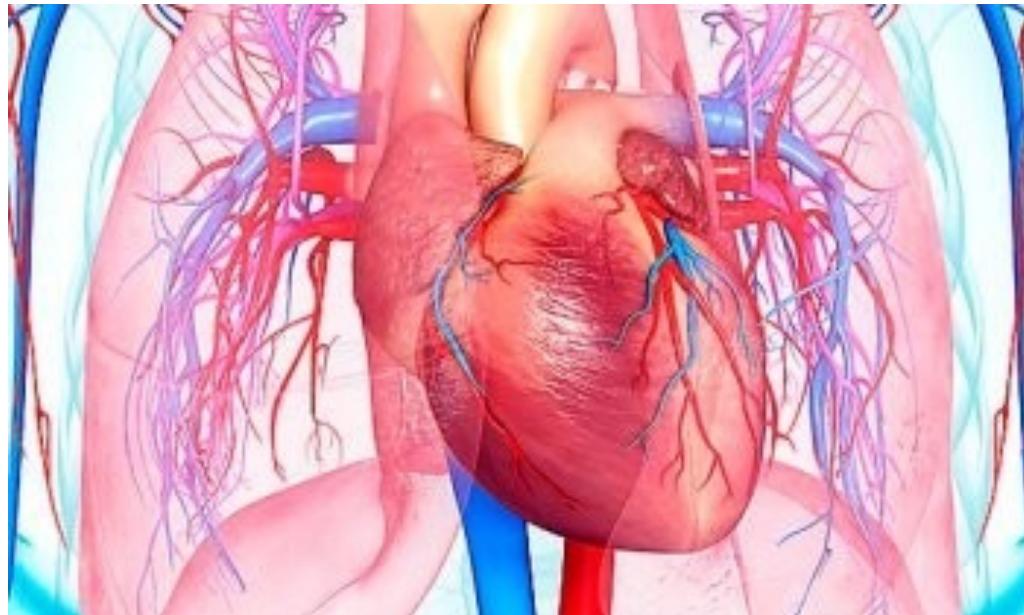


PULMONARY DISEASES OF VASCULAR ORIGIN



**MARAM ABDALJALEEL, MD.
DERMATOPATHOLOGIST AND NEUROPATHOLOGIST
UNIVERSITY OF JORDAN , SCHOOL OF MEDICINE**





PULMONARY DISEASES OF VASCULAR ORIGIN

- Pulmonary Embolism, Hemorrhage, and Infarction
- Pulmonary Hypertension
- Diffuse Alveolar Hemorrhage Syndromes

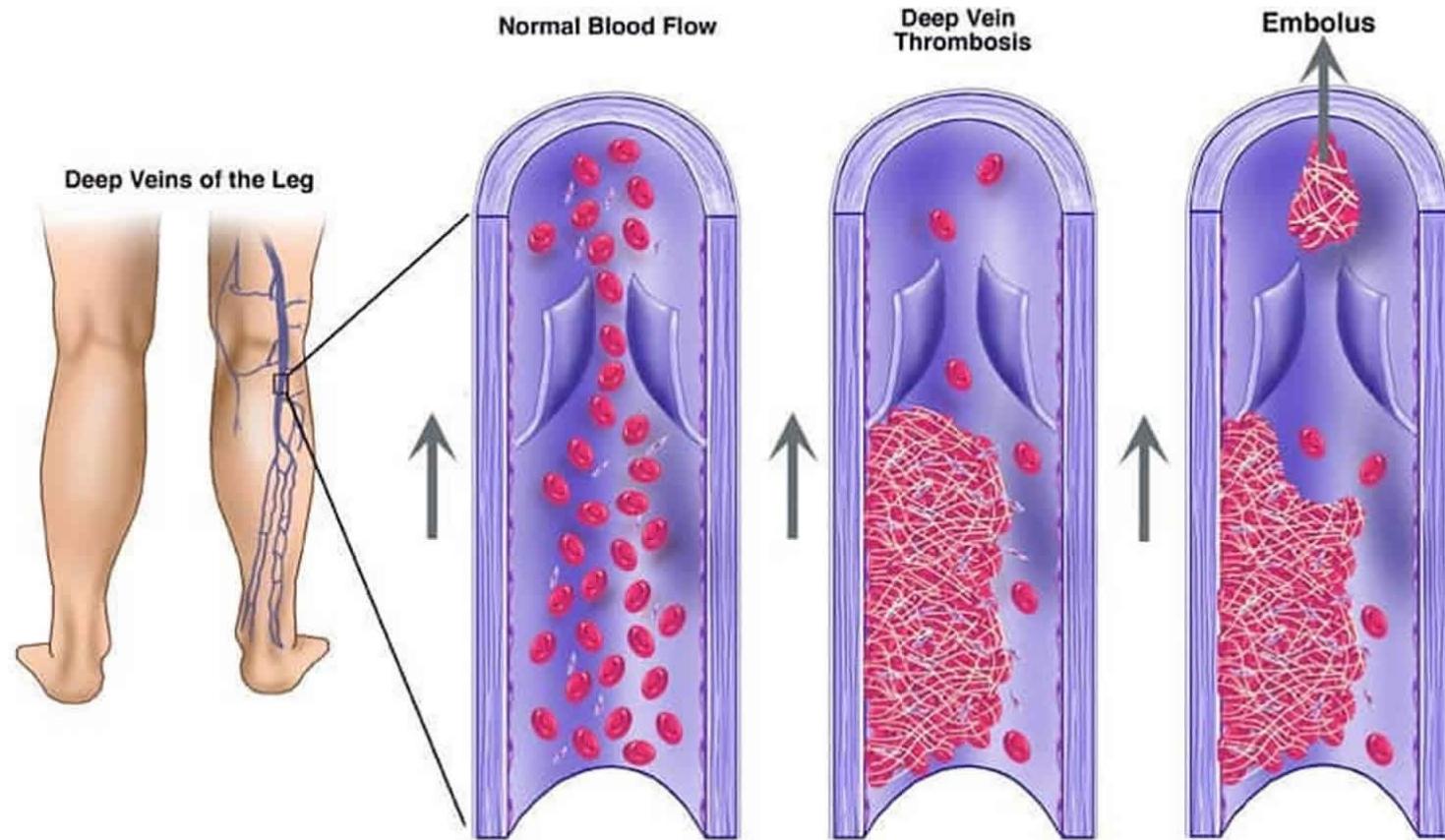
PULMONARY EMBOLISM:

- Thromboembolism
- Nonthrombotic pulmonary emboli

THROMBOEMBOLISM

- Almost all large pulmonary artery thrombi are embolic in Origin.
- >95% of PE arise from thrombi within the large deep veins of the legs, most often popliteal vein and larger veins above it.

Deep Vein Thrombosis (DVT)



RISK FACTORS FOR VENOUS THROMBOSIS:

1. prolonged bed rest (immobilization of the legs)
2. Surgery (orthopedic surgery on the knee or hip)
3. severe trauma (burns or multiple fractures)
4. congestive heart failure
5. in women, the period around parturition or the use of OCPs (high estrogen content)
6. disseminated cancer
7. primary disorders of hypercoagulability (factor V Leiden)



CONSEQUENCES

- 1. increase in pulmonary artery pressure and vasospasm**

- 2. ischemia of the downstream pulmonary parenchyma.**



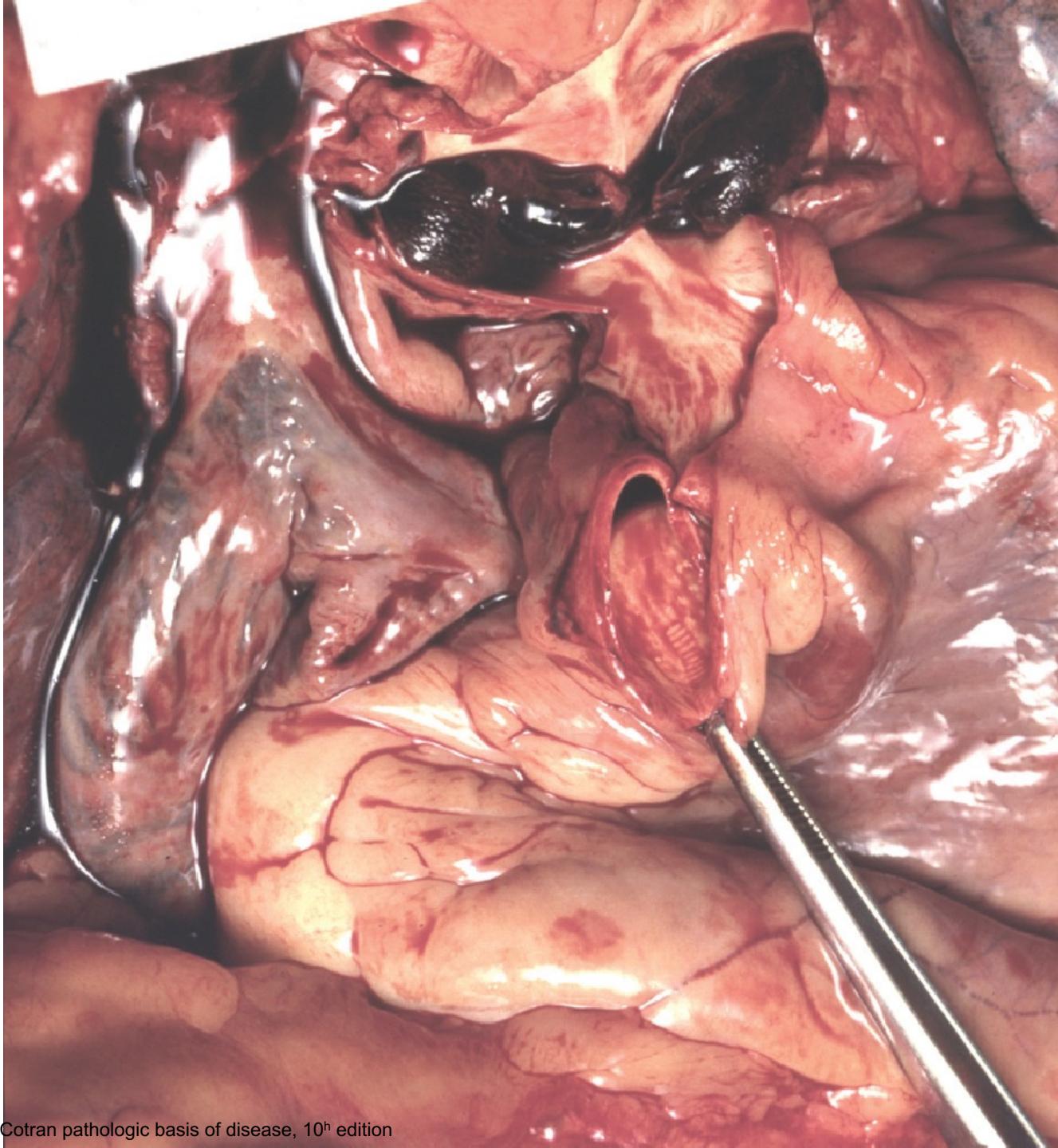
CONSEQUENCES:

- depend mainly on:

1- size of the embolus:

- large embolus may embed in the main pulmonary artery or its major branches or lodge at the bifurcation as a saddle embolus
- Smaller emboli become impacted in medium-sized and small-sized pulmonary arteries.

2- the cardiopulmonary status of the patient.





MORPHOLOGY:

- **No morphologic alternations**: large emboli
- **alveolar hemorrhage**: Smaller emboli
- **infarction** :
 - compromised cardiovascular status (congestive heart failure)
 - The more peripheral the embolic occlusion, the higher the risk for infarction.
 - $\frac{3}{4}$ lower lobes & >50% multiple.
 - wedge-shaped, with their base at the pleural surface and the apex pointing toward the hilus of the lung.

PULMONARY INFARCTS

- Typically, hemorrhagic with red-blue areas of coagulative necrosis in the early stages
- The adjacent pleura surface is covered by fibrinous exudate
- The occluded vessel is located near the apex of the infarcted area.
- The red cells begin to lyse within 48 hrs → red-brown as hemosiderin is produced → fibrous replacement begins at the margins as a gray-white peripheral zone → scar.







CLINICAL FEATURES

- 60% - 80% → clinically silent
 - Small emboli
 - embolic mass is rapidly removed by fibrinolytic activity.
- 5% → death, acute right-sided heart failure, or cardiovascular collapse.
 - As in Massive pulmonary embolism: >60% of the total pulmonary vasculature is obstructed by a large embolus or multiple small emboli.

CLINICAL FEATURES

- 10-15% → dyspnea
- Obstruction of small to medium pulmonary branches → pulmonary infarction
- <3% → progressively worsening dyspnea
 - recurrent showers of emboli leading to pulmonary hypertension, chronic right-sided heart failure, and pulmonary vascular sclerosis.

MANAGEMENT:

- Prophylactic therapy: anticoagulation, early ambulation, elastic stockings, intermittent pneumatic calf compression, and isometric leg exercises for bedridden patients.
- anti-coagulation therapy for patients who develop pulmonary embolism
- thrombolytic therapy for hemodynamically unstable pts with massive pulmonary embolism

NONTHROMBOTIC PULMONARY EMBOLI:

- uncommon but potentially lethal
- such as:
 - air, fat, amniotic fluid embolism,
 - foreign body embolism in intravenous drug abusers
 - Bone marrow embolism:
 - the presence of hematopoietic and fat elements within a pulmonary artery
 - after massive trauma and in patients with bone infarction secondary to sickle cell anemia



PULMONARY HYPERTENSION

- defined as pressures of **25 mm Hg or more at rest**
- may be caused by a **decrease** in the cross-sectional area of the pulmonary vascular bed or by **increased** pulmonary vascular blood flow.



CLASSIFIED AS FOLLOWING:

- **Pulmonary arterial hypertension:**
 - heritable forms of pulmonary hypertension
 - affects small pulmonary muscular arterioles
 - Examples: connective tissue diseases, human immunodeficiency virus, and congenital heart disease with left to right shunts
- **Pulmonary hypertension due to left-sided heart disease:**
 - including systolic and diastolic dysfunction and valvular disease

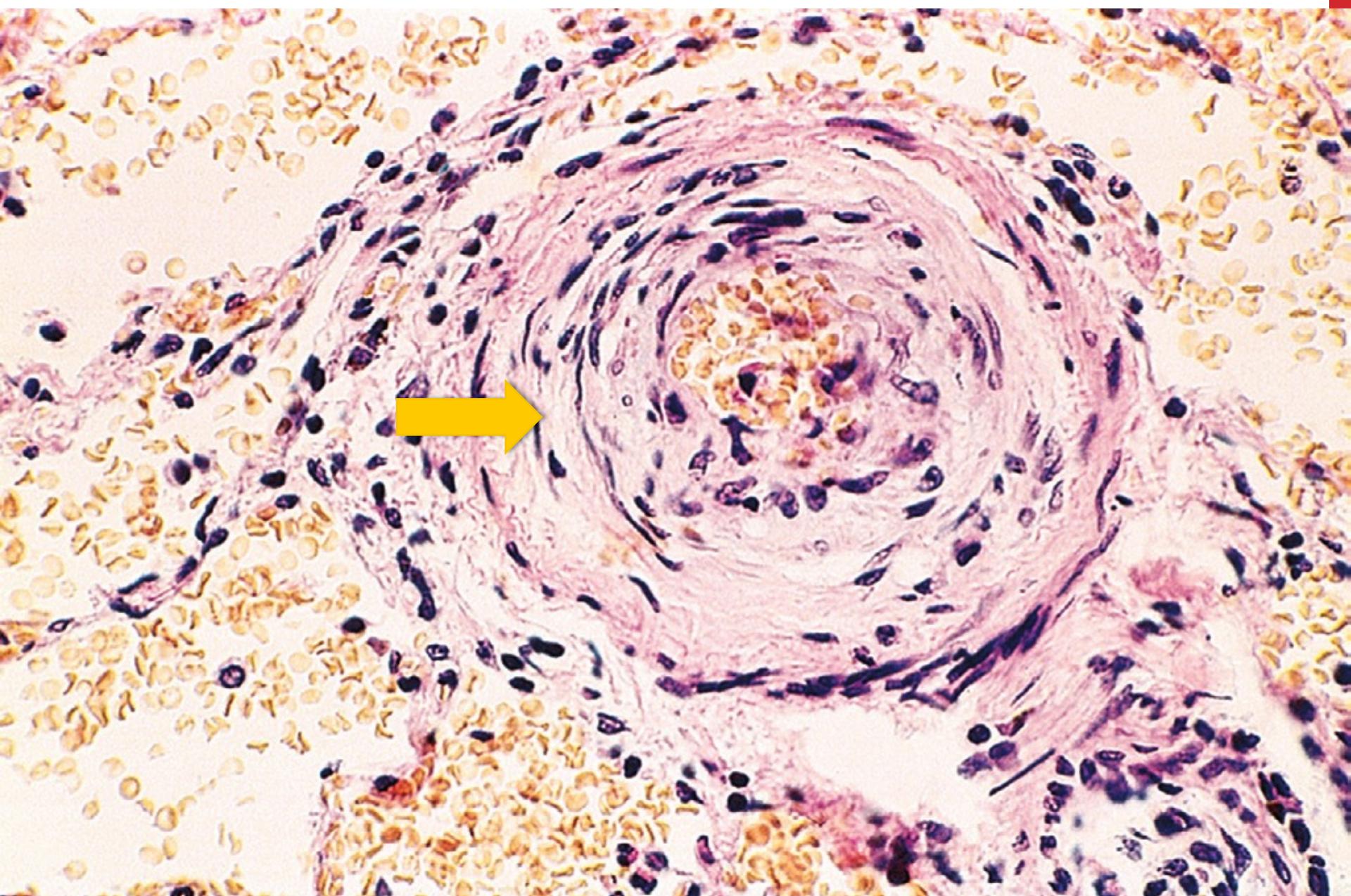


- **Pulmonary hypertension due to lung diseases and/or hypoxia:**
 - including COPD and interstitial lung disease
- **Chronic thromboembolic pulmonary hypertension**
- **Pulmonary hypertension with unclear or multifactorial mechanisms**



MORPHOLOGY:

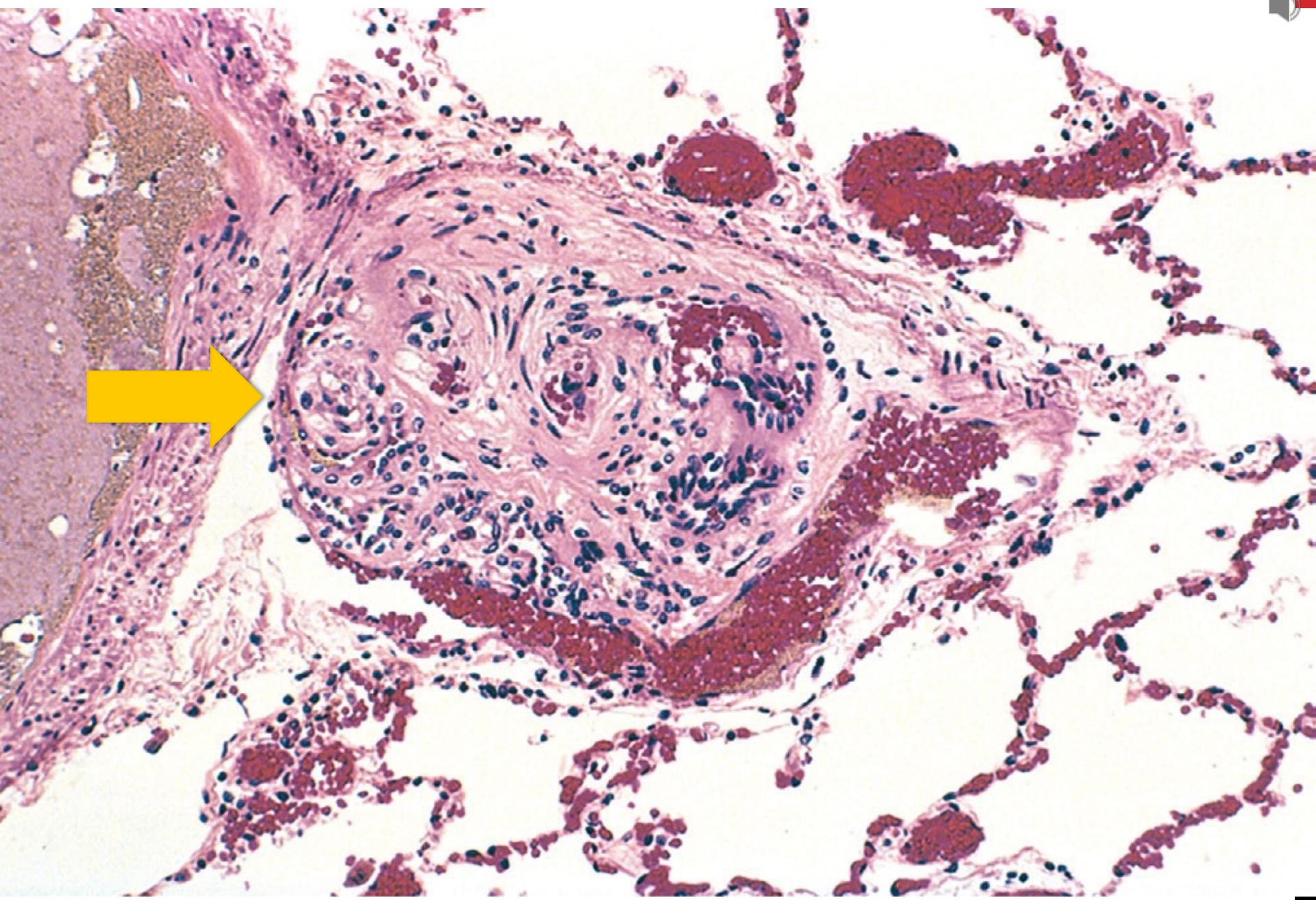
- **Medial hypertrophy of the pulmonary muscular and elastic arteries**
 - small arteries and arterioles
- **Pulmonary arterial atherosclerosis**
 - pulmonary artery and its major branches
- **Right ventricular hypertrophy**





- **Plexiform lesion:**

- uncommon
- a tuft of capillary formations producing a network, or web, that spans the lumens of dilated thin-walled, small arteries and may extend outside the vessel.





DIFFUSE ALVEOLAR HEMORRHAGE SYNDROMES

- Complication of some interstitial lung disorders.

Includes:

1. Goodpasture syndrome
2. Granulomatosis with polyangiitis
3. Idiopathic pulmonary hemosiderosis



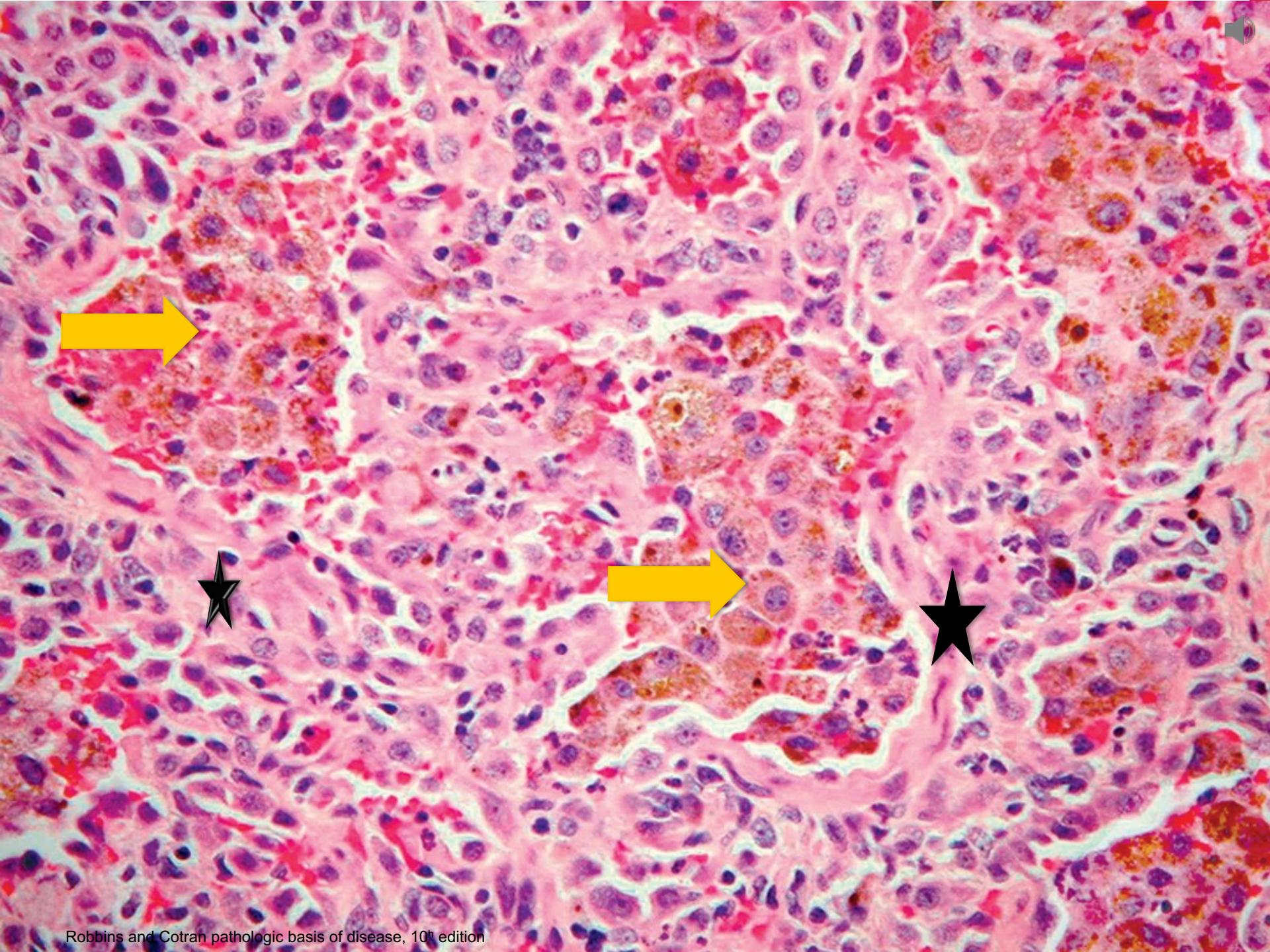
GOODPASTURE SYNDROME:

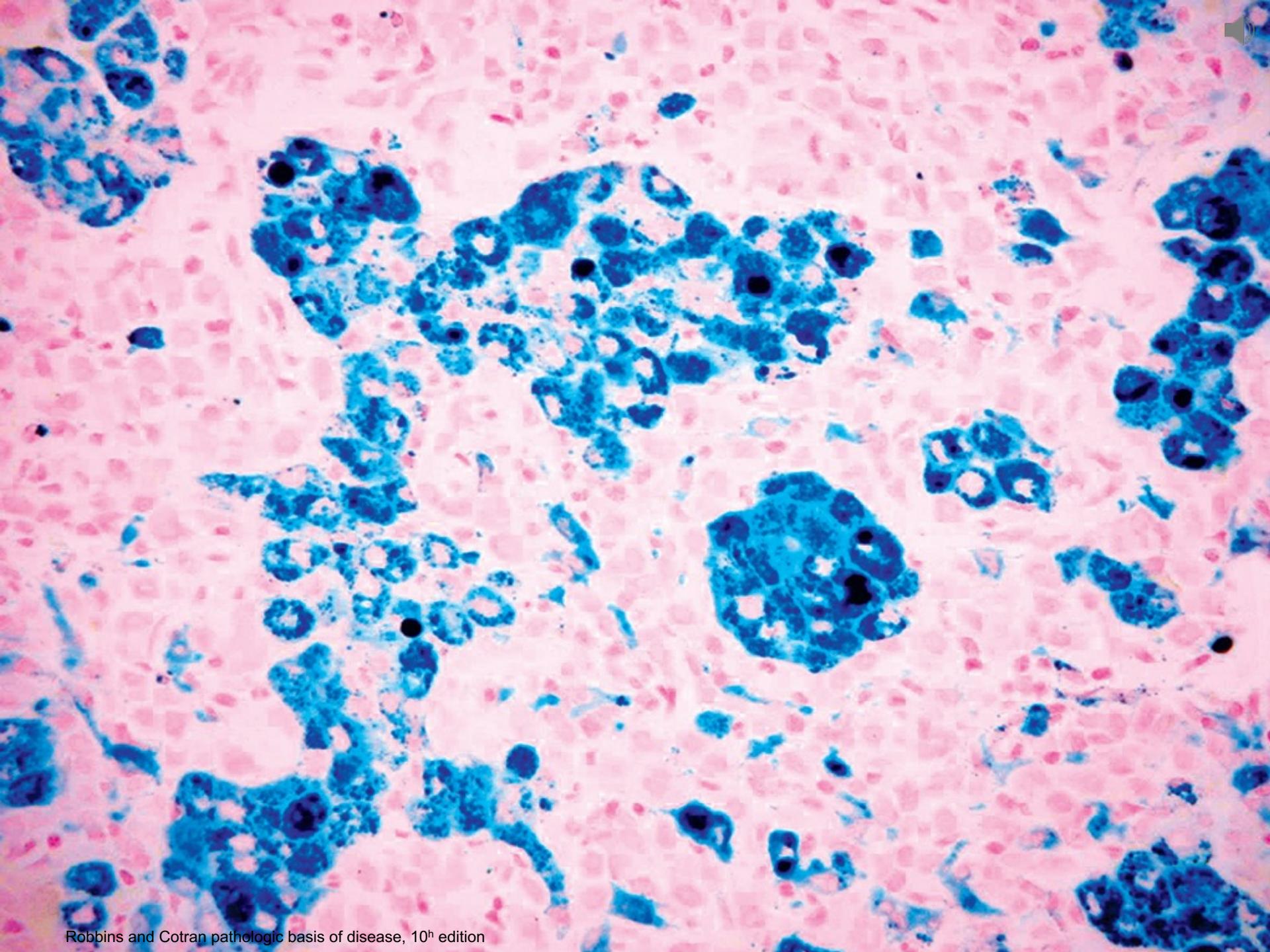
- Is an uncommon autoimmune disease in which lung and kidney injury are caused by circulating autoantibodies against certain domains of type IV collagen.
 - type IV collagen is intrinsic to the basement membranes of renal glomeruli and pulmonary alveoli
- Results in necrotizing hemorrhagic interstitial pneumonitis and rapidly progressive glomerulonephritis.



MORPHOLOGY:

- **Grossly**, red-brown consolidation due to **diffuse alveolar hemorrhage**
- **Microscopically**:
 - Focal necrosis of alveolar wall with intraalveolar hemorrhage,
 - Fibrous thickening of septa
 - Hypertrophic type II pneumocytes.
 - Abundant hemosiderin
 - Linear pattern of immunoglobulin deposition (IgG, sometimes IgA or IgM) seen along the alveolar septa.







CLINICAL FEATURES:

- Teens and twenties
- Males > females
- Active smokers
- Plasmapheresis and immunosuppressive therapy , renal transplantation



GRANULOMATOSIS AND POLYANGIITIS

- Formerly called **Wegener granulomatosis**
- >80% of patients develop upper-respiratory or pulmonary manifestations.
- The lung lesions are characterized by a combination of necrotizing vasculitis (“angiitis”) and parenchymal necrotizing granulomatous inflammation.

- The signs and symptoms of the upper-respiratory tract involvement (chronic sinusitis, epistaxis, nasal perforation) and the lungs (cough, hemoptysis, chest pain).
- Focal necrotizing, often crescentic, glomerulonephritis.
- Anti-neutrophil cytoplasmic antibodies (PR3- ANCAs) are present in close to 95% of cases

UNSOLVED

A large, bold, red stamp with the word "UNSOLVED" in capital letters is superimposed diagonally across the center of the image. The background consists of a collage of various newspaper clippings and black and white photographs. One clipping features a house with the headline "Murdered in the". Another shows a man with the headline "SUSPECT leaves 2 dead". A third clipping at the bottom left has the headline "Hand murder case solved". There are also several small, partially visible photographs of people.

A 45-year-old gentleman has chronic cough for the last 11 months. Physical examination, shows nasopharyngeal ulcers. on auscultation, the lungs have diffuse crackles bilaterally. Laboratory studies include a serum urea nitrogen level of 75 mg/dL and a creatinine concentration of 6.7 mg/dL. Urinalysis shows 50 RBCs per high-power field and RBC casts. His serologic titer for C-ANCA (proteinase 3) is elevated. A chest radiograph shows multiple, small, bilateral pulmonary nodules. A transbronchial lung biopsy specimen shows a necrotizing inflammatory process involving the small peripheral pulmonary arteries and arterioles. Which of the following is the most likely diagnosis?

- A. Granulomatosis with polyangiitis
- B. Pulmonary hypertension
- C. Goodpasture syndrome
- D. Idiopathic pulmonary hemosiderosis
- E. Polyarteritis nodosa



ANOTHER CASE?!



A 33-year-old gentleman, medically free, presented with acute onset of hemoptysis. he is afebrile, with normal heart rate, increased respiratory rate and blood pressure. A transbronchial lung biopsy, shows focal necrosis of alveolar walls associated with prominent intraalveolar hemorrhage. Two days later, he has decreased urine output with abnormal serum creatinine and urea nitrogen. Which of the following antibodies is most likely involved in the pathogenesis of his condition?

- A Anti–DNA topoisomerase I antibody**
- B Anti–glomerular basement membrane antibody**
- C Antimitochondrial antibody**
- D Anti–neutrophil cytoplasmic antibody**
- E Antinuclear antibody**



THANK YOU!