Pulmonary manifestations of connective tissue diseases (SLE ,RA , SS, PM/DM)

Spectrum of pleuro pulmonary involvement in CTD

Upper airway involvement
- cricoarytenoid joint arthritis
- aspiration pneumonia

Smaller airway
- bronchiolitis
- bronchiolitis obliterans, follicular bronchiolitis

Respiratory muscle weakness
- type 2 respiratory failure
- basal atelectasis , recurrent pneumonia

Interstitial lung disease
- acute and chronic ILD
- end stage fibrosis – honey combing

Pulmonary vascular disease
- secondary to underlying ILD
- Isolated PAH
- acute and chronic thromboembolic disease

Pulmonary vasculitis(Pulmonary capillaritis)
- diffuse alveolar hemorrhage

Parenchymal nodules
- rheumatoid arthritis
- pseudo lymphoma in Sjogrens

Drug related
- Immuno supression
- Gold and methotrexate related toxicity

Asymptomatic radiological abnormalities

- Nodules
- Early stage of ILD
- Small pleural effusions

SOB, Normal CXR

Normal spirometry

- Isolated PAH

Airflow limitation

- Upper airway obstruction

Restrictive pattern

- Muscle weakness

SOB, diffuse pulm infiltrates, fever (acute pneumonia like presentation)

- Acute ILD (DAD,BOOP)
- Infective pneumonia
- DAH
- Acute pul edema

Hempotysis

- Nodules
- Telangiectasia
- Carcinoma

CLINICAL PRESENTATION

Acute SOB ,normal CXR

- PTE
- Acute reversible hypoxemia syndrome

SOB ,dry cough, bibasilar crepts

- Chronic ILD
- No clubbing- SS

Pleuritic chest pain

Fever, SOB

- Pleuritis
- pneumonia

Upper respiratory symptoms –foreign body sensation , sore throat, stridor

- Cricoarytenoid arthritis

SLE

50% incidence

Pleura ,parenchyma and respiratory muscle commonly involved

Airway rarely involved

Lupus pleuritis and pleural effusion

Most common primary pulmonary manifestation of SLE -50-80% incidence

Usually symptomatic

Fever pleuritic chest pain, fever and dyspnea

Mild to moderate effusion , bilateral in 50 % cases

Serous to serosanguinous exudative effusion

TLC up to 10000, early Neutrophilic→ mononuclear

Glucose concentration usually normal

Pleural fluid anti ANA titre > 1:1600 highly suggestive

Pleural fluid LE cell preparation- specific ,low sensitivity

Rx – steroids , may require drainage and pleurodesis in refractory cases

Recurrent attack may cause pleural thickening and lung entrapment- surgical intervention

Acute lupus pneumonitis

Acute inflammatory process involving lung in which infection has been excluded
Acute diffuse alveolar damage with hyaline membrane formation
Uncommon complication -1-4%
Young females
Can occur in established disease or as first manifestation
More common in post partum period
Acute onset dyspnea ,cough, fever and respiratory failure
May resolve completely or progress to chronic ILD
CXR- U/L or B/L lower zone alveolar infiltrates , dense consolidation
Up to 50 % mortality rate
Infection should be ruled out prior to using immuno suppression(BAL or OLB)
Rx – Respiratory support , immunosuppressant(steroids first line therapy)
Cyclophosphamide , methotrexate, azathioprine

Diffuse alveolar hemorrhage

Usually seen in well established disease 1-4% incidence

Active necrotizing small vessel Vasculitis

Range from acute fulminant to rare mild chronic form

Hemoptysis , elevated CO diffusion capacity , fall in hematocrit

Diffuse B/L lower lobe alveolar infiltrates , patchy U/L

Bronchoscopy – exclude infection and demonstrate hemosiderin laden macrophage

Up to 1/3 patients have concomitant infection

Up to 50% mortality rate

High recurrence rate

Treatment

Cover with BSAS even in absence of positive culture

Steroids primary treatment

Cyclophosphamide ,Plasmapheresis

DAH IN SLE	
Age	29 yrs
Females	79%
As first presentation of SLE	11%
Mean disease duration	35 months
Renal involvement	60%
Concomitant infection	13%
Hemoptysis	66%

Acute reversible hypoxemia

Reported by Abramson et al in 1991
Acute onset respiratory distress , cough, chest pain
High level of complement degradation product
Complement induced neutrophilic activation → adherence to pulmonary vasculature → leuko occlusive vasculopathy
Normal CXR, impaired diffusion capacity and increased alveolar – arterial gradient
Good response to steroids

Chronic Interstitial lung disease

Low incidence of clinically evident chronic ILD than acute lung presentation HRCT 1/3 patients

Older age grp(45yrs)

High incidence of anti –SSa(Ro) antibodies

May progress to end stage pulmonary fibrosis

Infections in SLE

Most common cause of lung disease in SLE

Disease related immune dysfunction+ drug induced

Susceptible to both usual bacterial pathogen and opportunistic organism

Impaired cellular immunity and macrophage function – high incidence of Mycobacterium and Nocardial infections

Tuberculosis - up to 5% incidence in endemic areas

High incidence of miliary and extrapulmonary tuberculosis

Nocardia asteroides

Up to 2% incidence

Lung, CNS -10%

Consolidation or multiple nodules with cavitations, pleural effusion , chest wall extension

Pulmonary vascular disease

	MPA at rest	Post exercise
Definitive PAH	>25mm Hg	>30mmHg
Border line	>20mmHg	

Isolated PAH

Plexogenic arteriopathy

Up to 5% incidence

Usually seen in association with other evidence of vascular injury

Dyspnea, fatigue, syncope , peripheral congestion, cor pulmonale

CXR -PAH, Cardiomegaly, normal lung parenchyma

Normal spirometry and lung volume

Reduced DLCO and gas exchange abnormalities(resting or exercise induced hypoxemia)

Normal V/Q scan

Respiratory muscle dysfunction

25 % can have diaphgram weakness

Unexplained dyspnea, shrinking lung syndrome

Phrenic nerve conduction abnormalities

Decreased trans diaphragmatic pressure ---- basal atelectasis

Restrictive pattern on PFT

Normal diffusion capacity

Progression uncommon

Steroids not effective

Rx-Long term positive pressure ventilation

Airway in SLE

Expiratory airway obstruction uncommon

Obliterative or constrictive Bronchiolitis

Progressive airway obstruction

Poor response to therapy and poor prognosis

Rheumatoid arthritis

Pulmonary manifestation frequently seen in severe chronic articular disease, high RA factor titre , subcutaneous nodules and other systemic features
Males more commonly develop resp complication

Interstitial pulmonary fibrosis

Most common form of lung disease
Variable incidence
BX evidence of fibrosis- 60%
HRCT -20%
CXR-1-5%
Reduction in DLco- 40%
Restrictive PFT-14%
More common in males
Histology -Early disease- lymhocytic interstitial infiltrate, peribronchial follicle

Late fibrotic stage –, UIP

Radiographically similar to IPF

More indolent course than IPF

BOOP (organizing pneumonia)

RA most common cause among all CTD
Plugs of Granulation tissue in the airspaces distal to and including the terminal bronchioles ,associated with lymphocytic infiltration of bronchiolar wall and interstitium
Acute to sub acute presentation as pneumonia
Fever, productive cough, dyspnea ,crepts
CXR- multifocal consolidation
CT- patchy bilateral air space consolidation , ground glass attenuation , small nodules and limited fibrosis
Hypoxemia
Restrictive PFT
Good response to steroids however may progress to end stage disease
Cyclophosphamide

Pleural involvement

50% post mortem series
20 % pleuritic chest pain
5% pleural effusion- usually asymptomatic
Usually U/l and small in size
May be B/L(25%)
Exudative effusion
Low pH and glucose
TLC up to 15000, mixed population, RA cells, large elongated macrophages
Presence of RA factor in fluid is non specific
Rule out empyema and malignant pleural effusion
Rx not required in asymptomatic disease-spontaneous resolution
Steroids
Surgical intervention

Airway disease

Over all incidence -38%

Upper airway obstruction

Cricoarytenoid joint arthritis

CT and laryngoscopic involvement in 75% cases

Usually asymptomatic

Foreign body sensation, sore throat, dysphagia, ear pain

Respiratory obstruction, stridor

Difficult intubation

Laryngoscopy-erythema, swelling , thickening of mucosal folds

May result in fibrosis and ankylosis

Acute inflammation – anti inflammatory drugs

Chronic arthritis -surgical treatment if respiratory distress or stridor

Bronchiolitis obliterans(constrictive bronchiolitis)

Destruction of the bronchiolar wall by granulation tissue ,obliteration of lumen and replacement of bronchioles by fibrous tissue

Secondary Sjogrens and Penicillamine therapy are important risk factors

Progressive ,severe airway obstruction

Insidious onset rapidly progressive dyspnea and cough

Fever ,wt loss uncommon

Poor prognosis , type 2 respiratory failure

PFT- obstruction with increased RV, normal diffusion capacity

CXR- hyperinflation

HRCT – centrilobular micro nodular opacities(bronchiolar wall thickening)
area of reduced perfusion – mosaic pattern

Steroids + cyclophosphamide

Follicular bronchiolitis

External compression of bronchioles by hyperplasic lymphoid follicles

Variable lymphocytic infiltration of bronchiolar wall

Usually incidental BX or CT finding

CXR – simulate ILD –reticular or reticulo nodular

CT- cetrilobular and peribronchial nodules , patchy ground glass appearance

Good response to steroids

Bronchiectasis

HRCT- 30%
Clinically evident diseaes unusual

Vasculitis

Pulmonary vasculitis rare in RA

Case reports of DAH and isolated PAH

Pulmonary hyper tension

Usually secondary to underling parenchymal lung disease

Infection in RA

Frequent LRTI

Bronchopneumonia cause of 15-20% deaths in RA

Necrobiotic nodules

Area of fibrinoid necrosis surrounded by inflammatory cells

1% incidence

More common in males

Usually asymptomatic

Rarely cause cough ,hemoptysis or pneumothorax

Single or multiple

Upper and mid zone predilection

50 % may undergo cavitation

Variable size (up to 7 cm)

Spontaneous resolution and recurrence (size vary with disease activity)

No treatment required

Scleroderma

Synthesis and deposition of excessive extra cellular matrix

vascular obliteration

70- 100 % involvement in post mortem series

Chronic Interstitial lung disease- 80%

Pulmonary artery hypertension-60%

Most frequent cause of death

Interstitial pulmonary fibrosis

Highest incidence of ILD among all CTD
More common in diffuse cutaneous form
Systemic sclerosis sine scleroderma
HRCT- 80% incidence
Impaired PFT -90%
Symptomatic disease-55%
CXR – 30-60%
Clubbing unusual
Lung carcinoma may arise
Better prognosis than IPF

CXR- Early - symmetrical basal interstitial opacity,
Late- coarse reticulonodular abnormalities, volume loss, Honey combing
HRCT- Early- localized to post sub pleural aspect- ground glass attenuation
Late fibrotic stage - reticular pattern, traction bronchiectasis
BAL-high neutrophil count associated with fibrosis and reticular pattern on CT
PFT– restrictive pattern, decreased DLco , hypoxemia
Bx- Tran bronchial not useful, require surgical bx
most common pattern-NSIP,UIP less common
Tretment- low –moderate dose steroids + Cyclophosphamide

Isolated pulmonary vascular disease

Primarily seen in limited cutaneous form
Concentric fibrosis of small arteries
No plexiform lesions or fibrinoid necrosis
Up to 10 % incidence
Presence of Raynauds phenomena and anti centromere antibodies
PFT – normal lung volumes and air flow pattern
CXR -PAH, Cardiomegaly, normal lung parenchyma
Reduced DLCO and gas exchange abnormalities(resting or exercise induced hypoxemia)
Normal V/Q scan
Treatment Calcium channel antagonist
Prostacylin analogues
Endothelin receptor antagonist

Pleural involvement

40-80% - autopsy series (pleuritis or pleural effusion)

10% - pleural rub

Usually small pleural effusions

Hemoptysis

Bronchogenic carcinoma

Bleeding telangiectasia

Rarely alveolar hemorrhage

Lung cancer

2.1 times higher risk

Long duration of illness ,diffuse cutaneous form and anti-Topoisomerase -1 antibody

Epithelial hyperplasia, defective immune surveillance , impaired clearance of carcinogens

Sarcoidosis and limited cutaneous scleroderma

Polymyositis and Dermatomyositis

Up to 40 % incidence

Pleural , vascular and airway involvement rare

Most common cause of death

Recurrent Aspiration

Secondary to inflammatory myositis of hypopharynx and upper esophagus

Upto20% incidence

Most common pulmonary complication

Pneumonia, lung abscess, ARDS

Respiratory muscle involvement

Hypercapnic respiratory failure

- Uncommon event
- 5% incidence

Limited respiratory muscle involvement with impaired cough, basal atelectasis ,recurrent pneumonia and dyspnea more common

Reduced lung volumes and maximum inspiratory and expiratory pressure

Pulmonary hypertension
Secondary to DCM
Respiratory failure
Secondary to ILD

Chronic Interstitial lung disease
Up to 30% incidence
F>M, mean age 50 yrs
No correlation between muscle disease severity and ILD
Most common –UIP, end stage fibrosis
Clubbing rare
High prevalence of anti –JO-1 antibodies (66%)
Inflammatory myositis secondary to malignancy can also develop ILD

Acute ILD → respiratory failure
Diffuse alveolar damage, hyaline membrane formation
Poor prognosis

BOOP
Good prognosis
Rx steroids

	SLE	RA	SS	PM-DM
Respiratory muscle dysfunction	2	0	0	2
Aspiration pneumonia	0	0	3	3
Isolated PAH	2	1	4	1
Vasculitis /DAH	2	2	0	1
DAD (acute ILD)	2	0	0	2
Chronic ILD, pulm fibrosis	2	3	4	2
BOOP	1	3	1	3
Obliterative bronchiolitis	0	2	0	0
Parenchymal nodule	0	2	0	0
Pleural effusion	2	3	1	0
Honey comb lung	1	2	4	3