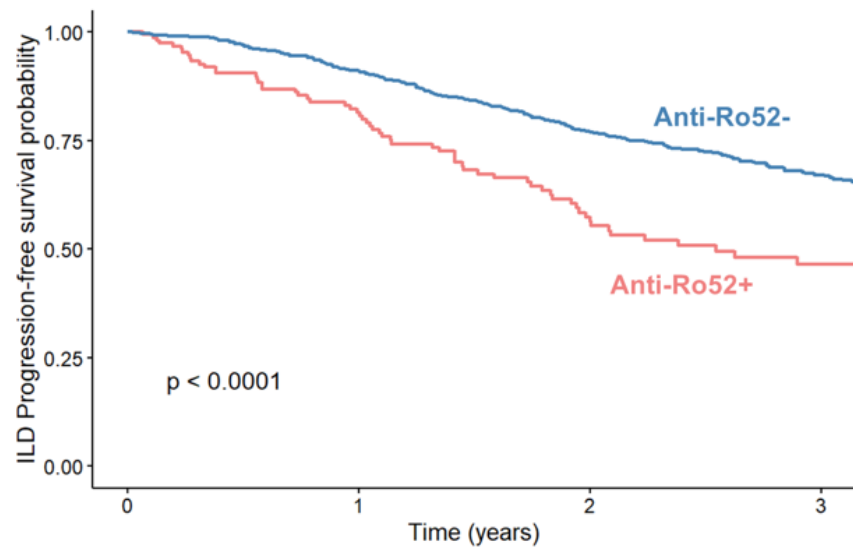


Anti-Ro52 associated with RP-ILD, 54.5% vs 23.8% ($p = 0.014$)

Anti-Ro52 associated with cutaneous ulcerations, 27.4% vs 4.8% ($p = 0.033$)

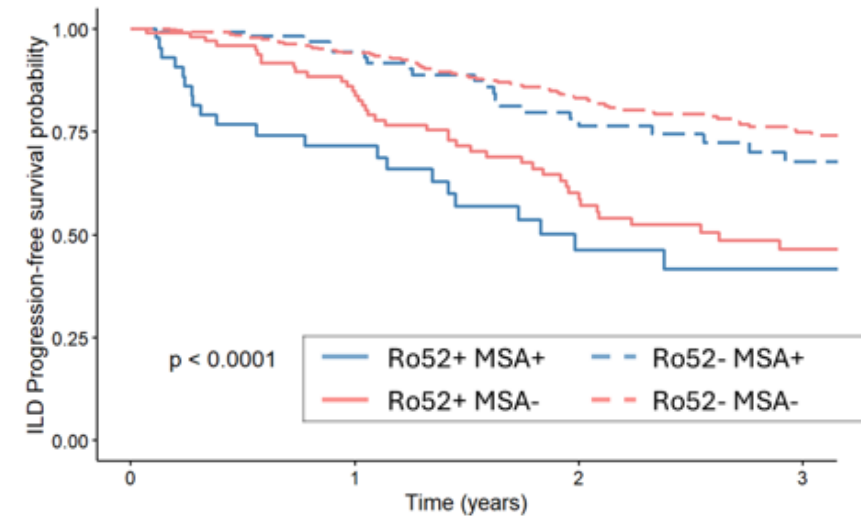
The presence of anti-Ro52 is associated with worse outcomes

A) ILD Progression-Free Survival



	Number at risk			
	0	1	2	3
Anti-Ro52+	154	103	55	31
Anti-Ro52-	874	613	382	211

B) ILD Progression-Free Survival by MSA positivity With or Without Anti-Ro52



	Number at risk			
	0	1	2	3
Ro52+ MSA+	44	26	12	6
Ro52- MSA+	117	71	48	28
Ro52+ MSA-	105	73	40	23
Ro52- MSA-	389	291	180	102



Myositis antibodies are lurking in our ILD patients

Retrospective study of 165 patients with “idiopathic” ILD

(36% of those with a MSA referred with a presumed diagnosis of IPF)

ANA, RF, CCP negative in 61.4% of patients with a MSA+

14 patients (8.5%) had a change in diagnosis as a result of the testing

Myositis antibodies	n (%)
Any antibody	44 (26.7)
Ro-52	18 (10.9)
PM/Sc175	8 (4.8)
Jo-1	5 (3.0)
PL-7	5 (3.0)
PL-12	4 (2.4)
PM/Sc1100	4 (2.4)
SRP	4 (2.4)
Ku	3 (1.8)
MDA-5	2 (1.2)
Mi-2 β	2 (1.2)
TIF-1 γ	2 (1.2)
NXP2	1 (0.6)
EJ	1 (0.6)
Mi-2 α	1 (0.6)
Mi-2	0 (0.0)
OJ	0 (0.0)



Myositis-specific antibodies are frequently associated with lung-dominant disease

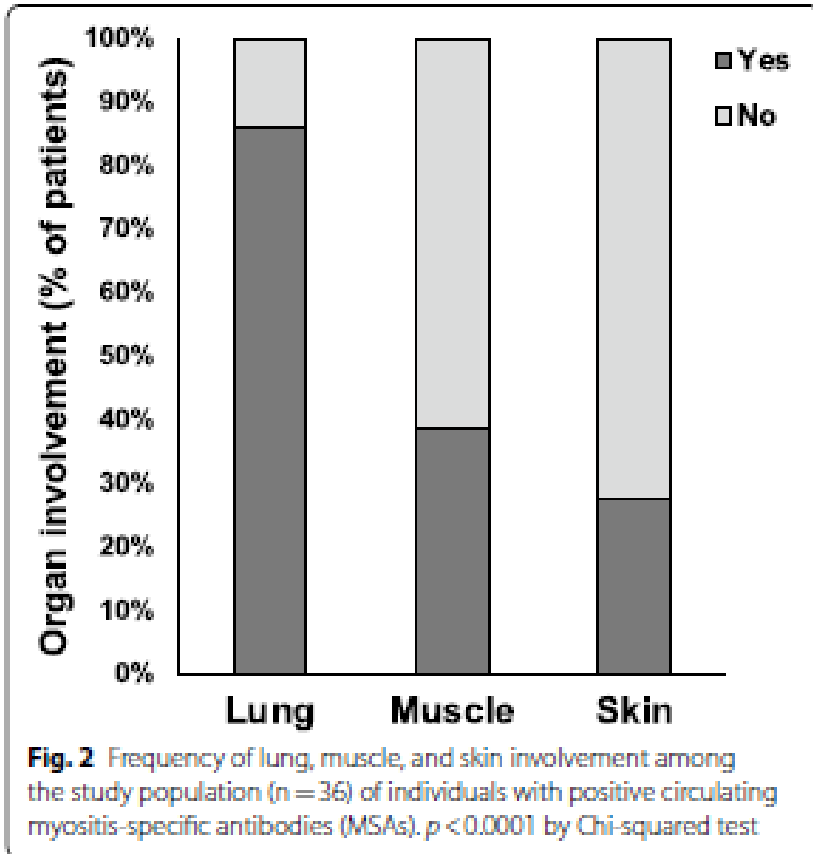


Chart review of 3078 tested patients

2631 tested for Jo-1

447 tested with a myositis panel



How do we define patients with ILD and myositis-specific antibodies in the absence of a defined CTD?

Undifferentiated CTD-associated ILD

Autoimmune-featured ILD

Lung-dominant CTD

**Idiopathic pneumonia with autoimmune features
(IPAF)**



Idiopathic pneumonia with autoimmune features (IPAF)

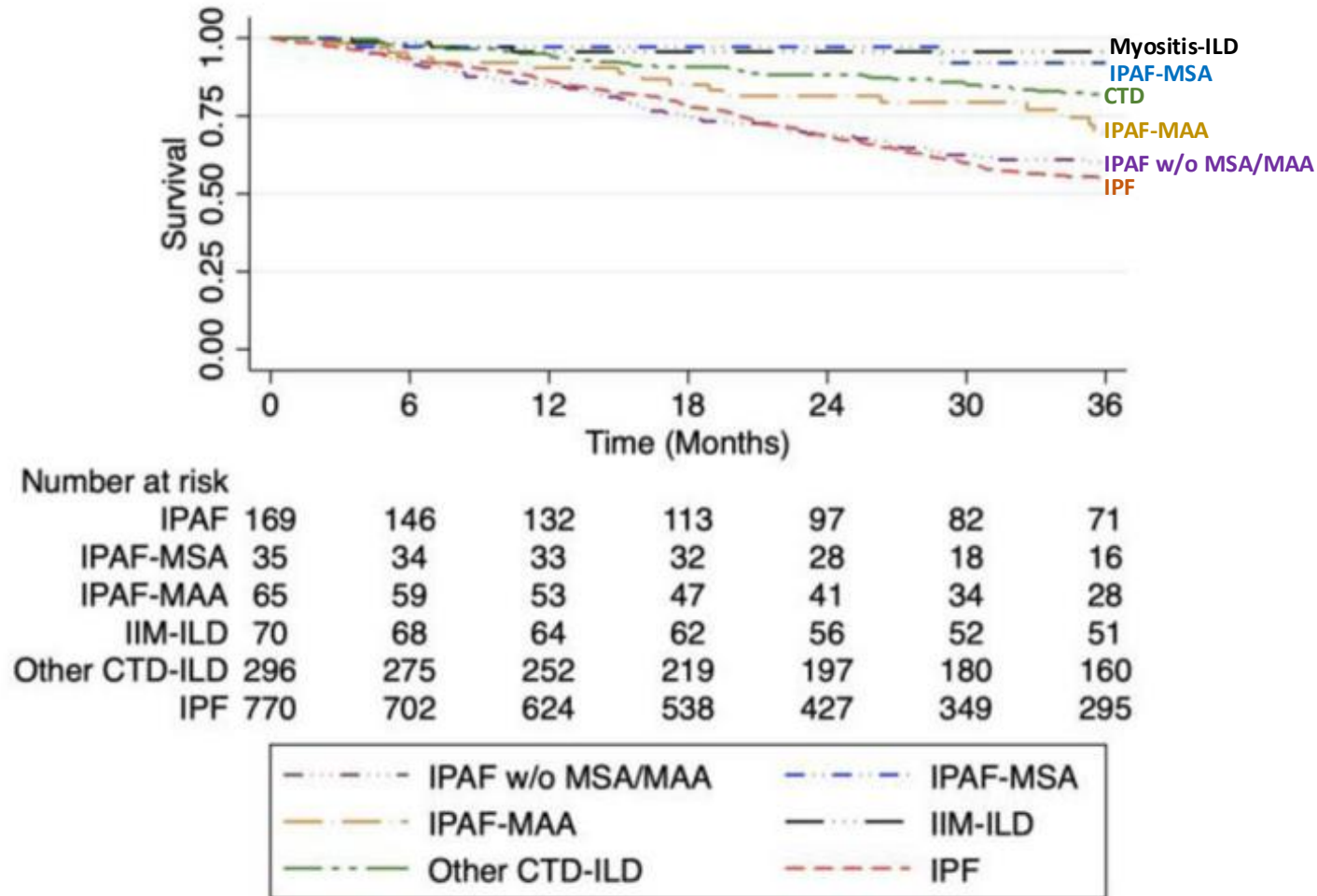
TABLE 1 Classification criteria for "interstitial pneumonia with autoimmune features"

1. Presence of an interstitial pneumonia (by HRCT or surgical lung biopsy) *and*,
 2. Exclusion of alternative aetiologies *and*,
 3. Does not meet criteria of a defined connective tissue disease *and*,
 4. At least one feature from at least two of these domains:
 - A. Clinical domain
 - B. Serologic domain
 - C. Morphologic domain
-
- A. Clinical domain**
1. Distal digital fissuring (*i.e.* "mechanic hands")
 2. Distal digital tip ulceration
 3. Inflammatory arthritis or polyarticular morning joint stiffness ≥ 60 min
 4. Palmar telangiectasia
 5. Raynaud's phenomenon
 6. Unexplained digital oedema
 7. Unexplained fixed rash on the digital extensor surfaces (Gottron's sign)
-
- B. Serologic domain**
1. ANA $\geq 1:320$ titre, diffuse, speckled, homogeneous patterns *or*
 - a. ANA nucleolar pattern (any titre) *or*
 - b. ANA centromere pattern (any titre)
 2. Rheumatoid factor $\geq 2\times$ upper limit of normal
 3. Anti-CCP
 4. Anti-dsDNA
 5. Anti-Ro (SS-A)
 6. Anti-La (SS-B)
 7. Anti-ribonucleoprotein
 8. Anti-Smith
 9. Anti-topoisomerase [Scl-70]
 10. Anti-tRNA synthetase (*e.g.* Jo-1, PL-7, PL-12; others are: EJ, OJ, KS, Zo, tRS)
 11. Anti-PM-Scl
 12. Anti-MDA-5
-
- C. Morphologic domain**
1. Suggestive radiology patterns by HRCT (see text for descriptions):
 - a. NSIP
 - b. OP
 - c. NSIP with OP overlap
 - d. LIP
 2. Histopathology patterns or features by surgical lung biopsy:
 - a. NSIP
 - b. OP
 - c. NSIP with OP overlap
 - d. LIP
 - e. Interstitial lymphoid aggregates with germinal centres
 - f. Diffuse lymphoplasmacytic infiltration (with or without lymphoid follicles)
 3. Multi-compartment involvement (in addition to interstitial pneumonia):
 - a. Unexplained pleural effusion or thickening
 - b. Unexplained pericardial effusion or thickening
 - c. Unexplained intrinsic airways disease[#] (by PFT, imaging or pathology)
 - d. Unexplained pulmonary vasculopathy

Serologic Domain	Reported prevalence in series (%)
ANA criteria	28.1—82.4
RF criteria	13--21.9
CCP	0--10.7
dsDNA	1.8--7.2
SSA	9.4--42.9
SSB	0--5.4
RNP	0--16.1
Smith	0--8.9
Scl-70	0—5.7
tRNA synthetase	0.7--35.7
PM-Scl*	0—5.7
MDA5*	0

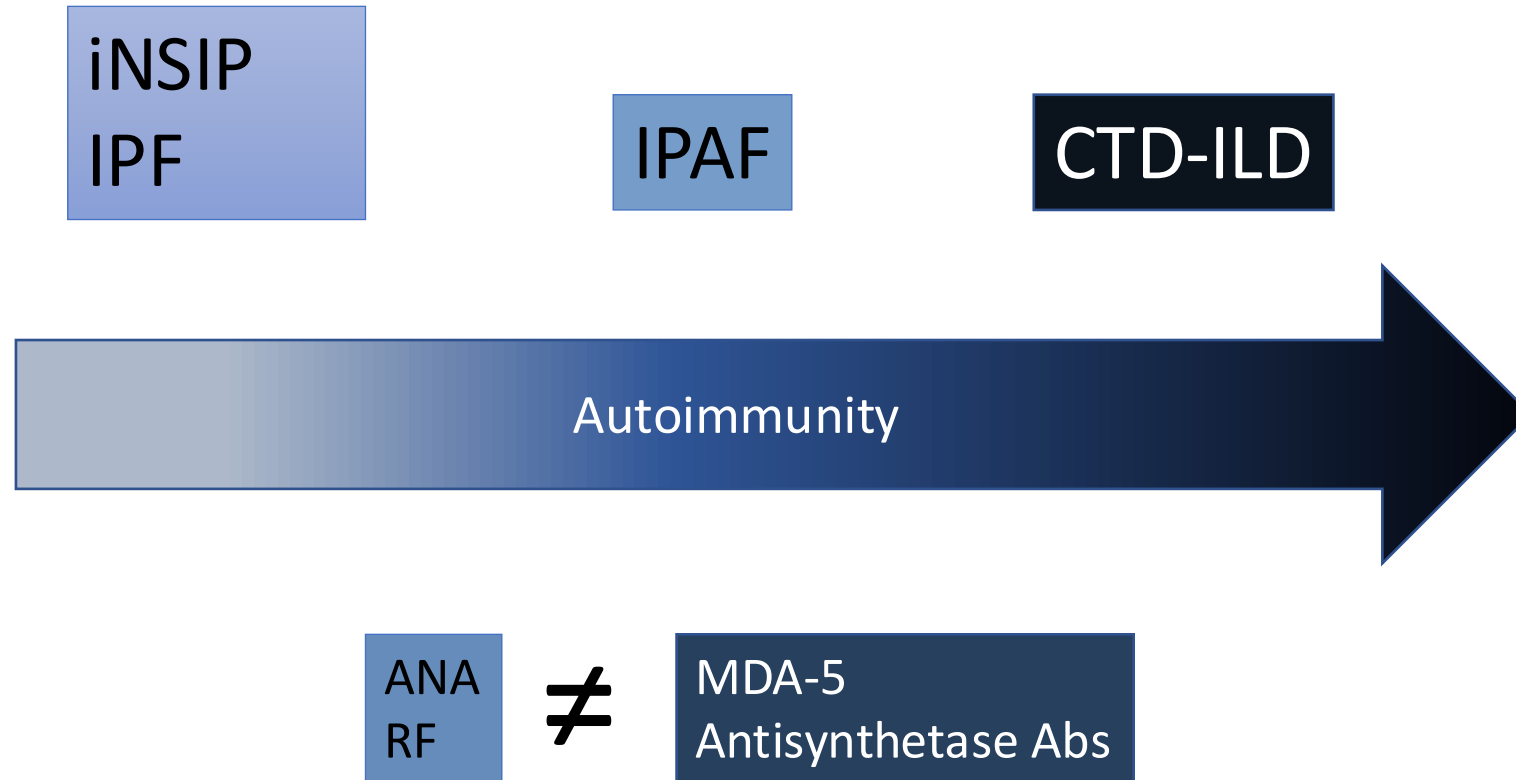
*Not always reported or tested

Not all IPAF is the same



*IPAF-MSA patients have outcomes similar to patients with myositis-ILD

ILD occurs along a spectrum of autoimmunity



75 M with anti-PL-7+ dermatomyositis

- Joint pains, fevers, rash *improved* after 5 months of therapy:
--Prednisone taper, mycophenolate 3000 mg
- Worsening dry cough and dyspnea over 6 months when carrying items up the stairs



68 F with anti-Jo-1+ dermatomyositis

- Progressive dyspnea over several months
- FVC decreased by 15%; unable to perform DLCO



MIP -21.5 (28% predicted)
MEP 28.5 (29% predicted)



CK 700 --> 6000

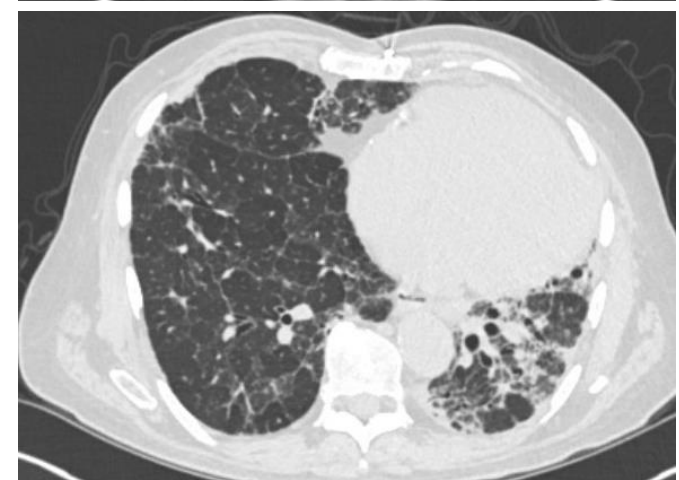
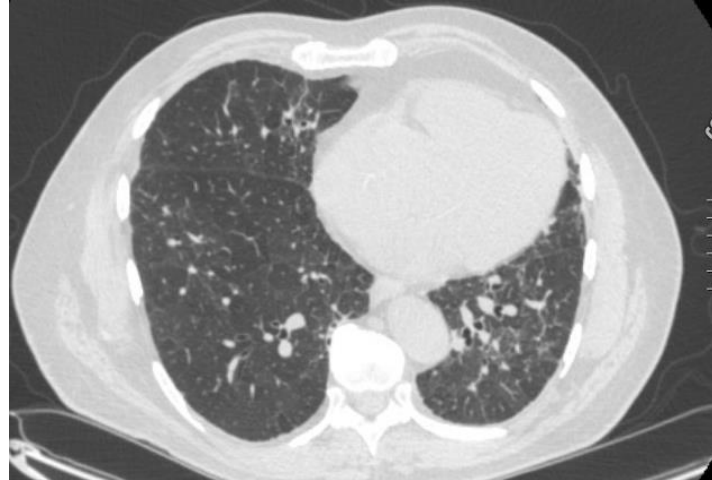
62 F with anti-PL-7+ dermatomyositis

- Skin and muscle disease stable
- Prednisone 5 mg daily; MMF 1500 bid

2019



2021



Some additional clinical pearls worth mentioning

- Declining FVC can be secondary to muscle weakness (myositis) or truncal skin thickening (scleroderma)
- Myositis develops after ILD in 29-64% of anti-synthetase cases
- Improving FVC may provide false (pulmonary) reassurance as the muscle disease responds to therapy
- Malignancy is common in patients with inflammatory myositis
 - 15-30%, with a higher incidence in DM vs PM
 - Majority of cases occur after the myositis diagnosis

Summary

- ILD is common in myositis; its presentation ranges from subclinical to fulminant respiratory failure.
- Diagnosing myositis-ILD often requires a nuanced approach and the careful consideration physical exam findings and autoantibodies.
- Changing symptoms in this patient population should be interpreted with a broadened differential.

