Conflict of Interest Disclosure

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CLINICAL
RADIOLOGIC PATHOLOGIC
CORRELATIONS
Case 1: Clinical features

- 67 yo male with dyspnea on exertion and abnormal chest imaging
- 18 months of stable dyspnea
- No cough, sputum, or wheeze
- No systemic complaints (fever, chills, sweats, weight loss, skin, arthralgias, myalgias, upper airway, cardiac or gastrointestinal complaints)
Case 1: Clinical features

- **PMH**
  - Pulmonary coccidiomycosis
  - Prostate cancer
    - External beam radiation
    - Bladder resection secondary to fistula

- **Medications**

- **No known allergies**
Case 1: Clinical features

- Social history
  - Ex smoker (5 years) 45 pack years

- Family history
  - Mother died of lung cancer
  - Father and brother with heart disease
  - No ILD or autoimmunity
Case 1: Clinical features

- Occupational/Avocational/Environmental history
  - + Plastic coating/molding exposure
  - No asbestos
  - No farming or mining
  - + Hot tub with regular use
  - No mold or water damage exposure
  - No pets or birds
Case 1: Clinical features

- Physical examination
  - Normal skin
  - Normal joints
  - No upper airway abnormalities
  - + inspiratory mid-to-late fine crackles, no wheeze
  - Normal cardiac exam
  - No adenopathy
Case 1: Physiologic features

- Pulmonary physiology
  - Restrictive ventilatory defect with a low DLCO

- Gas exchange with activity
  - Desaturation during six minute walk
Clinical context

- Infection
  - Active
  - Remote
Clinical context

- Infection
  - Active
  - Remote
- Genetic disorder
Clinical context

- Infection
  - Active
  - Remote
- Genetic disorder
- Systemic disorder
  - Associated
  - Complication
    - Direct
    - Secondary
Clinical context

- Exposure
  - Tobacco
  - Medications/drugs/supplements
  - Occupational/Avocational/Environmental
  - Accidental
Clinical context

- Exposure
  - Tobacco
  - Medications/drugs/supplements
  - Occupational/Avocational/Environmental
  - Accidental

- Idiopathic
  - Idiopathic Interstitial Pneumonia
  - Other ILD of unknown cause
Case 1: Clinical context

- Infection
  - Remote coccidiomycosis

- Systemic disease
  - Occult autoimmunity

- Exposures
  - Tobacco
  - Hot tub

- Idiopathic
  - Idiopathic Interstitial Pneumonia
  - Other ILD of unknown cause
Case 1: Radiologic description

- **Disease features:**
  - Reticular lines
  - Honeycombing
  - Little ground-glass
  - No consolidation, mosaic attenuation, cysts, nodules

- **Axial distribution:**
  - Peripheral predominant

- **Craniocaudal distribution**
  - Basal predominant
Case 1: Radiologic pattern

- Radiologic pattern: UIP pattern
- Level of confidence: High
- Differential diagnosis:
  - Collagen vascular disease
  - Asbestosis
  - Hypersensitivity pneumonitis
  - Idiopathic pulmonary fibrosis
Heterogeneous fibrosis
Microscopic honeycombing
Fibroblast foci
Regions of normal architecture
Rare granuloma
Case 1: Pathologic features

- **UIP:**
  - Heterogeneous fibrosis
  - Microscopic honeycombing
  - Fibroblast foci
  - Areas of normal lung

- **Granulomatous inflammation:**
  - Rare nonnecrotizing granuloma
Case 1: Pathologic pattern

- Pathologic pattern: UIP + granulomas
- Differential diagnosis:
  - IPF +
    - infection/sarcoid/aspiration
  - Hypersensitivity pneumonitis
Clinical impression:
- Remote infection
- Exposure (tobacco, hot tub)
- IIP

Radiologic diagnosis:
- UIP pattern
  - High confidence

Pathologic diagnosis:
- UIP pattern + rare granuloma
Clinical-radiologic-pathologic consensus

- Consensus diagnosis
34 yo male with 18 months of dyspnea on exertion and cough
No sputum, or wheeze
Significant gastroesophageal reflux x 4 years
Arthralgias, bilateral ankles
Clubbing
No fever, chills, sweats, weight loss, skin, upper airway, cardiac complaints
Case 2: Clinical features

- **PMH**
  - Obstructive sleep apnea
  - GERD

- **Medications**
  - PPI
  - MVI

- No known allergies
Case 2: Clinical features

- Social history
  - Never smoker

- Family history
  - + Grandmother died of scleroderma
  - + Sister with JRA
  - No ILD
Case 2: Clinical features

- Occupational/Avocational/Environmental history
  - Building code inspector
  - No asbestos
  - No farming or mining
  - No hot tub
  - No mold or water damage exposure
  - No pets or birds
Case 2: Clinical features

- Physical examination
  - Normal skin
  - Normal joints
  - + Clubbing
  - No upper airway abnormalities
  - + inspiratory mid-to-late fine crackles, no wheeze
  - Normal cardiac exam
  - No adenopathy
Case 2: Physiologic features

- Pulmonary physiology
  - Restrictive physiologic defect with a low DLCO

- Gas exchange with activity
  - Desaturation during six minute walk
Case 2: Clinical context

- **Systemic disease**
  - Occult autoimmunity

- **Idiopathic**
  - Idiopathic Interstitial Pneumonia
  - Other ILD of unknown cause
Case 2: Radiologic description

- **Disease features:**
  - Ground-glass
  - Fine reticular abnormality
  - Traction bronchiectasis
  - No honeycombing

- **Axial distribution:**
  - Peribronchovascular
  - Subpleural sparing

- **Craniocaudal distribution**
  - Basal predominant
  - Moderate lower lobe volume loss
Case 2: Radiologic pattern

- Radiologic pattern: NSIP
- Level of confidence: Moderate-High
- Differential diagnosis:
  - Collagen vascular disease
  - Hypersensitivity pneumonitis
  - Drug-related pulmonary fibrosis
Diffuse process sparing the subpleura
Diffuse septal inflammation and fibrosis
Inspissated mucus
Focal organizing pneumonia
Injury with squamous metaplasia
Case 2: Pathologic features

- **NSIP:**
  - Diffuse inflammation and fibrosis
  - Subpleural sparing

- **Organizing injury:**
  - Organizing fibrin
  - Organizing pneumonia
  - Squamous metaplasia
Case 2: Pathologic pattern

- Pathologic pattern: NSIP + organizing pneumonia/injury

- Differential diagnosis:
  - Collagen vascular diseases
  - Drugs
  - Infections (viral)
Clinical-radiologic-pathologic consensus

- Clinical impression:
  - Occult autoimmunity
  - IIP
- Radiologic diagnosis:
  - NSIP pattern
    - Moderate to high confidence
- Pathologic diagnosis:
  - NSIP pattern with organizing pneumonia
Clinical-radiologic-pathologic consensus

- Consensus diagnosis
Case 3: Clinical features

- 77 yo male with 1 week of increasing dyspnea
- Minor cough, no sputum, no hemoptysis
- No chest pain, but increasing lower extremity edema
- No systemic complaints (fever, chills, sweats, weight loss, skin, arthralgias, myalgias). No gastrointestinal complaints.
Case 3: Clinical features

- **PMH**
  - “Pulmonary fibrosis”
  - Degenerative joint disease with bilateral TKR
  - Gout
  - Abdominal aortic aneurysm repair
  - Cerebrovascular accident

- **Medications**
  - Allopurinol
  - Finasteride
  - Advair
  - Ibuprofen
Case 3: Clinical features

- **Allergies**
  - Penicillin

- **Social history**
  - Ex-smoker 40 pack years

- **Family history**
Case 3: Clinical features

- Occupational/Avocational/Environmental history
  - Retired without significant exposures
Case 3: Clinical features

- Physical examination
  - Normal skin
  - Normal joints
  - No upper airway abnormalities
  - Diffuse crackles, no wheeze
  - Accentuated P2
  - No adenopathy
Case 3: Physiologic features

- Pulmonary physiology
  - Hypoxemic

- Echocardiogram
  - Normal LVEF, RV dysfunction, estimated PA pressures 55-60 mmHg

- Bronchoscopy
  - Normal airways
  - No evidence of alveolar hemorrhage
  - BAL - 22% neutrophils, 2% lymphocytes
  - Negative cultures
Case 3: Clinical context

- Infection
- Congestive heart failure
- Acute exacerbation
Case 3: Radiologic description

- **Disease features:**
  - Reticular lines
  - Honeycombing
  - Superimposed diffuse ground-glass

- **Axial distribution:**
  - Peripheral predominant reticular abnormality
  - Superimposed diffuse ground-glass

- **Craniocaudal distribution**
  - Basal/Diffuse
Case 3: Radiologic pattern

- Radiologic pattern:
  - UIP
  - Superimposed diffuse ground-glass = likely DAD
- Level of confidence: moderate-high
- Differential diagnosis:
  - HP
  - UIP with infection or edema
Airspace consolidation with fibrin exudates
Airspace consolidation with fibrin exudates
Airspace consolidation with fibrin exudates
Airspace consolidation with fibrin exudates
Squamous metaplasia in regions of acute injury
Microscopic honeycombing
Microscopic honeycombing
Case 3: Pathologic features

- Organizing acute lung injury:
  - Airspace fibrin exudates
  - Reactive squamous metaplasia

- Honeycomb change:
  - Most likely represents a pre-existent UIP-like process, but cannot be definitively classified due to overwhelming superimposed injury pattern
Case 3: Pathologic pattern

- Pathologic pattern: organizing diffuse alveolar damage + honeycombing
- Differential diagnosis:
  - UIP with acute exacerbation
  - Exacerbation of another fibrotic ILD with honeycombing
  - Fibrotic ILD with superimposed drug reaction, sepsis or infection
Clinical-radiologic-pathologic consensus

- Clinical impression:
  - Infection
  - Congestive heart failure
  - Acute exacerbation

- Radiologic diagnosis:
  - Pattern: UIP with superimposed acute exacerbation
  - Moderate-high confidence

- Pathologic diagnosis:
  - Organizing DAD pattern + honeycombing
Clinical-radiologic-pathologic consensus

- Consensus diagnosis
Case 4: Clinical features

- 52 yo male with 8 months of progressive dyspnea on exertion
- No cough, sputum, hemoptysis or wheeze
- 10 years of rheumatoid arthritis
- Gastroesophageal reflux x 4 years
- No fever, chills, sweats, weight loss, skin, upper airway, or cardiac complaints
Case 4: Clinical features

- **PMH**
  - RA x 10 years
  - Secondary Sjogrens syndrome
  - GERD

- **Medications**
  - Methotrexate x 10 years
  - Prednisone
  - NSAID
  - Proton pump inhibitors

- **No known allergies**
Case 4: Clinical features

- **Social history**
  - Ex-smoker 10 pack years

- **Family history**
  - OA in mother
Case 4: Clinical features

- Occupational/Avocational/Environmental history
  - Fireman
  - No asbestos
  - No farming or mining
  - No hot tub
  - No mold or water damage exposure
  - No pets or birds
Case 4: Clinical features

- Physical examination
  - Normal skin
  - Mildly deformed joints without synovitis
  - No upper airway abnormalities
  - + inspiratory crackles R > L, no wheeze
  - Normal cardiac exam
  - No adenopathy
Case 4: Physiologic features

- Pulmonary physiology
  - Obstructive ventilatory defect with a low DLCO

- Gas exchange with activity
  - Desaturation during six minute walk
Case 4: Clinical context

- Infection
- Systemic disease
  - Known autoimmunity
- Exposure
  - Tobacco
  - Medications/drugs/supplements
  - Occupational/Avocational/Environmental/Accidental
Case 4: Radiologic description

- **Disease features:**
  - Cylindrical bronchial dilation
  - Mild bronchial wall thickening
  - Severe diffuse air trapping

- **Axial distribution:**
  - Diffuse

- **Craniocaudal distribution**
  - Diffuse
Case 4: Radiologic pattern

- Radiologic pattern: Obliterative bronchiolitis pattern
- Level of confidence: High
- Differential diagnosis:
  - **AIR Trapping:** Adenovirus (PNA), Inhalational lung injury, RA, Transplant (SCT, Lung)
  - Cryptogenic, drugs
Hyperinflation
Obliterated bronchiole
Obliterated bronchiole
Obliterated bronchiole
Cellular & constrictive bronchiolitis
Bronchiolectasis
Obliterated bronchioles
Case 4: Pathologic pattern

- Pathologic pattern: Constrictive/obliterative bronchiolitis
- Differential diagnosis:
  - Infections
  - Drugs
  - Collagen vascular diseases
  - Idiopathic
Clinical impression:
- Infection
- Autoimmunity
- Exposures

Radiologic diagnosis:
- Obliterative bronchiolitis pattern
  - High confidence

Pathologic diagnosis:
- Constrictive/obliterative bronchiolitis pattern
Clinical-radiologic-pathologic consensus

- Consensus diagnosis
Case 5: Clinical features

- 68 yo female with 18 months of dyspnea on exertion
- Occasional cough and sputum
- No systemic complaints (fever, chills, sweats, weight loss, skin, arthralgias, myalgias, upper airway, cardiac or gastrointestinal complaints)
Case 5: Clinical features

- **PMH**
  - Depression
  - “Bronchiectasis”
  - Bladder suspension x 3
  - Rotator cuff repair x 2

- **Medications**

- **No known allergies**
Case 5: Clinical features

- Social history
  - Ex-smoker 60 pack years

- Family history
  - Father died of lung cancer
  - + Sister with RA
  - + Strong history of severe emphysema
Case 5: Clinical features

- Occupational/Avocational/Environmental history
  - Beautician x 10 years
  - Airplane manufacturing x 33 years
    - Grinding of titanium, steel, aluminum, carbon
  - No asbestos
  - No farming or mining
  - Water damage exposure
    - Flooded basement
  - No pets or birds
Case 5: Clinical features

- Physical examination
  - Normal skin
  - Normal joints
  - No upper airway abnormalities
  - + inspiratory mid-to-late fine crackles, no wheeze
  - Accentuated P2
  - No adenopathy
Case 5: Physiologic features

- Pulmonary physiology
  - Restrictive physiologic defect with a low DLCO
- Gas exchange with activity
  - Desaturation during six minute walk
Case 5: Clinical context

- **Exposures**
  - Tobacco
  - Beautician
  - Metal grinding
  - Water damage

- **Systemic disease**
  - Family history of RA

- **Idiopathic**
  - Idiopathic Interstitial Pneumonia
  - Other ILD of unknown cause
Case 5: Radiologic description

- **Disease features:**
  - Reticular lines
  - Ground-glass
  - Mild mosaic attenuation

- **Axial distribution:**
  - Slightly peripheral predominant

- **Craniocaudal distribution**
  - Upper lung predominant
  - Upper lung volume loss
Case 5: Radiologic pattern

- Radiologic pattern: Hypersensitivity pneumonitis
- Level of confidence: moderate
- Differential diagnosis:
  - Sarcoidosis
  - Familial lung fibrosis
Heterogeneous subpleural fibrosis
Heterogeneous subpleural fibrosis
Nonnecrotizing granuloma
Nonnecrotizing granuloma
Case 5: Pathologic features

- **UIP:**
  - Heterogeneous fibrosis
  - Areas of normal lung
  - (Few fibroblast foci)
  - (No microscopic honeycombing)

- **Granulomatous inflammation:**
  - Well-formed nonnecrotizing granulomas
Case 5: Pathologic pattern

- Pathologic diagnosis: UIP + granulomas
- Differential diagnosis:
  - IPF + infection
  - Fibrotic sarcoid/beryllium disease
  - Fibrotic hypersensitivity pneumonitis
Clinical-radiologic-pathologic consensus

- Clinical impression:
  - Occult systemic disease (autoimmunity)
  - Exposures (multiple)
  - IIP

- Radiologic diagnosis:
  - Hypersensitivity pneumonitis pattern
    - moderate confidence

- Pathologic diagnosis:
  - UIP pattern + granulomas
Clinical-radiologic-pathologic consensus

- Consensus diagnosis
Case 6: Clinical features

- 41 yo male with a chronic cough and abnormal chest imaging
- Non-diagnostic bronchoscopy
- Outside surgical lung biopsy diagnosis of DIP
- Initial improvement in cough with prednisone. Now little response
- Multiple ER visits with exacerbation of cough and dyspnea
- Systemic complaints
  - Raynaud’s, exanthem of the hands
  - No fever, chills, sweats, weight loss, skin, arthralgias, myalgias, upper airway, cardiac or gastrointestinal complaints
Case 6: Clinical features

- **PMH**
  - “Asthma”
  - Atrial fibrillation
  - Osteopenia

- **Medications**
  - Prednisone, alendronate, MVI, sotalol

- **No known allergies**
Case 6: Clinical features

- **Social history**
  - Never smoker

- **Family history**
  - Prostate cancer, brain tumor
  - No ILD or autoimmunity
Case 6: Clinical features

- Occupational/Avocational/Environmental history
  - Manufacturing plant (paper dust)
  - Asphalt/concrete
  - Deployed to Iraq 1991
  - No asbestos
  - No farming or mining
  - No mold or water damage exposure
  - No pets or birds
Case 6: Clinical features

- Physical examination
  - Erythematous exanthem of hands, abnormal nailfold capillaroscopy
  - Normal joints
  - No upper airway abnormalities
  - + inspiratory mid-to-late fine crackles, no wheeze
  - Normal cardiac exam
  - No adenopathy
Case 6: Physiologic features

- **Pulmonary physiology**
  - Restrictive ventilatory defect (FVC 77% pred) with a low DLCO (67% pred)

- **Gas exchange with activity**
  - Desaturation during six minute walk (97% - 89%)
Case 6: Clinical context

- Systemic disease
  - Autoimmunity
- Idiopathic
  - Idiopathic Interstitial Pneumonia
  - Other ILD of unknown cause
Radiologic description

- **Disease features:**
  - Reticular pattern, ground-glass
  - Traction bronchiectasis, lower lobe volume loss
  - No honeycombing, mosaic

- **Axial distribution:**
  - Slightly peribronchovascular, subpleural sparing

- **Craniocaudal distribution**
  - Basal predominant
Radiologic pattern

- Radiologic pattern: NSIP
- Level of confidence: moderate-high
- Differential diagnosis:
  - Collagen vascular disease
    - Dermatomyositis/polymyositis
    - Antisynthetase syndrome
Case 6: Pathologic features

- Fibrotic diffuse septal expansion
- Cellular infiltration of septae
- Lymphoid hyperplasia
Case 6: Pathologic pattern

- Pathologic pattern: mixed NSIP
- Differential diagnosis:
  - Collagen vascular diseases
Clinical context:
- Autoimmunity (PL-12+, SSA+)
- IIP

Radiologic pattern:
- NSIP
  - Moderate-high confidence

Pathologic pattern:
- Mixed NSIP
Clinical-radiologic-pathologic consensus

- Consensus diagnosis