B. Silicosis

- Silicosis is the most prevalent chronic occupational disease in the world and caused by inhalation of crystalline silica, mostly in occupational settings.
- Workers in sandblasting are at particular risk

Silica Forms

a. Crystalline (such as quartz) are by far the most toxic and fibrogenic and quartz is most

commonly implicated in silicosis and when mixed with other minerals, it has been observed to have a reduced fibrogenic effect and quartz in the workplace is rarely pure

b. Amorphous forms

MORPHOLOGY

Silicotic nodules :- Characterized grossly in early stages by barely palpable ,

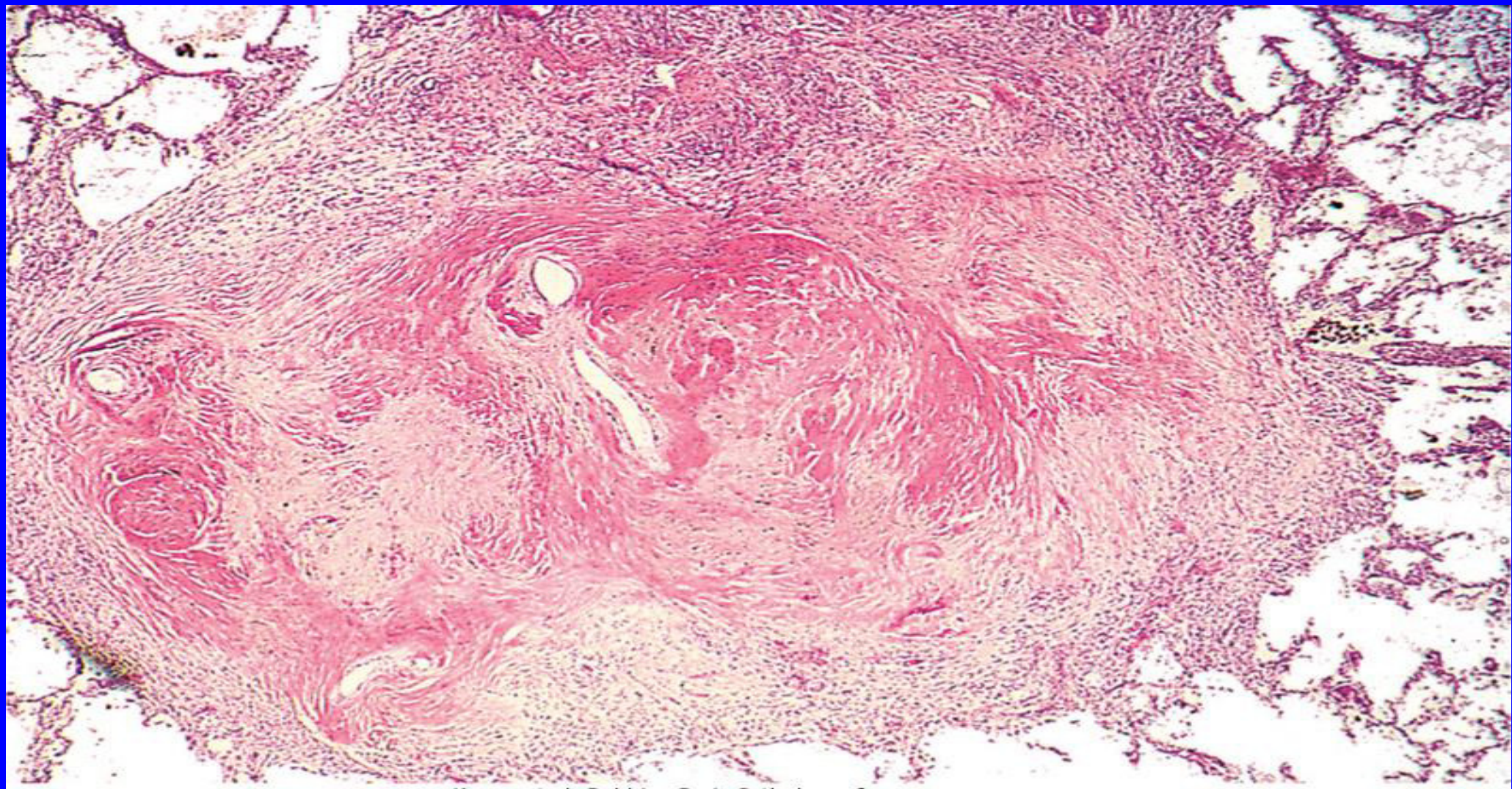
pale-to-blackened (if coal dust is present) nodules in the upper zones of the lungs.

Microscopically,

- It shows concentrically arranged hyalinized collagen fibers surrounding amorphous center and this whorled" appearance of the collagen fibers is distinctive for silicosis

- Polarized microscopy reveals weakly birefringent silica particles, primarily in the center of the nodules
- As the disease progresses, the individual nodules may coalesce into hard, collagenous scars, with eventual progression to PMF
- Fibrotic lesions may also occur in the hilar lymph nodes and pleura.

silicosis



- Sometimes, thin sheets of calcification occur in the lymph nodes and are appreciated radiographically as "eggshell" calcification (e.g., calcium surrounding a zone lacking calcification).

Clinical Features:

- Silicosis usually is detected on routine chest radiographs obtained in asymptomatic workers.
- The radiographs shows a fine nodularity in the upper zones of the lung, but pulmonary function is either normal or only moderately affected.
- Most patients do not develop shortness of breath until late in the course, after PMF is present.

- At this time, the disease may be progressive, even if the person is no longer exposed.
- Many patients with PMF develop pulmonary hypertension and cor pulmonale.
- The disease is slow to kill, but impaired pulmonary function may severely limit activity

NOTE: Silicosis is associated with an increased susceptibility to tuberculosis.

- It is postulated that crystaline silica may inhibit the ability of pulmonary macrophages to kill phagocytosed mycobacteria.
- Nodules of silicotuberculosis often contain a central zone of caseation

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The relationship between silica and *lung cancer* has been a contentious issue.

- In 1997, based on evidence from several epidemiologic studies, the International Agency for Research on Cancer concluded that *crystalline silica* is carcinogenic in humans.
- However, this subject continues to be controversial

C. Asbestosis and Asbestos-Related Diseases

- Occupational exposure to asbestos is linked to

1. Parenchymal interstitial fibrosis (*asbestosis*);
2. Localized fibrous plaques and rarely, diffuse fibrosis in the pleura;
3. Pleural effusions;

4. Lung carcinomas;
5. Malignant pleural and peritoneal mesotheliomas;
6. Laryngeal carcinoma.

- An increased incidence of asbestos-related cancers in family members of asbestos workers

PATHOGENESIS: Forms of asbestos:

A. Serpentine :

- In which the fiber is curly and flexible and chrysotile accounts for most of the asbestos used in industry and because of their structure are likely to become impacted in the upper respiratory passages and removed by the mucociliary elevator.

Note:

- Those that are trapped in the lungs are gradually leached from the tissues, because they are more soluble than amphiboles.

b. Amphibole, in which the fiber is straight, stiff

- Amphiboles, are less prevalent but more pathogenic than the serpentine and align themselves in the airstream and are delivered deeper into the lungs

- Where they may penetrate epithelial cells to reach the interstitium
- Asbestos probably also functions as both a tumor initiator and a promoter
- Some of the oncogenic effects of asbestos on the mesothelium are mediated by reactive free radicals generated by asbestos fibers

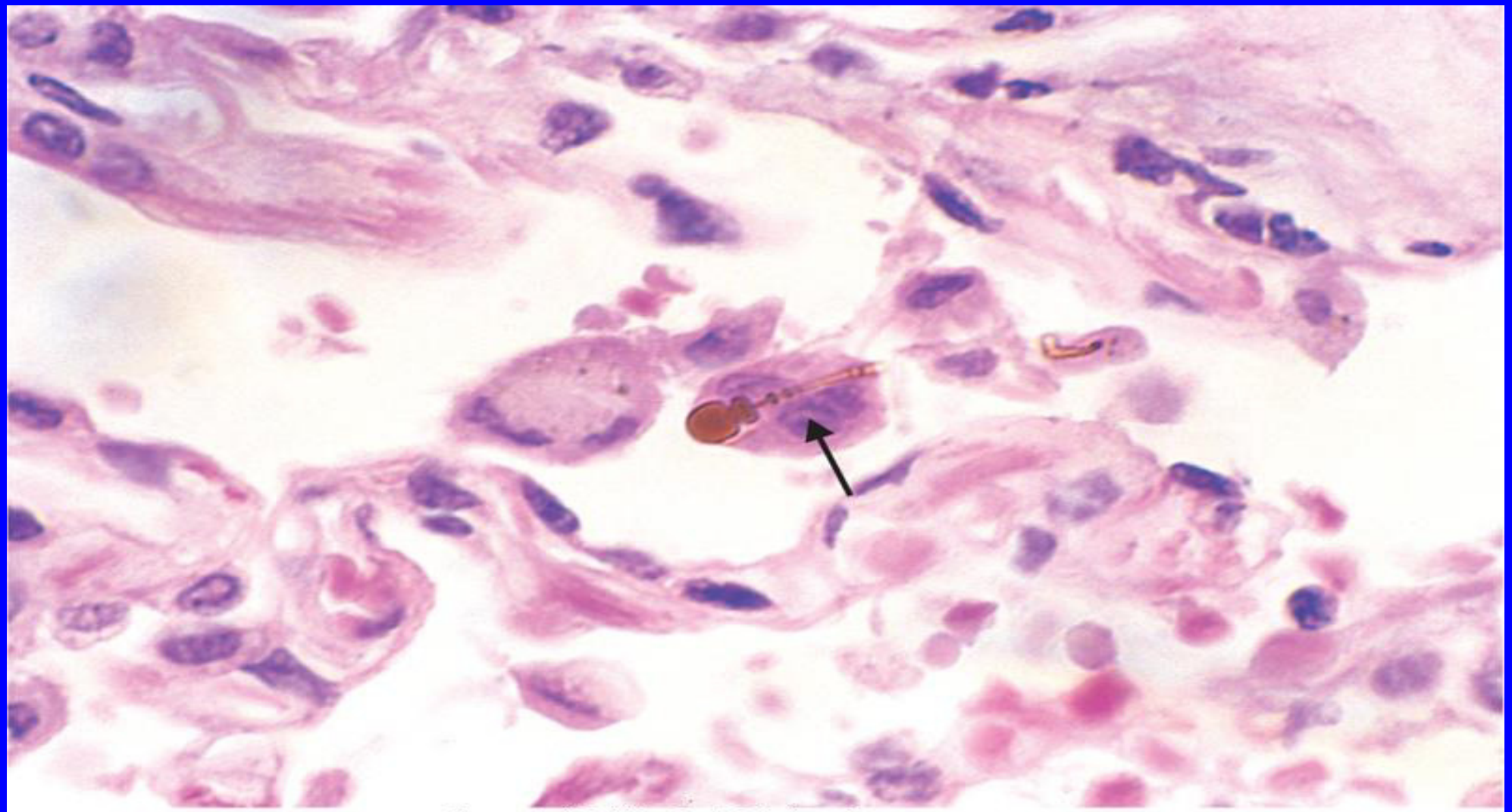
.

MORPHOLOGY

1- **Asbestosis** is marked by diffuse pulmonary interstitial fibrosis which is indistinguishable from UIP, except for the presence of asbestos bodies,

a. Which are golden brown, fbeaded rods with a translucent center and consists of asbestos fibers coated with an iron-and formed when macrophages attempt to phagocytose fibers; the iron is derived from phagocyte ferritin.

Asbestos body



- Asbestos bodies sometimes can be found in the lungs of normal persons, but usually in much lower concentrations and without an accompanying interstitial fibrosis.:

Note

- In contrast with CWP and silicosis, asbestosis begins in the lower lobes and subpleurally
- Contraction of the fibrous tissue distorts the normal architecture,

- Simultaneously, fibrosis develops in the visceral pleura, causing adhesions between the lungs and the chest wall.
- The scarring may narrow pulmonary arteries causing pulmonary hypertension and cor pulmonale

2. Pleural plaques :

- Are the most common manifestation of asbestos exposure
- Are well-circumscribed plaques of dense collagen , often containing calcium.

- They develop most frequently on the anterior and posterolateral aspects of the parietal pleura and do not contain asbestos bodies, and rarely do they occur in persons with no history or evidence of asbestos exposure.

3. Uncommonly, asbestos exposure induces pleural effusion or diffuse pleural fibrosis

Clinical Manifestations

- Progressively worsening dyspnea appears 10 to 20 years after exposure which is usually accompanied by a cough associated with production of sputum.
- The disease may remain static or progress to congestive heart failure, and death.
- Pleural plaques are usually asymptomatic and are detected on radiographs as circumscribed densities.

Note

- Both lung carcinoma and malignant mesothelioma develop in workers exposed to asbestos.
- The risk of lung carcinoma is increased about five-fold for asbestos workers; and the relative risk for mesothelioma, normally a very rare tumor (2 to 17 cases per 1 million persons), is more than 1000 times greater.

- Concomitant cigarette smoking greatly increases the risk of lung carcinoma but not that of mesothelioma and .

Diffuse alveolar hemorrhagic syndromes

1. Goodpasture Syndrome

- Is uncommon condition characterized by a proliferative, rapidly progressive, glomerulonephritis and) hemorrhagic interstitial pneumonitis.
- Both the renal and the pulmonary lesions are caused by antibodies targeted against the noncollagenous domain of the α3 chain of collagen IV which can be detected in the serum of more than 90% of patients

- The characteristic linear pattern of immunoglobulin deposition (usually IgG, that is the hallmark diagnostic finding in renal biopsy specimens may be seen along the alveolar septa by immunoflurescence studies

. - Plasmapheresis which removes the offending agent and immunosuppressive therapy that inhibits antibody formation have markedly improved the prognosis

- With severe renal disease, renal transplantation is eventually required

2.Idiopathic Pulmonary Hemosiderosis

- Is a rare disease of uncertain etiology that has pulmonary manifestations and histologic features similar to those of Goodpasture syndrome but

a. No associated renal disease

b. No circulating anti-basement membrane antibody.

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- Most cases occur in children, although the disease is reported in adults as well, who have a better prognosis
- With steroid and immunosuppressive therapy, survival has markedly improved from the historical 2.5 years;
- Thus, an immune-mediated etiology is postulated

Diffuse alveolar hemorrhage syndrome –perl'sstain