

Imaging of Coal Workers' Pneumoconiosis and Silicosis

Pneumoconiosis

- Origin
 - Pneumo – related to lungs
 - Konis - Greek word dust
- Usually of occupational or environmental origin
- Tissue reaction to its presence

Pneumoconiosis

- Amount of dust retained in the lungs
 - Duration and intensity
 - Interval onset since exposure
- Particle size

Pneumoconiosis

- Fibrotic reaction
 - Focal and nodular (coal, silica)
 - Diffuse (asbestos)
 - Usually associated with radiographic abnormalities and functional respiratory impairment

Pneumoconiosis

- Aggregates of particle-filled macrophages
 - Minimal or no fibrosis (iron, tin, barium)
 - May have radiographic abnormalities
 - Little or no functional impairment

Silicosis



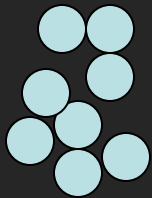
Silicosis

- Inhalation of crystalline SiO_2
- Characterized by lung fibrosis
- Incidence ↓ since World War II
- New OSHA regulations because of new exposures
- Shifting disease burden to developing countries

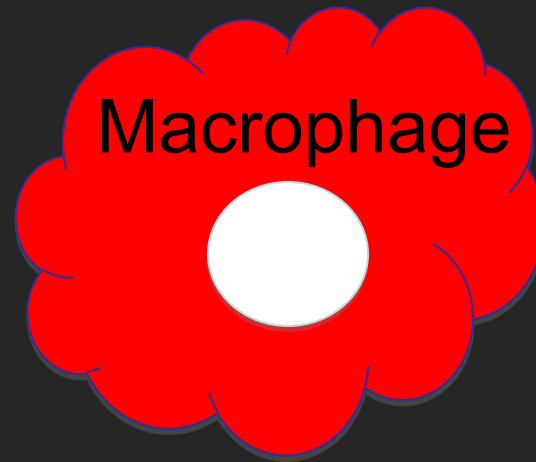
Silicosis

- Free silica (SiO_2) exposure
 - Mining
 - Hydraulic fracturing
 - Foundries
 - Tunneling
 - Stone and countertop cutting
 - Sandblasting
 - Construction and masonry
 - Glass manufacturing
 - Concrete and ceramics production
 - Agriculture

Silicosis

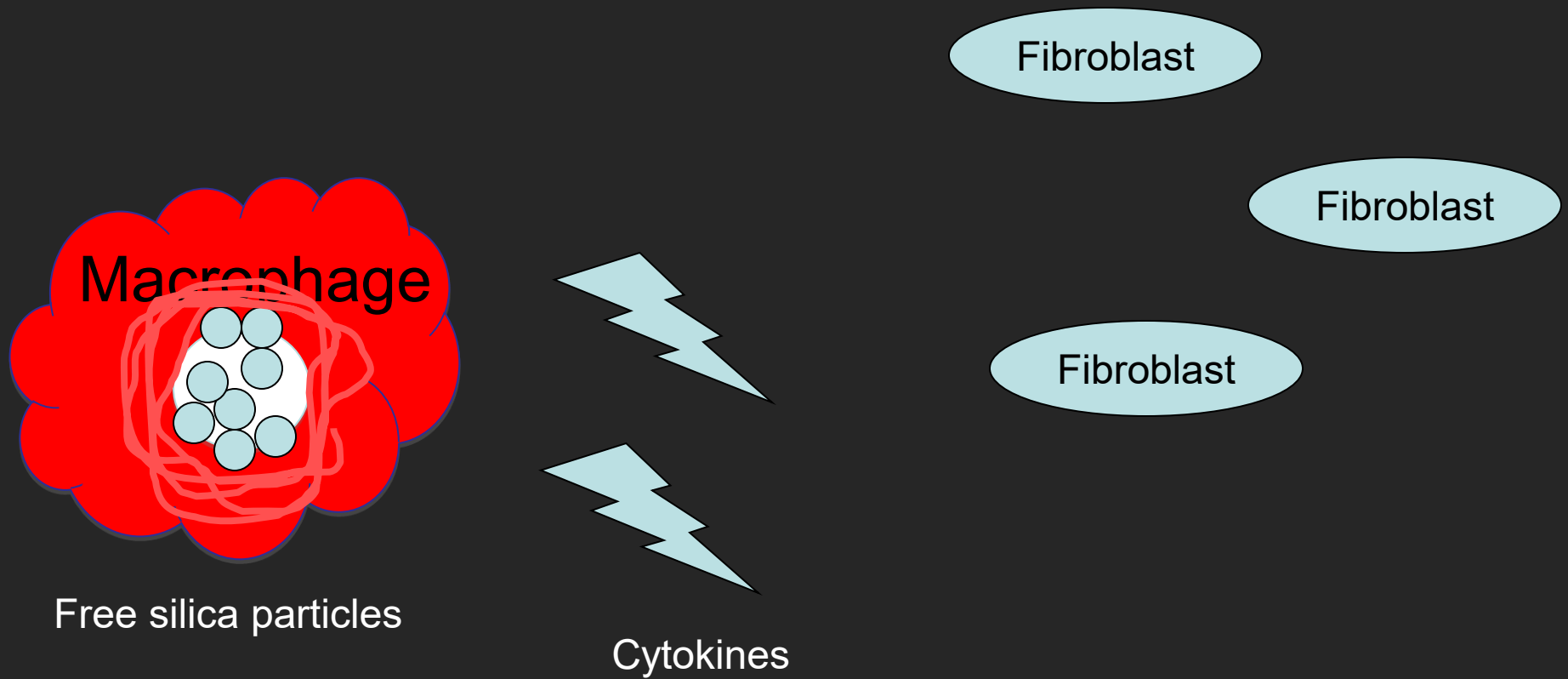


Free silica particles

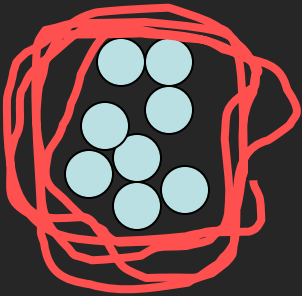
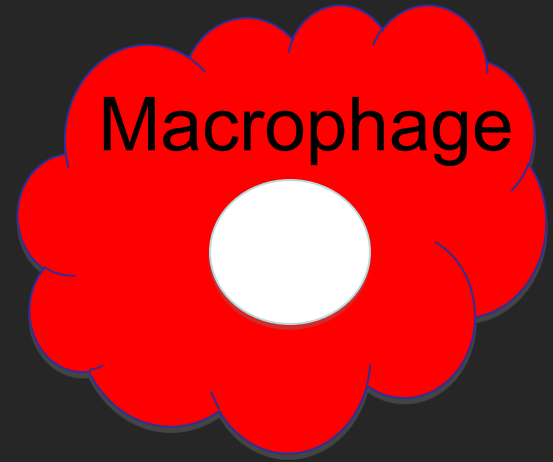


Macrophage

Silicosis

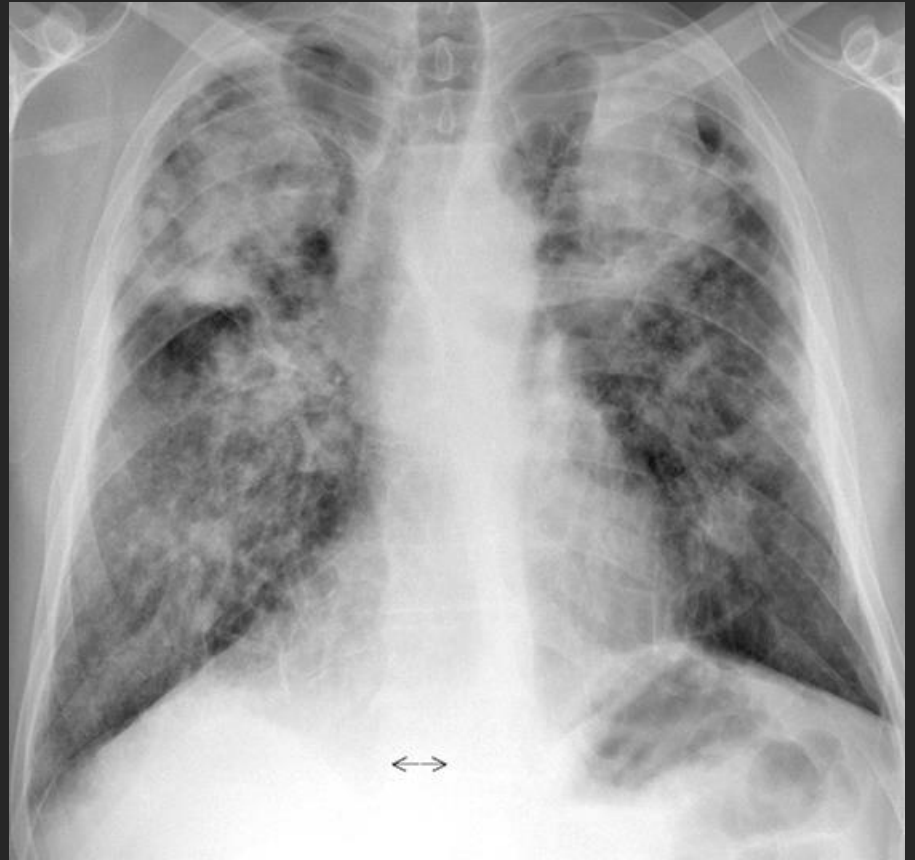
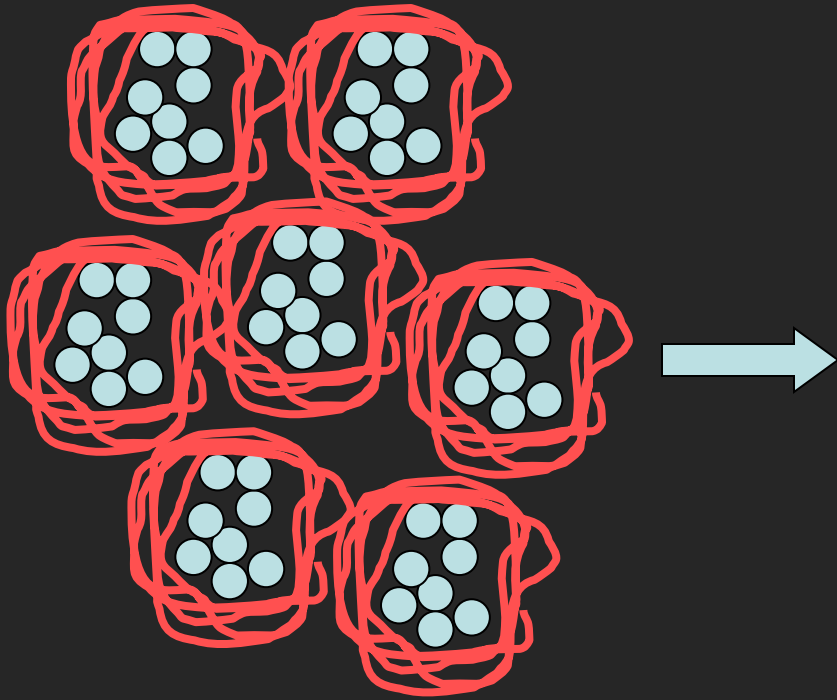


Silicosis



Silicotic nodule

Silicosis



Complicated silicosis (progressive massive fibrosis)

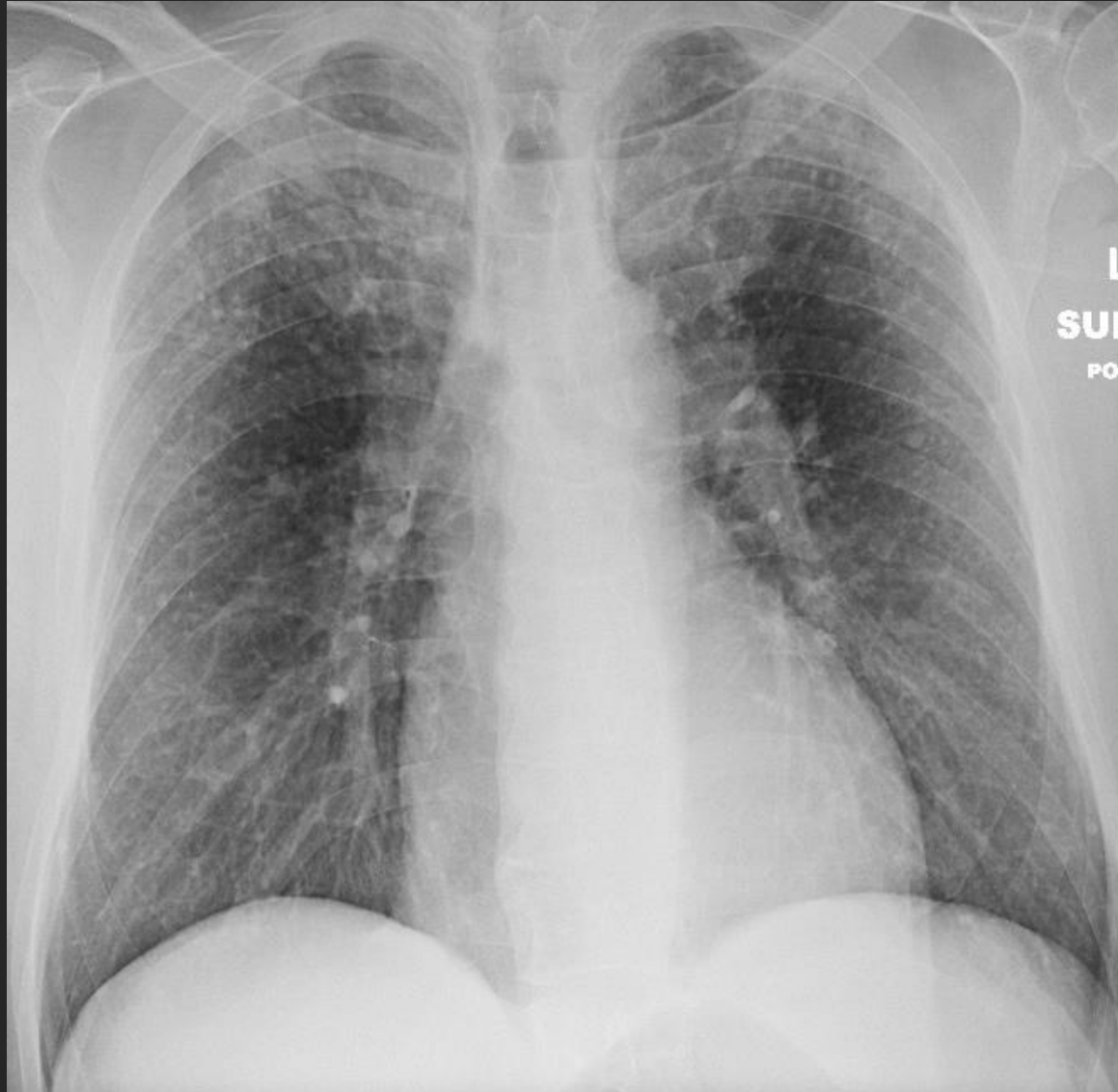
Silicosis

- Simple silicosis
- Accelerated silicosis
- Complicated silicosis
(progressive massive fibrosis)
- Silicoproteinosis
- Other complications

Silicosis - Simple

- Nodules
 - 1 cm or less, well-defined
 - Mid and upper lung zone predominance
 - Posterior > anterior
 - CT – centrilobular and perilymphatic distribution

Silicosis - Simple



Silicosis - Simple



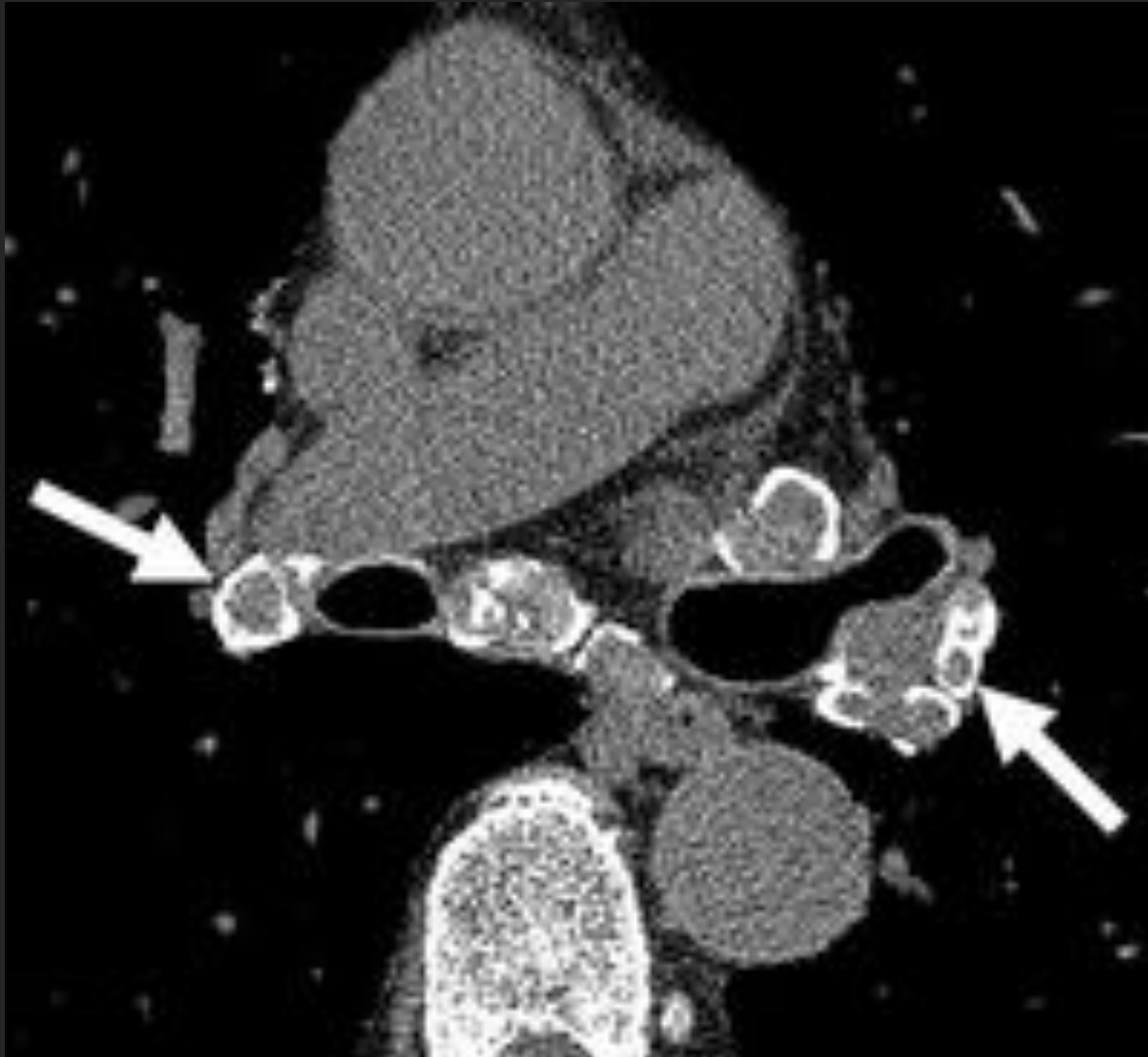
Silicosis - Simple

- Lymph nodes
 - Increased attenuation
 - Enlarged
 - Calcifications

Eggshell Calcification (es)



Eggshell Calcification (es)



Silicosis - Accelerated

- Development of silicosis <10 years after exposure
- Usually associated with more intense exposure
- Radiograph and HRCT similar to simple silicosis
- Greater risk of complications

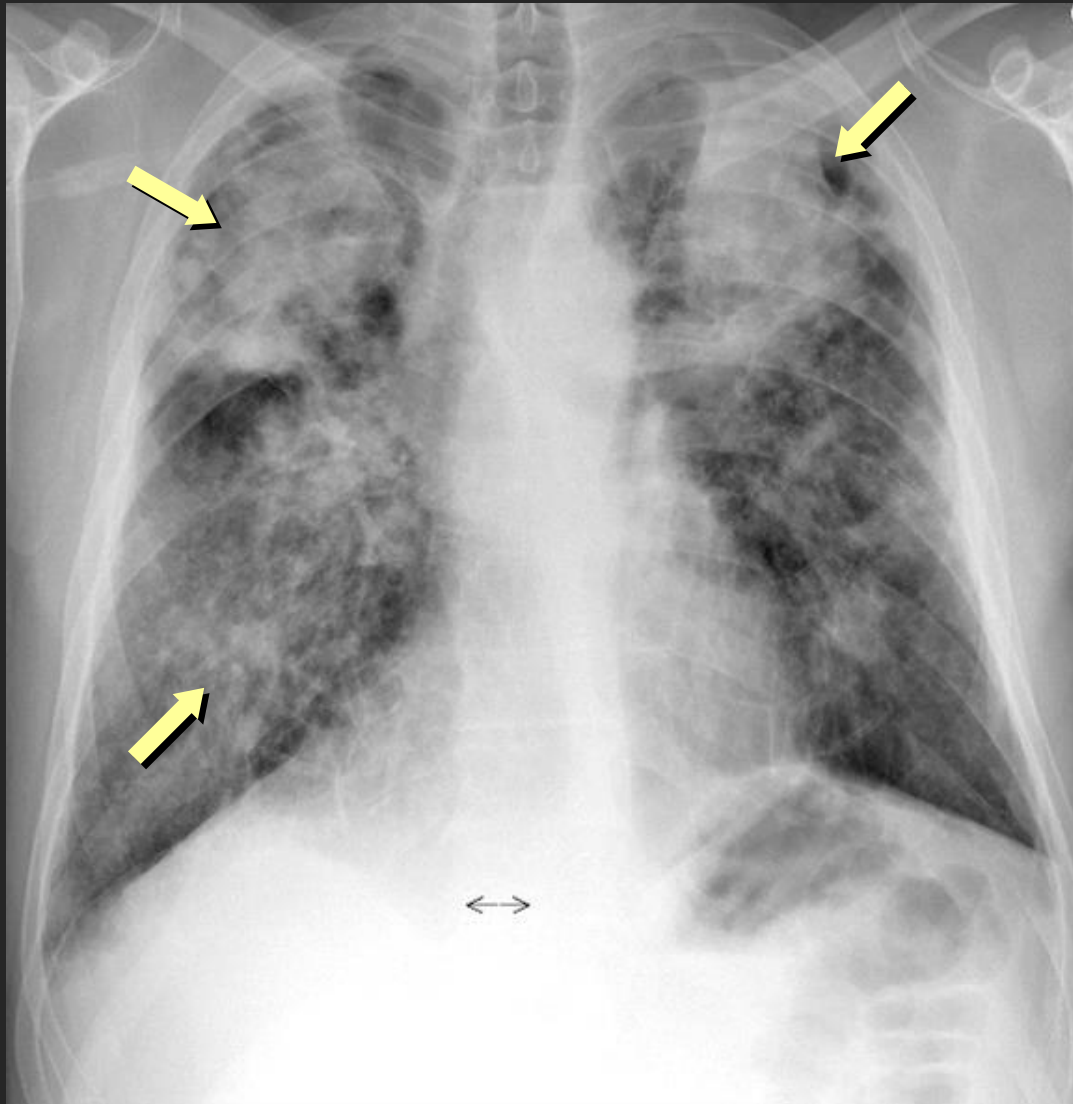
Silicosis - Complicated

- Progressive massive fibrosis (PMF)
- Opacities > 10 mm
- Patients usually symptomatic
- Physiologic impairment
 - Respiratory failure
 - Pulmonary hypertension

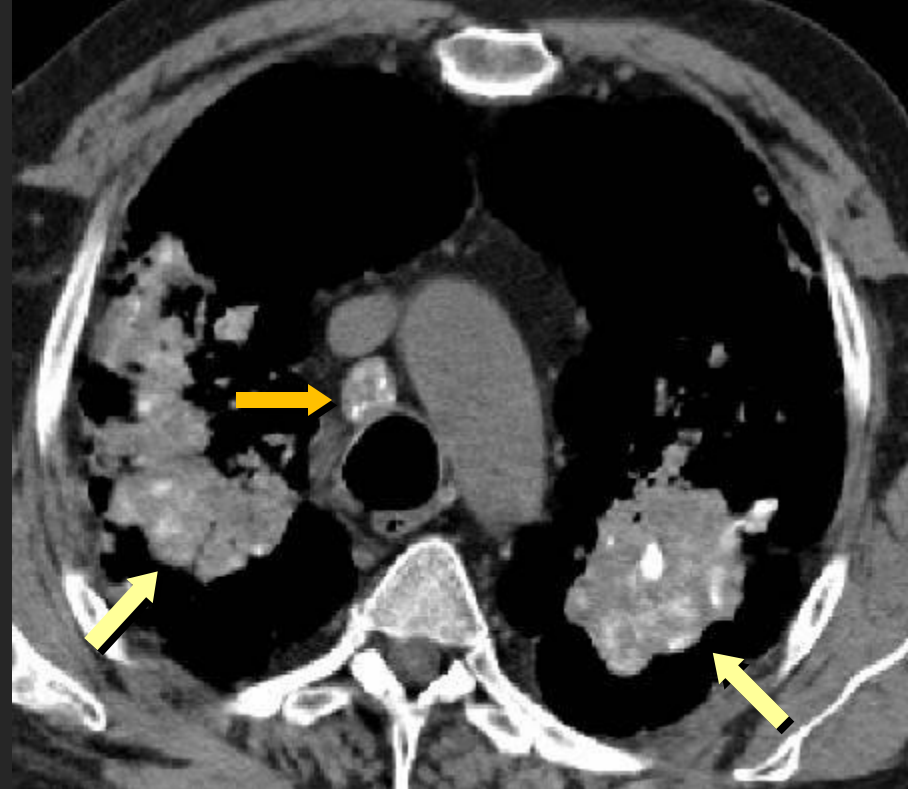
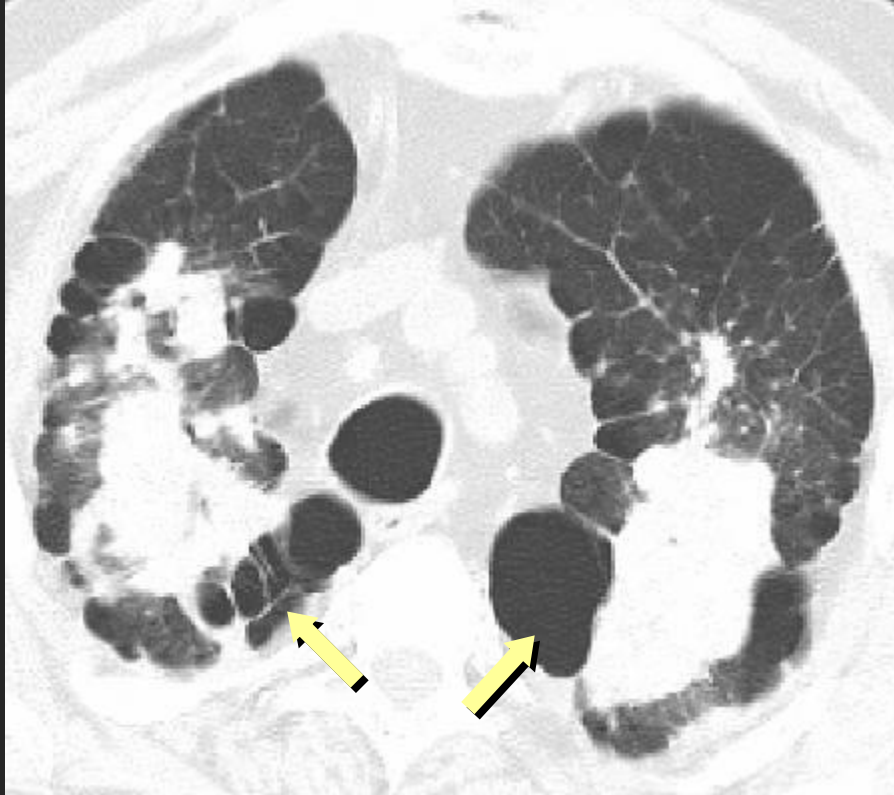
Silicosis - Complicated

- Round or oval mass near periphery
 - Well-defined lateral border
 - Parallels lateral chest wall
 - Posterior location
- Hilar retraction
- Compensatory emphysema or hyperinflation

Silicosis - Complicated



Silicosis - Complicated



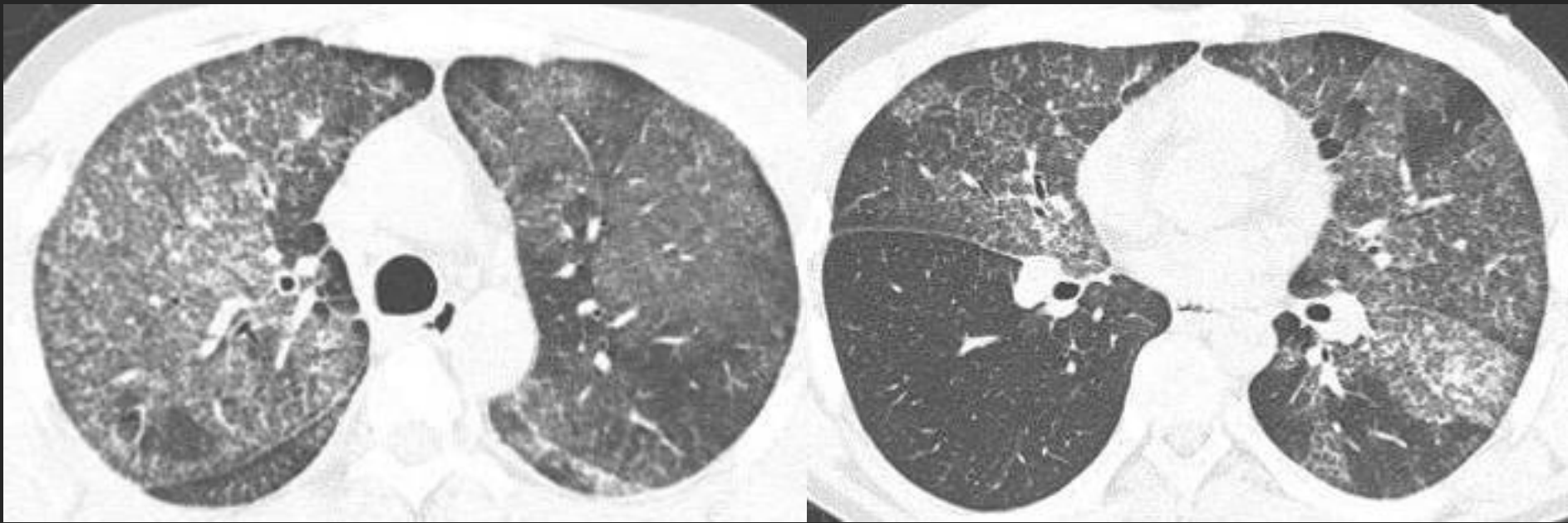
Silicoproteinosis

- Usually occurs with extensive silica exposure over short period of time
- Marked cellular and exudative alveolar injury
- Similar to alveolar proteinosis
- Death may ensue in 1-3 years

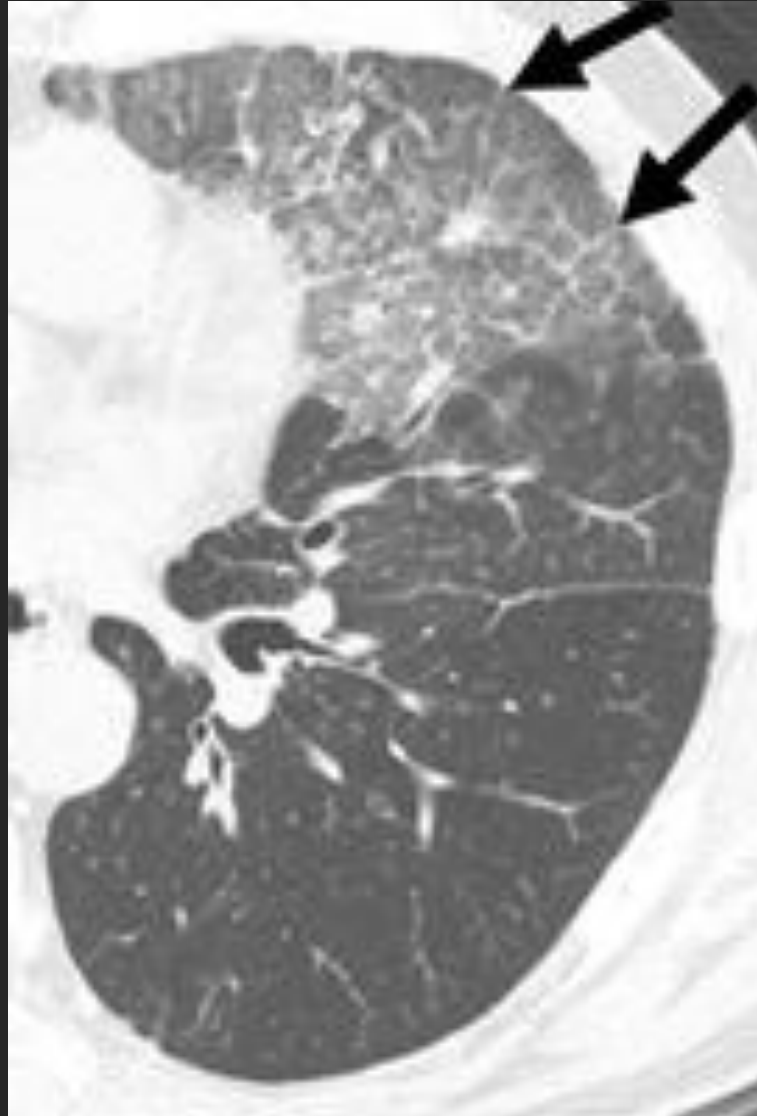
Silicoproteinosis

- HRCT
 - Extensive ground-glass opacity
 - Superimposed septal and intralobular lines
 - Patchy areas of sparing
 - Fine nodularity
 - “Crazy-Paving” pattern

Silicoproteinosis



Silicoproteinosis



Coal Workers' Pneumoconiosis



CWP

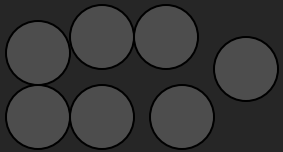
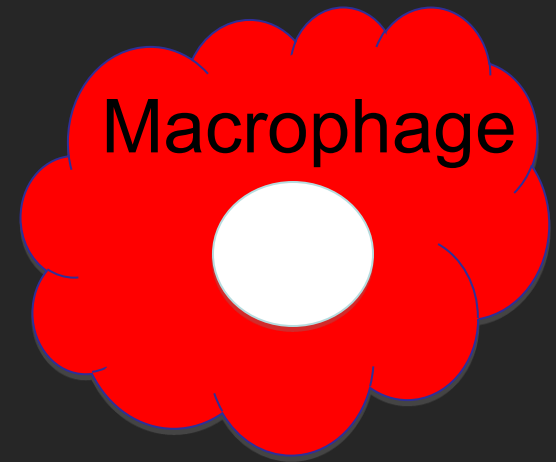
- Prevalence of CWP *was* declining
 - Federal Coal Mine Health and Safety Act 1969
- Recent increases in US
- Miners often exposed to other dusts
 - Especially silica

CWP



- ↑ incidence, early/rapid progression
- ↑ work week
- ↑ coal production
- Mining powerful and efficient
- Noncompliance

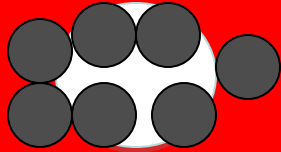
CWP



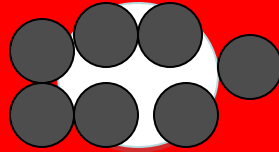
Small coal particles

CWP

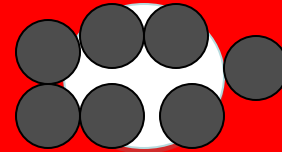
Macrophage



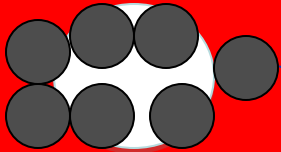
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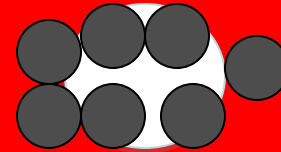
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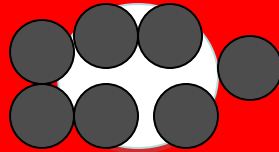
Macrophage



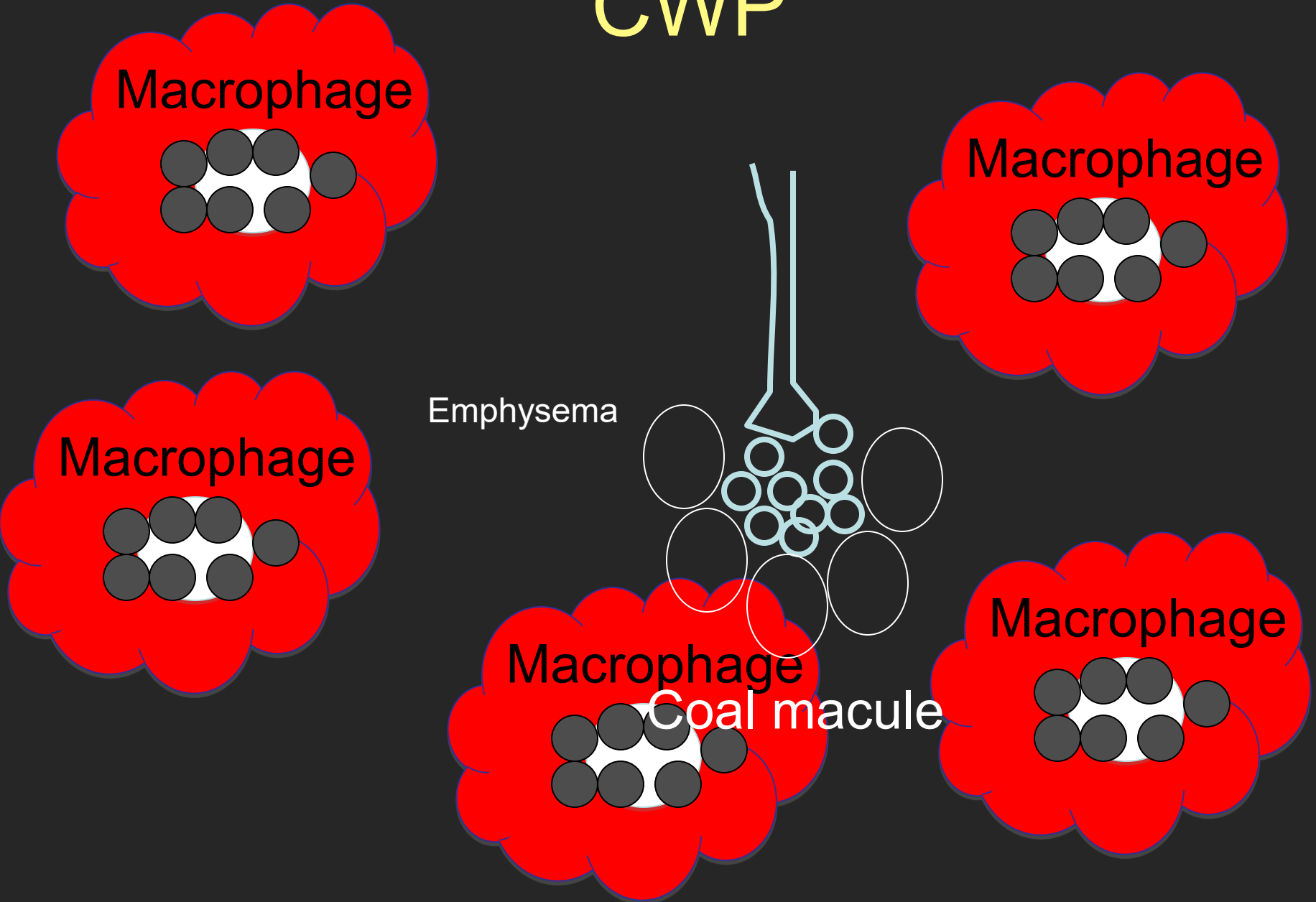
Macrophage



Macrophage



CWP



CWP

- For all practical purposes, CWP and silicosis are indistinguishable by imaging
- May coexist, as some miners exposed to silica



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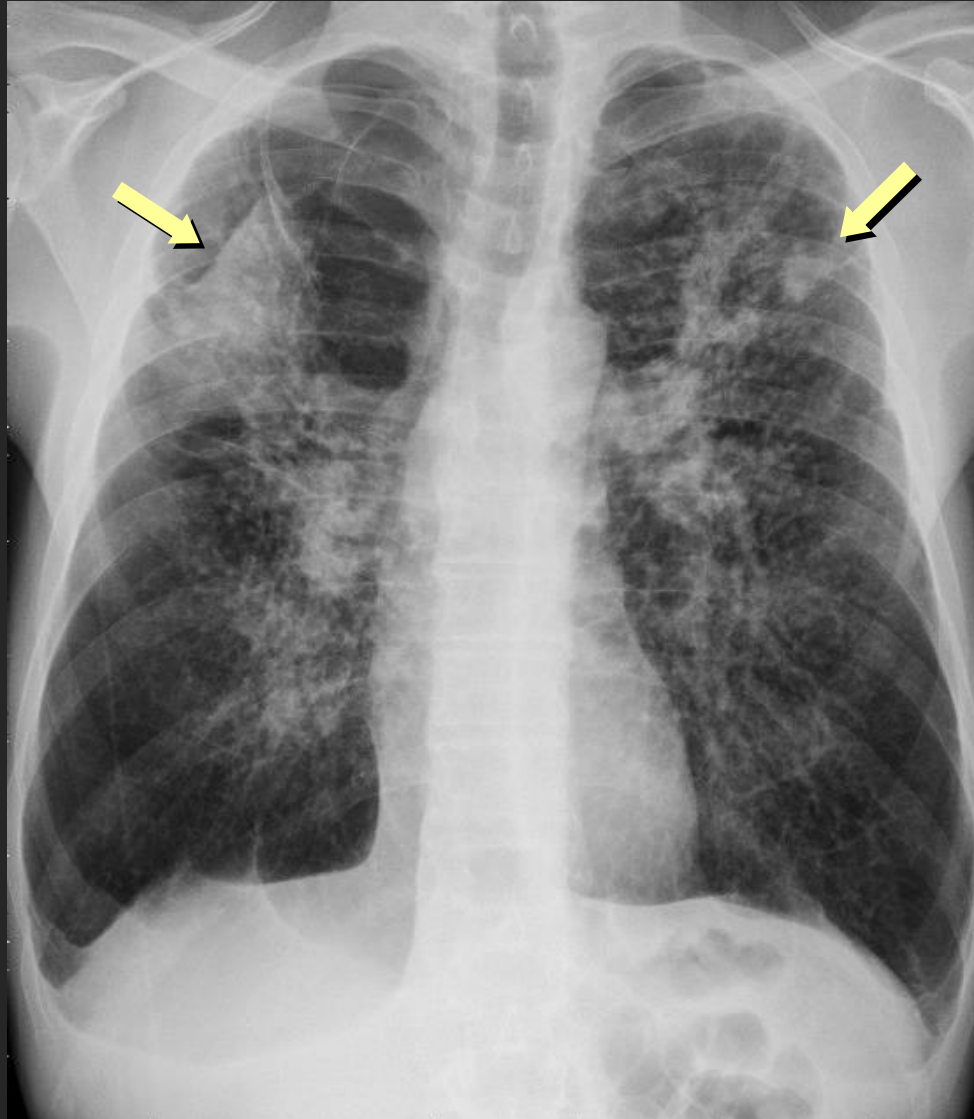
Simple CWP



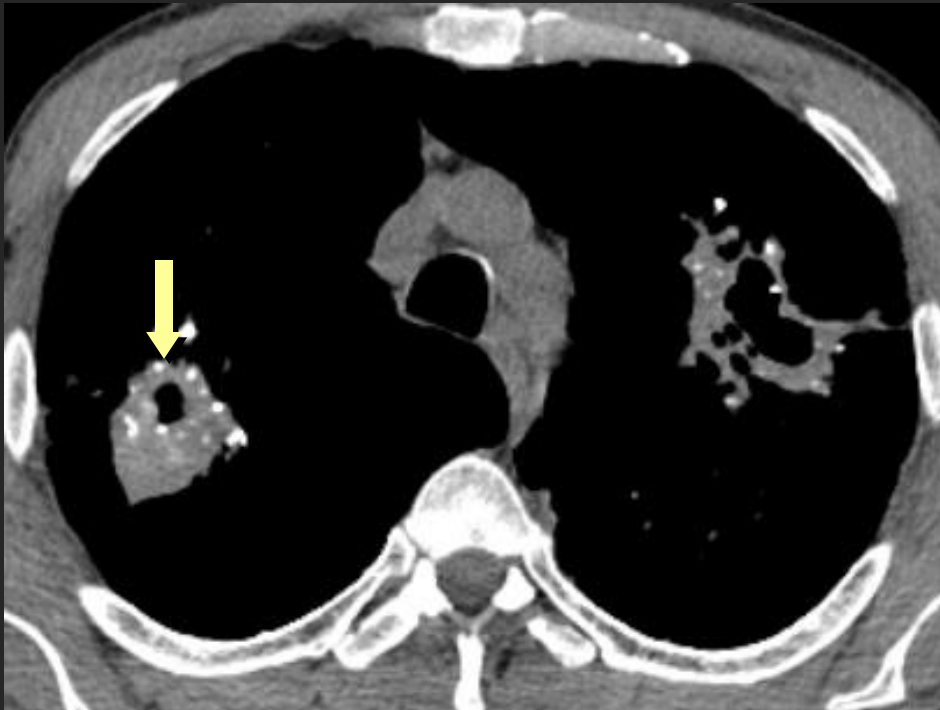
CWP - lymphadenopathy



Complicated CWP



Complicated CWP



Complicated CWP



Silicosis? CWP?



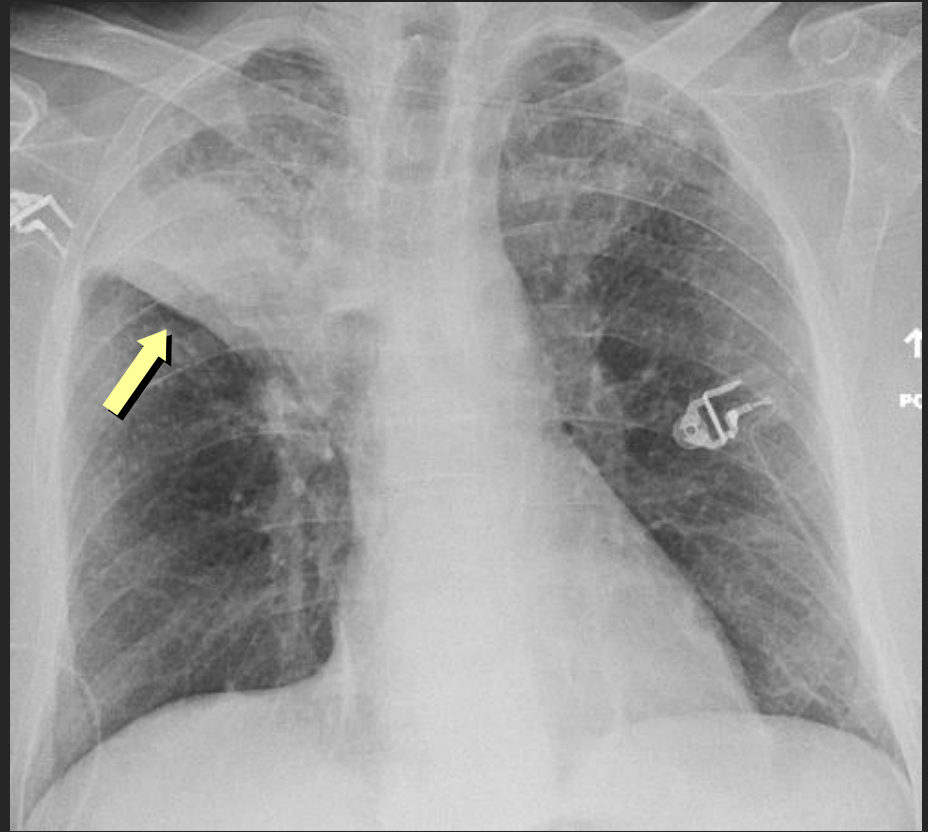
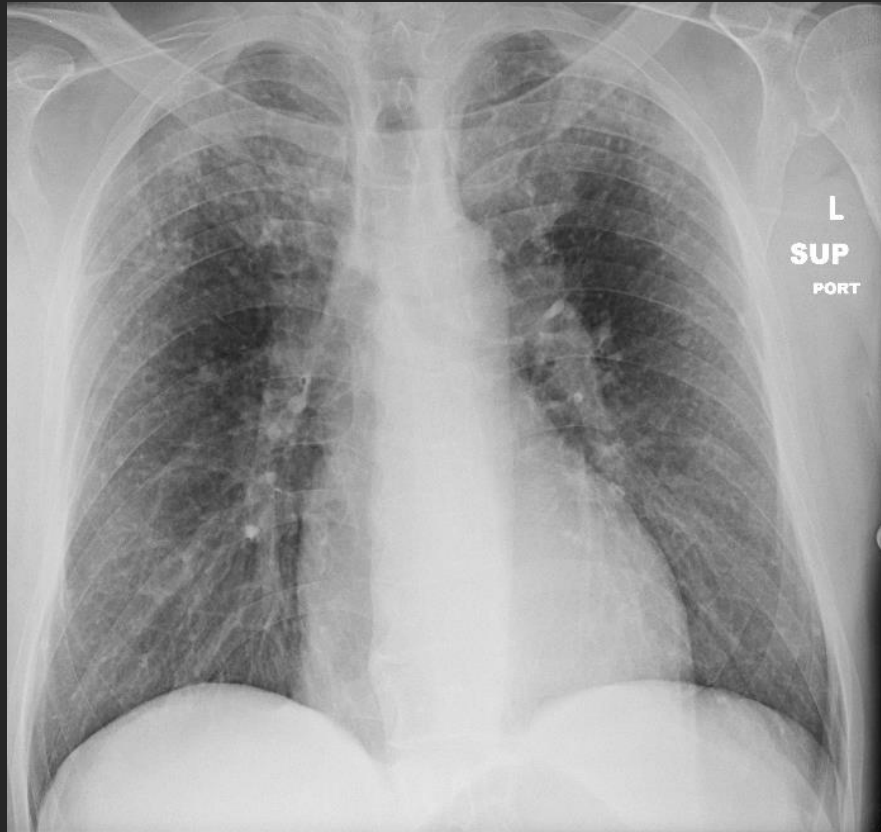
Sarcoidosis



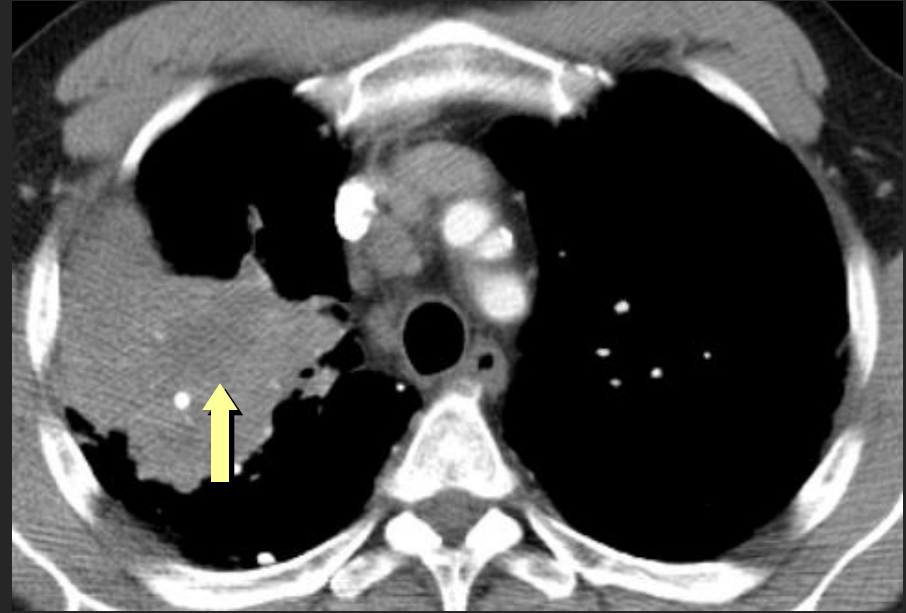
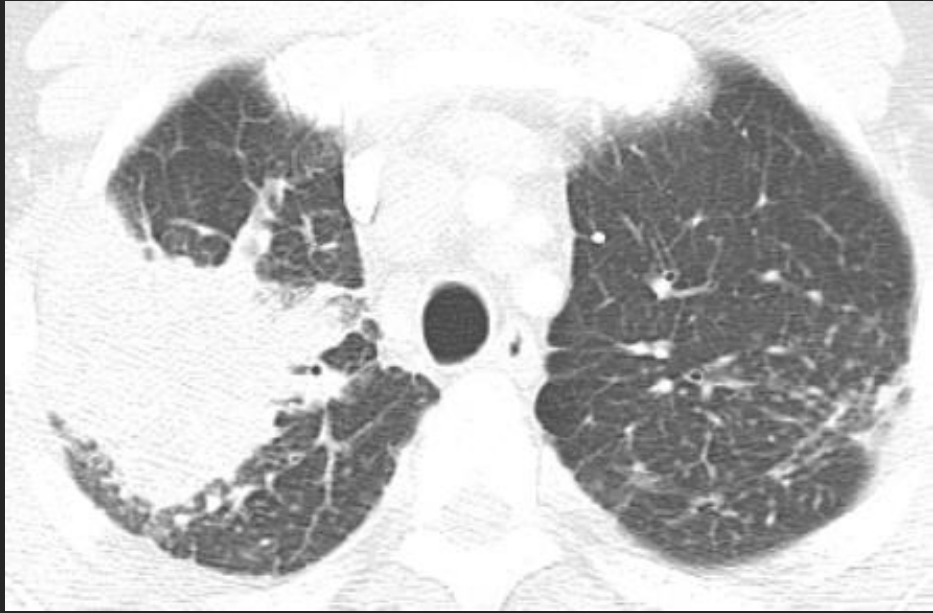
Complications

- Carcinoma
- Infection
 - *M. tuberculosis*
 - Nontuberculous mycobacteria
- COPD
- Connective tissue disease
 - Systemic sclerosis
 - Rheumatoid arthritis (?), SLE (?)

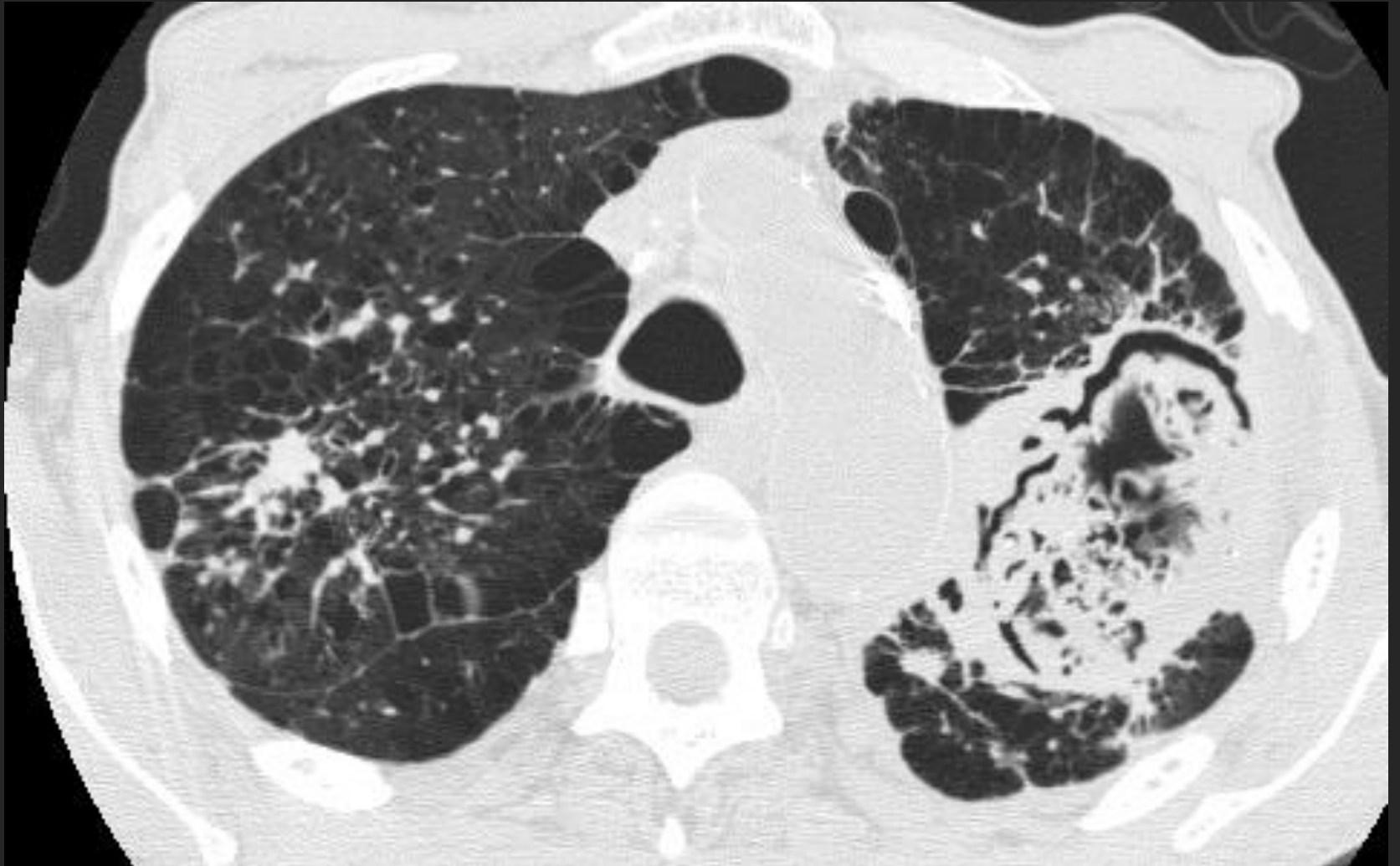
Silicosis - Adenocarcinoma



Silicosis - Adenocarcinoma



Complicated CWP with MAC



Silicotuberculosis with Chronic Necrotizing Aspergillosis

