EMERGENCIES IN LUNG BIOPSY INTERPRETATION. THE MOST COMMON CIRTCUMSTANCES AND HOW TO HANDLE THEM

PULMONARY PATHOLOGY SOCIETY
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EMERGENCY LUNG DISEASE FOR PATHOLOGISTS

Most common medical cases in MGH experience.

- Adult respiratory distress syndrome (most common).
- Vasculitis / Capillaritis (relative to emergency exchange transfusion or therapy to prevent renal disease).
- Idiopathic pulmonary hemosiderosis.
- Graft-versus-Host Disease (constrictive bronchiolitis).
- Severe rejection or post-implantation response in a lung transplant patient.
- Influenza
- Other viral pneumonias, particularly in immunosuppressed patients.
- Fulminant bacterial pneumonia.
- Fulminant fungal pneumonia, particularly in immunosuppressed patients.
- Acute asthma.
- Tuberculosis (especially in multii-drug resistant cases), particularly in an immunodeficient patient (public health issue).

EMERGENCY LUNG DISEASE FOR PATHOLOGISTS

Most common medical cases in MGH experience, continued.

- Acute exacerbation in UIP or NSIP.
- Thromboemboli or embolic tumor (acute right heart failure).
- Incipient or evolving leukemia, particularly in myelodysplastic syndromes.
- Intravascular lymphoma.
- Acute drug reactions.
- Acute hypersensitivity pneumonitis.
- Acute fibrinous pneumonia.

EMERGENCY LUNG DISEASE FOR PATHOLOGISTS

Most common surgical cases in MGH experience

- Hemoptysis due to endobronchial mucor or endobronchial small cell carcinoma (transbronchial biopsy).
- Tuberculosis (especially MDR) in an immunodeficient patient (public health issue).
- Thromboemboli or embolic tumor (acute right heart failure)..
- Pneumothorax without obvious clinical cause. (carcinoma, AIDS).
- Pleural angiosarcoma in massive hemothorax (relative to do-not-resuscitate orders).
- Small cell carcinoma with venous obstruction.
- NUT carcinoma with rapidly progressive disease.
- Recurrent treated carcinoma versus drug or radiation reaction, pending lobectomy, in a patient with respiratory failure.

THORACIC SURGERY EMERGENCIES (NON-CARDIAC)

Autopsy Pathology Answers

- Tension pneumothorax
- Massive hemoptysis
- Obstructed upper airway
- Superior vena caval syndrome
- Massive acute pulmonary embolism
- Bronchial rupture

EMERGENCY LUNG BIOPSY INTERPRETATION: EXTENUATING CIRCUMSTANCES

Aggressive therapy or “do not resuscitate” depending upon unexpected biopsy findings in a very ill patient.

Transfer to MGH or other center depending upon circumstances.

Public health concerns depending upon suspicion of infection, including autopsy (tuberculosis, anthrax, meningococcus, hemorrhagic fever)

SEQUENCE OF THE LECTURE

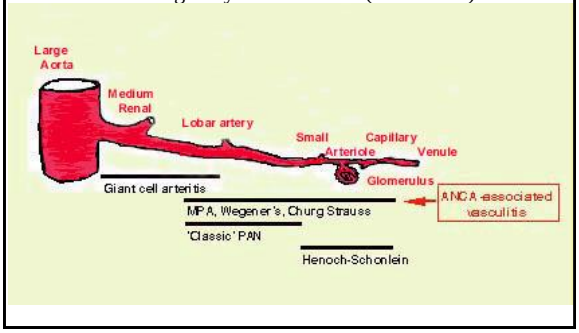
Emergency is here used for a diagnosis expected within 24-48 hours

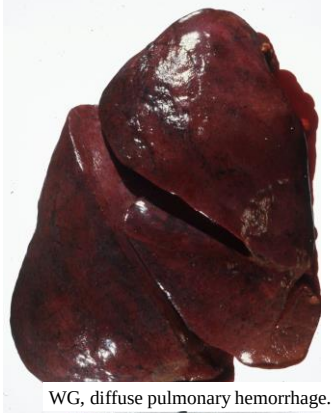
- Vasculitis. Is the blood part of disease, or operative, or aspiration, or artefact.
- Is there capillaritis?
- What is the cause of the capillaritis?
- Accelerated phases of interstitial pneumonitis
- Hypersensitivity pneumonitis
- Drug reactions
- Lung transplant pathology, in this lecture for illustrative purposes only

PULMONARY HEMORRHAGE IN OPEN LUNG BIOPSY: CAUSES

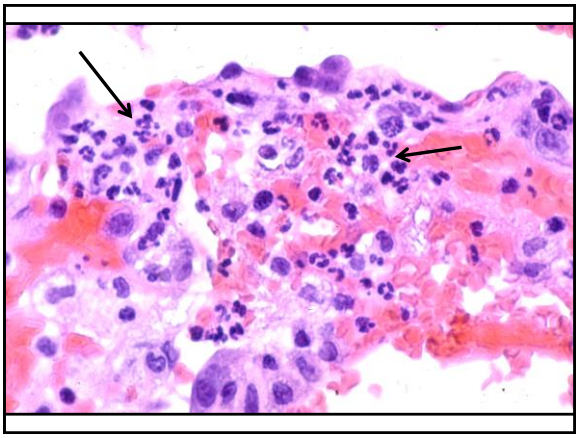
- Operative effect (blood, not hemorrhage).
- Aspiration of blood (not hemorrhage).
- Bleeding diathesis.
- Severe heart failure.
- Diffuse alveolar damage.
- Infective pneumonia.
- Goodpasture's disease.
- Idiopathic pulmonary hemosiderosis (inactive vasculitis).
- Pulmonary capillary hemanagiomatotsis.
- Arteriovenous malformations (disrupted).
- Capillaritis.

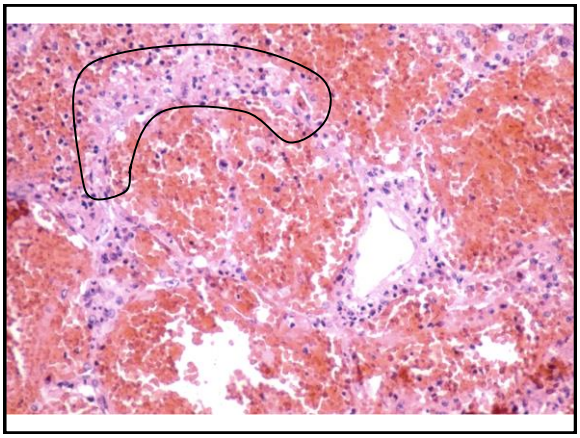
- Vasculitis Classification
- Originally based on size (Pearl Zeek)





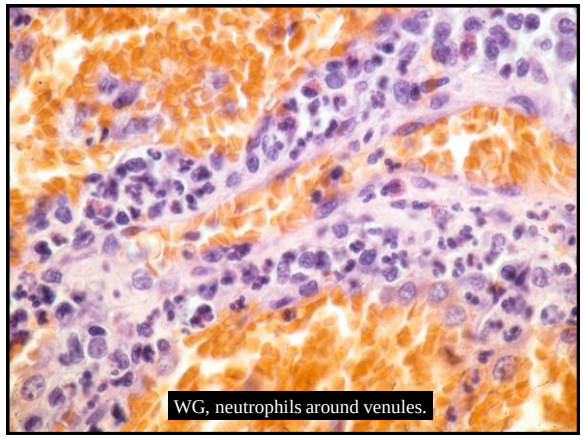
WG, diffuse pulmonary hemorrhage.



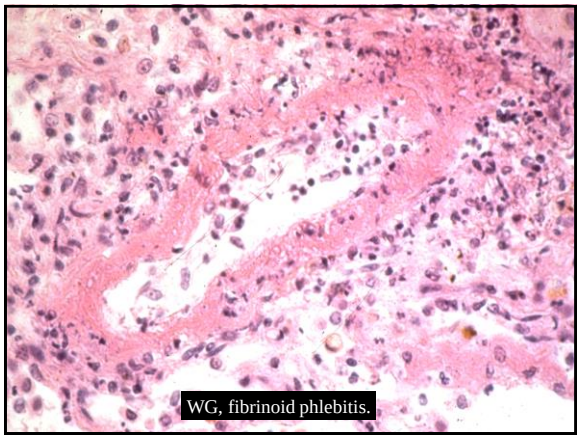


PULMONARY CAPILLARITIS: HISTOLOGIC FEATURES

- Neutrophils and nuclear dust in interstitium and along alveolar walls.
- Blood in alveoli with few neutrophils.
- Capillary thrombosis.
- Fibrin nodules on alveolar walls.
- Fibrinoid necrosis of alveolar walls and loss of alveolar walls
- Advanced cases with alveolar filling by neutrohils ("alveolitis").



WG, neutrophils around venules.



WG, fibrinoid phlebitis.

PULMONARY CAPILLARITIS: CAUSES

Wegener's granulomatosis (ANCA- associated vasculitis)
Lupus erythematosus
Acute rheumatoid disease
Systemic sclerosis
Henoch-Schoenlein purpura
Transfusion reaction
Idiopathic glomerulonephritis
Microscopic polyarteritis
Plexogenic hypertension
Gram-negative septicemia
? Goodpasture's disease

PULMONARY CAPILLARITIS: BEYOND HEMATOXYLIN-EOSIN

- Periodic acid-Schiff to delineate alveolar basement membrane.
- Endothelial markers show intact cells but not the destroyed ones.
- Immunoglobulins may characterize pathogenesis in a given case but not the diagnosis.
- Electron microscopy of historical interest.

PULMONARY HEMOSIDEROSIS (HEMOSIDERIN AND FIBROSIS) VS. IDIOPATHIC PULMONARY HEMOSIDEROSIS (IPH)

Pulmonary hemosiderosis, a histopathologic diagnosis.

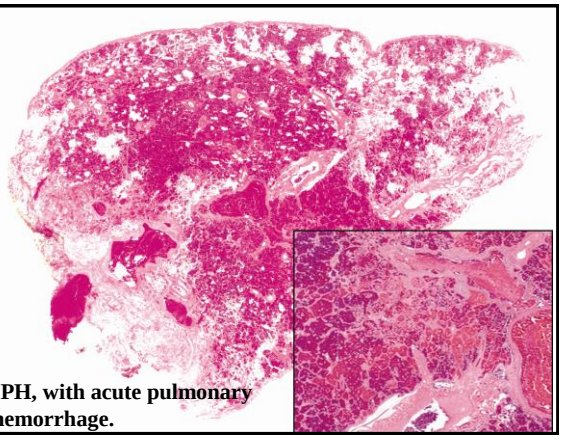
Idiopathic pulmonary hemosiderosis (IPH), a murky clinicopathologic diagnosis.

Wide variety of clinical scenarios, from normal for years to sudden hemorrhage.

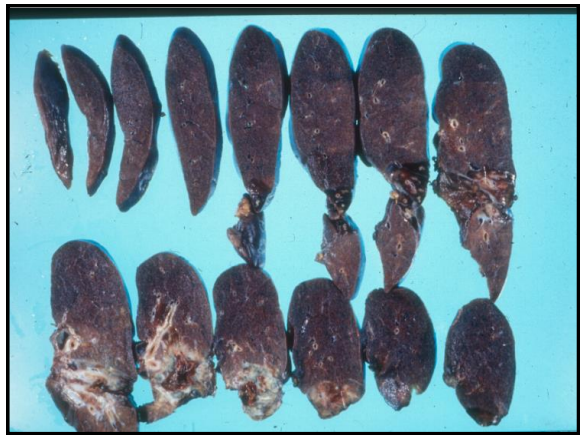
Children or adults.

Occult cardiac disease.

Coeliac disease is one unusual but distinct relationship.



IPH, with acute pulmonary hemorrhage.



WEGENER'S GRANULOMATOSIS: GENERAL APPROACH TO THE LUNG BIOPSY

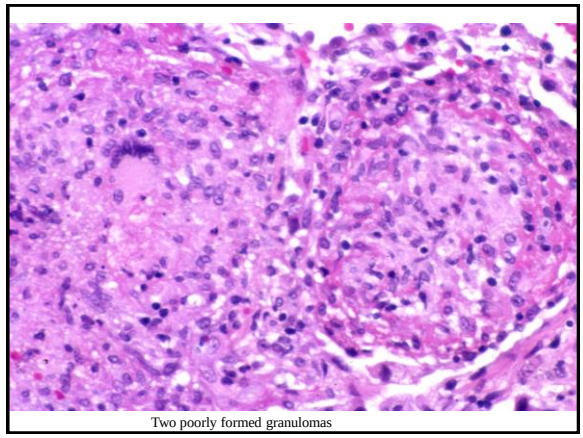
- Necrosis of collagen but not infarction.
- Granulomatous inflammation but no granulomas (always exclude infection).
- Microabscesses but not bronchopneumonia.
- Capillaritis and hemorrhage (medical emergency).
- ? Renal or other extrapulmonary disease.
- Evaluation of ANCA and ANA.

WEGENER'S GRANULOMATOSIS: GROUND RULES

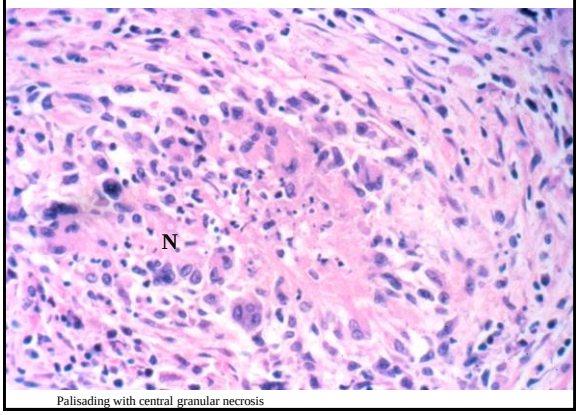
- Affects of anatomic compartments (vessels, airways, interstitium, pleura).
- Thus, not just a vasculitis.
- Variety of pulmonary symptoms (hemoptysis, cough, dyspnea).
- Panoply of radiographic findings (airspace, interstitial, nodular).

DIFFUSE GRANULOMATOUS TISSUE

- Transformed histiocytes and epithelioid histiocytes in sheets and poorly defined aggregates.
- Relatively clear cytoplasm.
- Focal palisading.
- Occasional multinucleated histiocytes.
- No necrosis.
- No nodularity.



Two poorly formed granulomas



Palisading with central granular necrosis

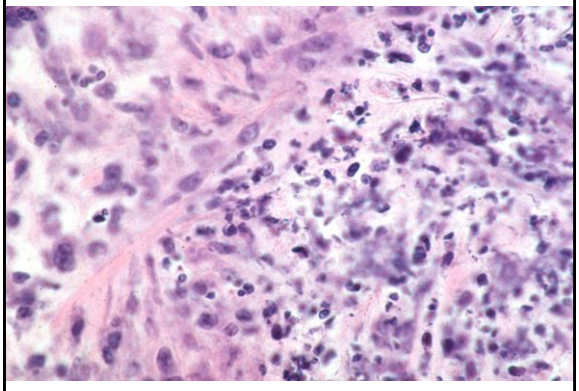
PALISADING GRANULOMA

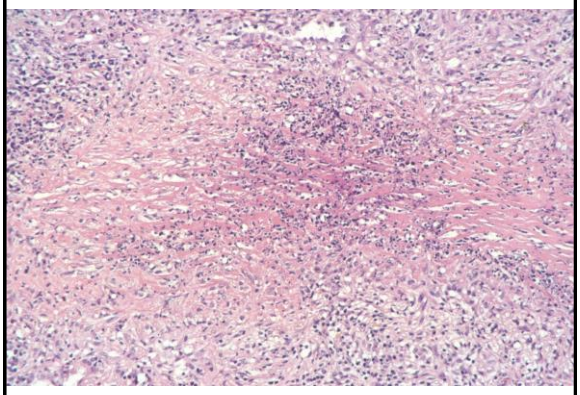
Sarcoidal

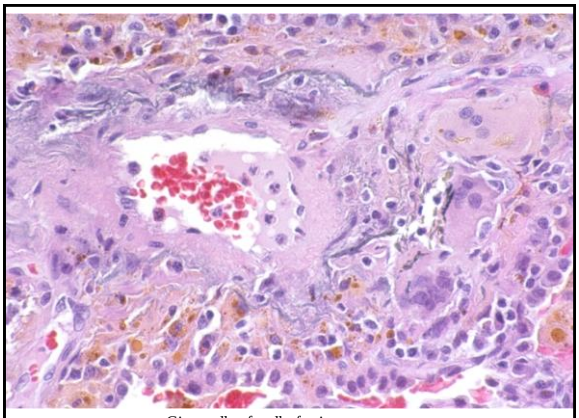
Tuberculoid

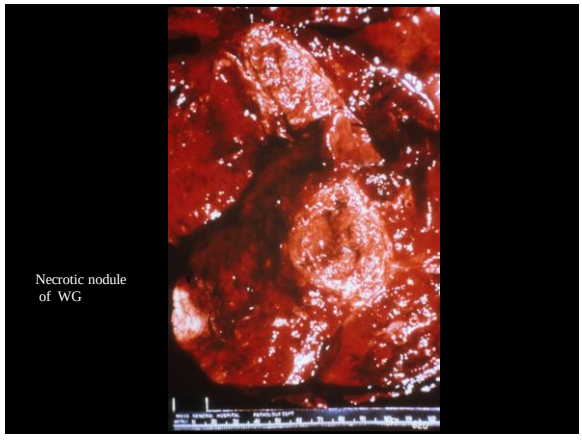
Palisading

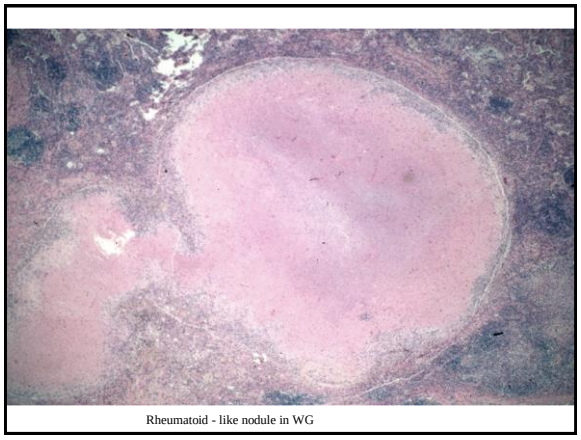
- Nidus of fibrinoid necrosis.
- Perpendicular nuclear palisading.
- Indistinct cytoplasm.
- No precise outer edge.


Few micro abscesses

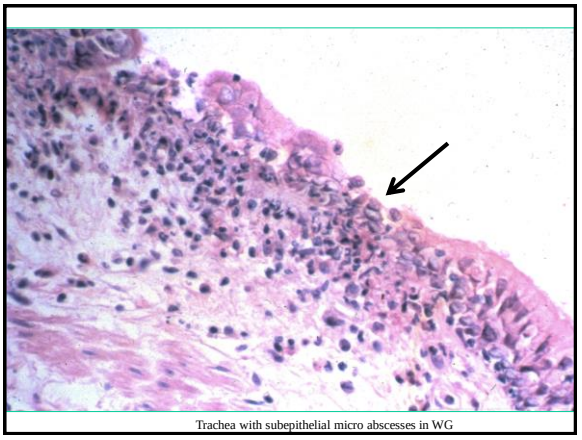

Central fibinoid necrosis of collagen


Giant cells of wall of vein

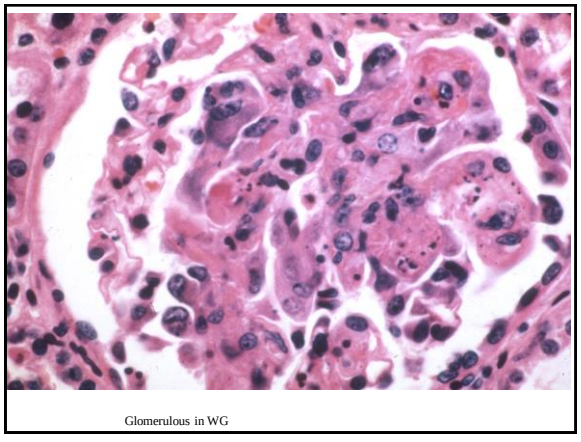




Rheumatoid - like nodule in WG



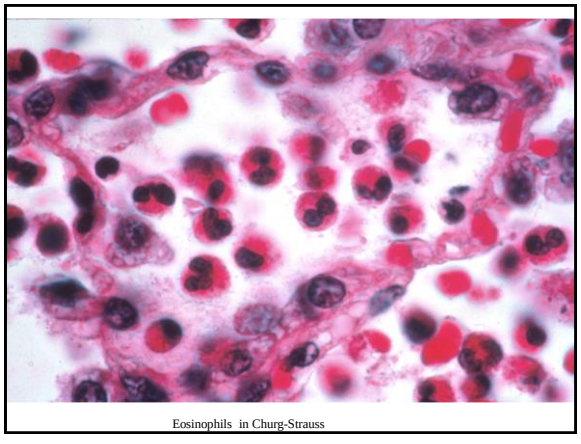
Trachea with subepithelial micro abscesses in WG



Glomerulous in WG

CHURG-STRAUSS GRANULOMATOSIS IN THE LUNG

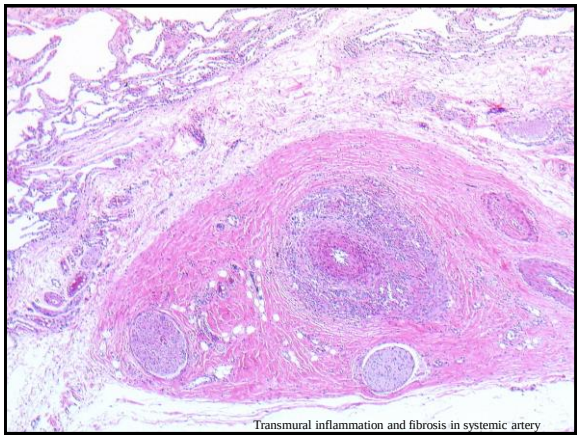
- Most diagnostic feature: eosinophilic vasculitis or eosinophilic abscesses.
- Necrosis variable.
- Hemorrhage inconspicuous.
- Original definition included asthma.
- Extrapulmonary facets: myocarditis, myositis, neuritis.



Eosinophils in Churg-Strauss

POLYARTERITIS NODOSA IN THE LUNG

- Very rare.
- Polymorphous inflammation.
- Nodular inflammatory response.
- No fibrinoid necrosis.
- No capillaritis.



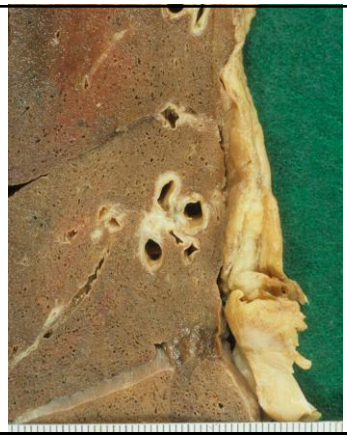
Transmural inflammation and fibrosis in systemic artery

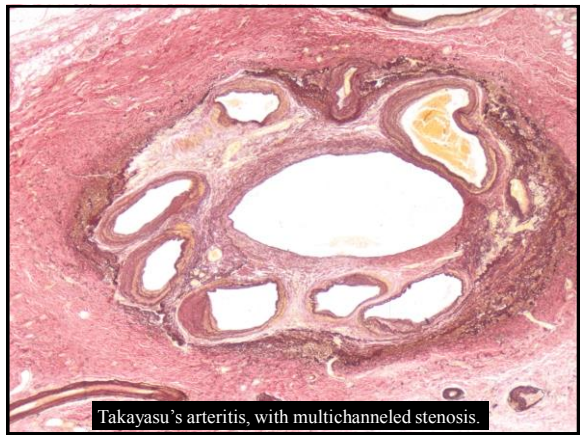
TAKAYASU'S ARTERITIS IN THE LUNG

- Rare disease in North America, but lung involvement not uncommon.
- Large elastic arteries.
- Histiocytic giant cells.
- Stenosis with recanalization.

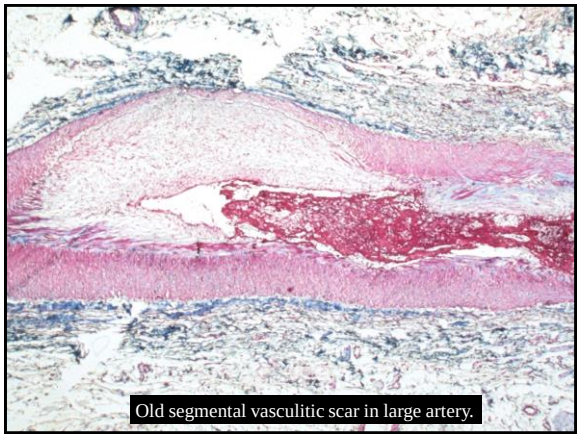
Reference: Matsubara O et al. Pathological features of the pulmonary artery in Takayasu's arteritis. Heart and Vessels 1992; 7 (suppl) 18-25.

Areterial wall thickening



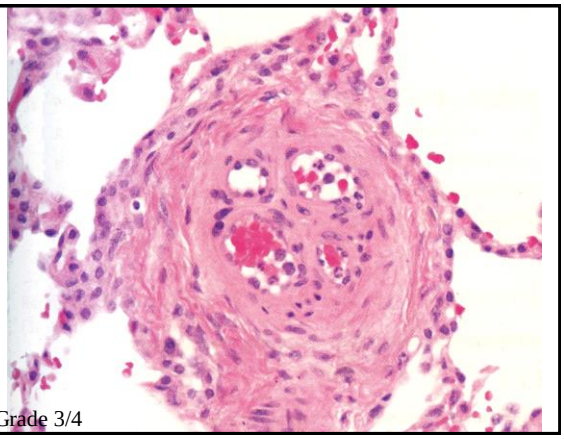


Takayasu's arteritis, with multichanneled stenosis.

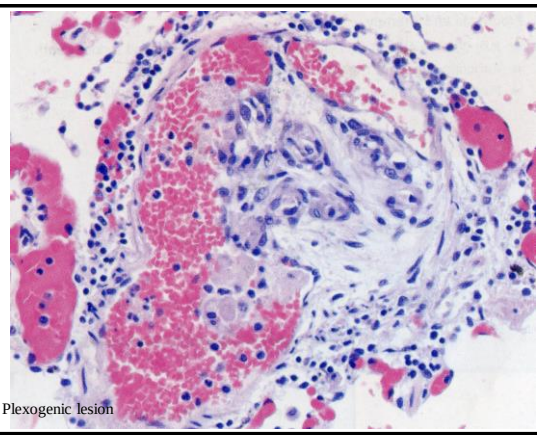


Old segmental vasculitic scar in large artery.

PULMONARY ARTERIAL HYPERTENSION – EMERGENT ISSUES



Grade 3/4



Plexogenic lesion

THROMBOEMBOLISM—PATHOLOGIC FEATURES

Gross Findings

- Early: fibrin and blood loosely adherent to vessel wall
- Late: fibrous intravascular webs visible in larger arteries

Microscopic Findings

- Early (72 hours): fibrin and blood within arteries
- Mid (one week): endothelial cells cover the clot and grow into the embolus
- Mid (second week): fibroblasts and capillaries form within the embolus
- Late (third to fourth week): collagen fibers form, recanalization begins
- Depending on size of vessel and blood supply, infarcts may occur
- Non-blood clots can embolize to the pulmonary arteries, including megakaryocytes, bone marrow, adipose tissue, skin, hair, air, and gas. Most are incidental findings
- Tumor emboli can cause pulmonary hypertension
- Foreign body emboli can cause pulmonary hypertension

Pathologic Differential Diagnosis

- Plexiform lesions of pulmonary arterial hypertension

TABLE 7-1

Heath and Edwards Grading Scheme for Hypertensive Pulmonary Vascular Disease

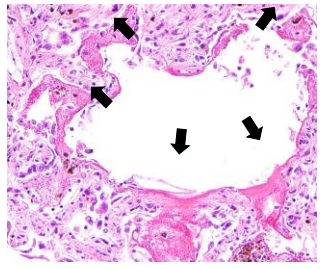
Grade	Structural Change
Grade I:	Medial hypertrophy of arteries and muscularization of arterioles
Grade II:	Intimal proliferation develops in arteries
Grade III:	Intimal concentric laminar fibrosis becomes prominent in muscular arteries
Grade IV:	Dilatation of small arteries occurs with development of plexiform lesions
Grade V:	Plexiform and angiomatoid lesions become prominent; hemosiderin deposition present
Grade VI:	Necrotizing arteritis develops

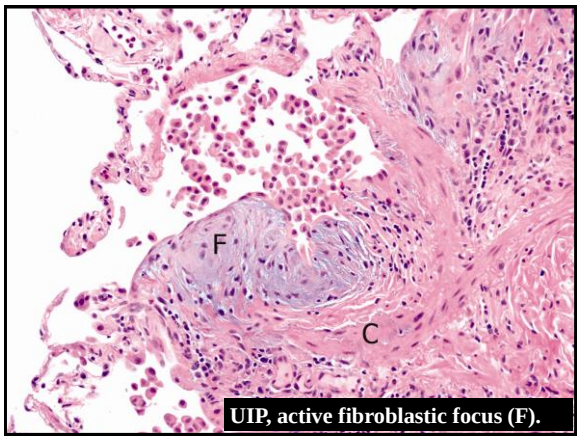
From Heath D, Edwards JE. The pathology of hypertensive pulmonary vascular disease: a description of six grades of structural changes in the pulmonary arteries with special reference to congenital cardiac septal defects. *Circulation*. 1958;18:533-547.

ACCELERATED UIP/NSIP

- Clinically, an abrupt deterioration of chronic interstitial lung disease, which may have been occult previously and assumed to be all acute.
- Radiologically, peripheral ground-glass densities and honeycomb fibrosis or traction bronchiectasis.
- Diffuse alveolar damage (acute interstitial pneumonitis) superimposed on old scarring.
- Large number of active fibroblastic foci.
- By some clinical definitions, superimposed infectious pneumonia, organizing pneumonia, hemorrhage or cardiac disease is also consistent with accelerated phase.
- Accelerated phase may also occur in NSIP and possibly other forms of interstitial lung disease.

Accelerated UIP with Hyaline Membranes





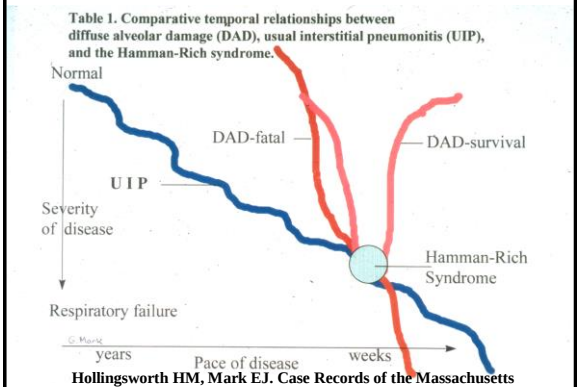
UIP, active fibroblastic focus (F).

ACTIVE FIBROSIS : WHEN AND WHERE IT CAN DEVELOP IN THE LUNG

- Along alveolar wall in UIP.
- In bronchiole in BO (vascularized).
- In pleura in organizing pleuritis.
- In artery in organizing thromboembolus.
- In response to invasive tumor.
- In healing surgical excision site.

ACCELERATAED USUAL INTERSTITIAL PNEUMONITIS : WHY ACCELERATED?

- Relation to rheumatoid diseases (as with UIP in general).
- The common suspect - a virus – rarely proven.
- Develops post-operatively (thoracoscopy or other surgical procedure).
- ? cytokines provoking fibrosis.
- ? drug reaction.
- Usually unknown.



Hollingsworth HM, Mark EJ. Case Records of the Massachusetts General Hospital, N Engl J Med 2001; 345: 1263-1269.

Hypersensitivity Pneumonitis (HSP)

- Interstitial lung disease which develops in response to inhaled antigen exposure
- Antigens:
  - **Contacts with birds**: Pigeons, parakeets,
  - **Fungus/Molds**:
    - Farmers, food industry workers
    - Humidifiers
    - Household molds
  - **"Hot tub lung"**: Mycobacterium species in hot tub users
  - **Summer type HP**: Japan

Clinical Features of HSP

Cases can be stratified by antigen load and exposure duration into:

Acute
- High dose exposure, short duration, rapid recovery
- Sudden onset of cough and shortness of breath
- Rarely biopsied due to rapid symptom onset and recovery

Subacute
- Persistent repeated exposure
- Insidious onset of cough and shortness of breath

Chronic
- Persistent repeated exposure with fibrosis
- Insidious-onset, progressive cough and shortness of breath

Pathological Features of HSP

Acute HSP

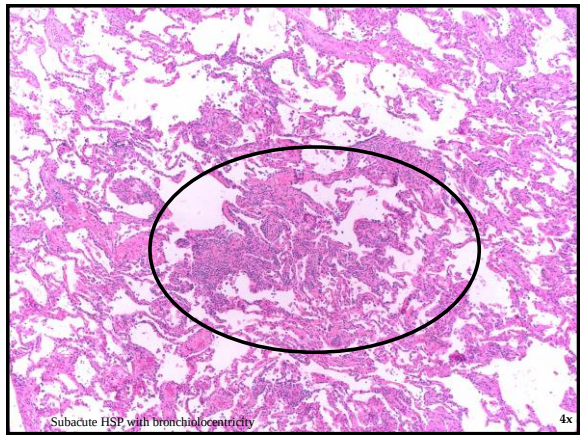
- Airway centered granulomatous inflammation
- Fibrin greater than 5% in area of inflamed lung
- More than 5 neutrophils/HPF

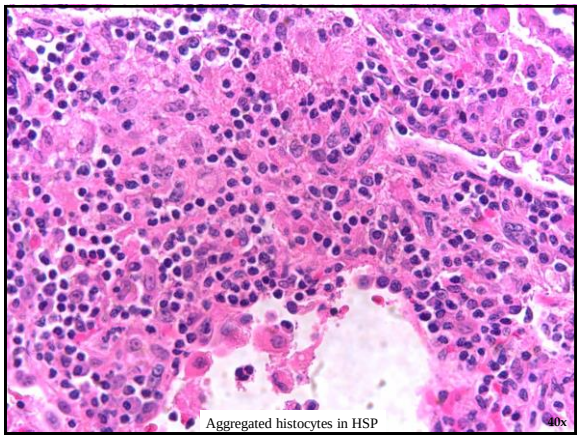
Chronic HSP

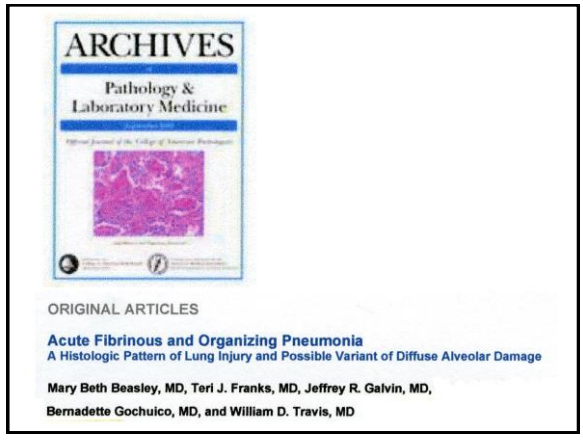
- Airway centered granulomatous inflammation
- Background of fibrosis
  - UIP-like
  - NSIP-like
  - Peribronchiolar fibrosis

Subacute HSP

- Bronchiolocentric inflammatory response
  - Patchy distribution
  - Mononuclear cell infiltrate
  - Interstitial distribution
  - Scattered eosinophilic infiltrate
- Nonnecrotizing granulomatous inflammation
  - Loose granulomas
  - Giant cells with or without cholesterol clefts

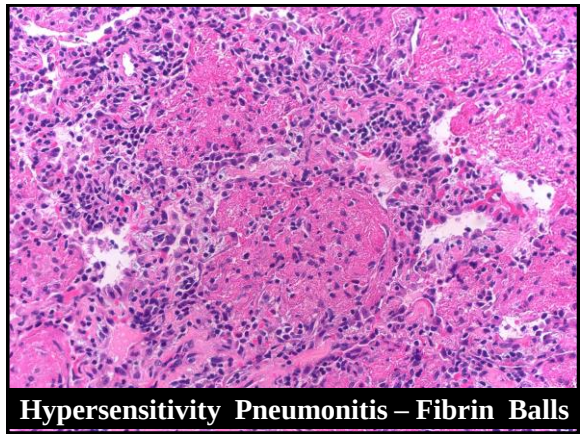






Acute Fibrinous and Organizing Pneumonia (AFOP) - Differential

- Collagen vascular diseases
  - SLE, ankylosing spondylitis, juvenile dermatomyositis
- Drug reaction
  - Amiodarone
  - Abacavir therapy in an HIV positive patient[1]
- Infection
- Lymphoma
- Stem cell transplant for acute myelogenous leukemia
- **Acute HSP**



DRUG PNEUMONITIS

Characterization by histologic pattern:

- NSIP, granulomatous pneumonitis,
- BOOP, eosinophilic pneumonitis, DAD, pleuritis.

Overlap of patterns, similar to collagen-vascular disease.

DRUG PNEUMONITIS

Once brought into the clinical differential diagnosis, drug reaction is very difficult for the clinician to ignore, and further therapy with that drug becomes problematic.

DRUG PNEUMONITIS

Characterization by drug or type of drug:

- Chemotherapeutic agents.
- Antibiotics.
- Drugs for rheumatologic diseases.
- Cardiac drugs.

But many of the drugs can give rise to a panoply of patterns.

DRUG REACTIONS IN THE LUNG : MORE COMMON FORMS

Acute
- Pulmonary edema.
- Pulmonary hemorrhage.
- Acute fibrinous and organizing pneumonia.
- Diffuse alveolar damage.
- Acute eosinophilic pneumonia.
- Fibrinous pleuritis.

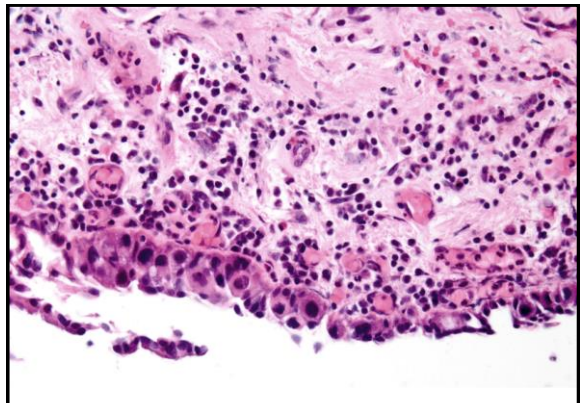
Subacute
- Interstitial pneumonitis, including non-specific interstitial pneumonitis.
- Granulomatous pneumonitis or pneumonia.
- Organizing pneumonia, including bronchiolitis obliterans organizing pneumonia.
- Chronic eosinophilic pneumonia.

Chronic
- Constrictive bronchiolitis.
- Interstitial fibrosis.

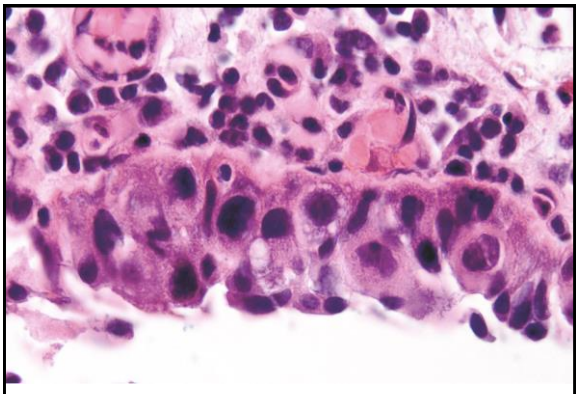
DRUG PNEUMONITIS WITH CHEMOTHERAPY AND/OR RADIOTHERAPY

Enlarged and hyperchromatic nuclei (e.g., busulfan, cytoxan, BCNU).

Preserved nucleus to cytoplasm ratio (N/C ratio).



Chemotherapy/radiotherapy effect



Chemotherapy/radiotherapy effect

Non-specific interstitial pneumonitis (NSIP)–like drug pneumonitis

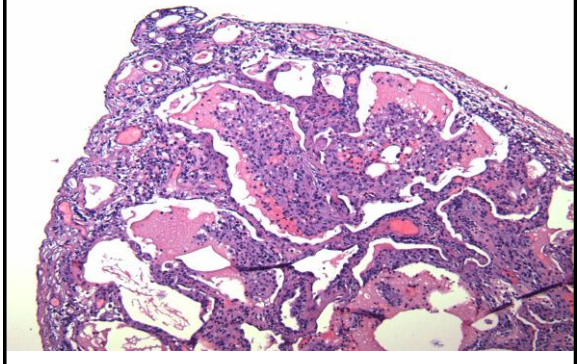
The most common manifestation, the least specific, and the hardest to prove.

Examples: Cytoxan, methotrexate inflixamab

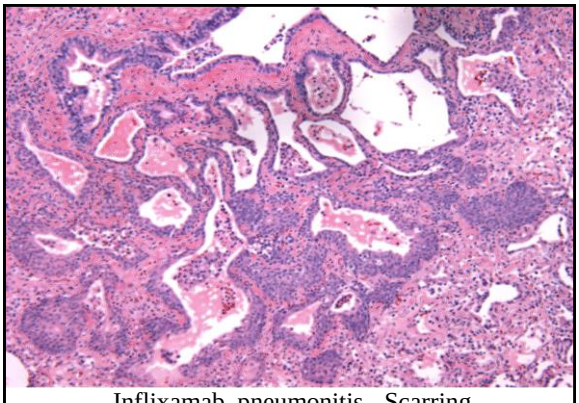
INFLIXIMAB-RELATED LUNG DISEASE

Clinical scenario
- Rheumatoid arthritis.
- Inflammatory bowel disease.
- Wegener's granulomatosis.
- Relationship to methotrexate.

Associated infections
- Bacteria (Legionella, pneumococcus, staphylococcus).
- Pneumocystis.
- Fungus (coccidioides, cryptococcus).
- Mycobacteria.
- Virus (adenovirus).



Inflixamab pneumonitis



Inflixamab pneumonitis - Scarring

DRUG REACTIONS : SOME UNUSUAL CONDITIONS

Histiocytic nodules resembling tuberculosis.

Necrotizing nodules resembling Wegener's granulomatosis.

Eosinophilic pneumonias.

Non-specific interstitial pneumonitis.

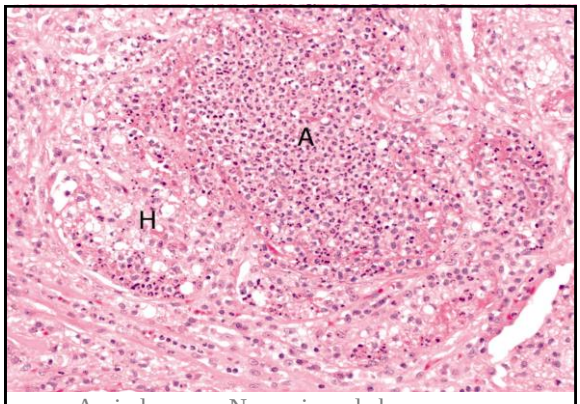
Acute and organizing fibrinous pneumonia.

AMIODARONE PNEUMONITIS

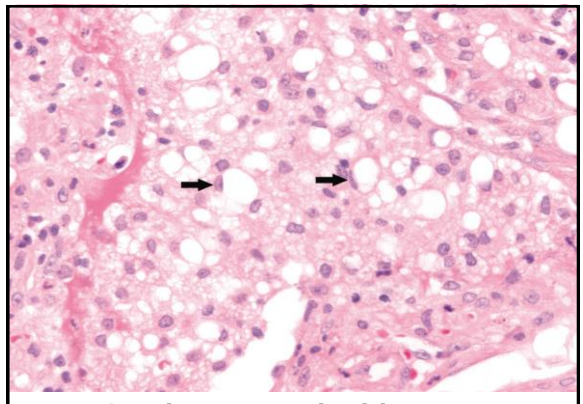
- **Used to suppress ventricular tachycardias.**
- **Drug-induced phospholipidosis.**
- **Vacuolated macrophages and pneumocytes.**
- **Lamellar inclusions (birefringence).**
- **Interstitial pneumonitis (R/O UIP).**
- **Hyaline membranes.**
- **Bronchiolitis.**
- **? Reversible, ? Honeycomb fibrosis.**

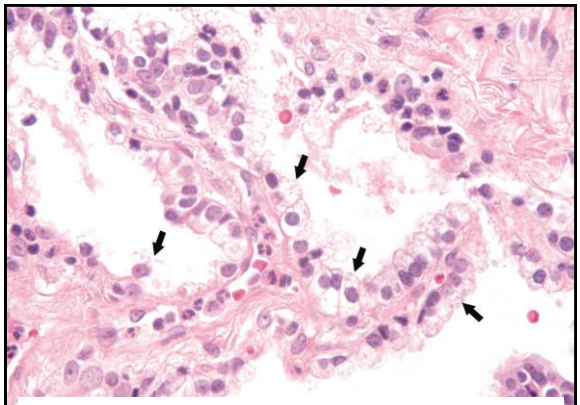
AMIODARONE DRUG EFFECT
Pulmonary Pathology

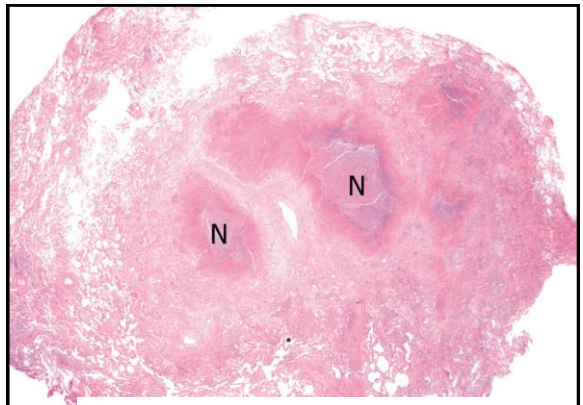
Interstitial pneumonitis and fibrosis.
Vacuolated pneumocytes, histiocytes, endothelial cells.
Tumefactive lesions with necrosis.



Amiodarone – Necrosis and abscess


Amiodarone – Vacuolated histiocytes


Amiodarone effect, with vacuolated pneumocytes



Amiodarone, nodular form with necrosis

Eosinophilic pneumonia, chronic

Asthma.

Aspergillus lung disease, including particularly allergic bronchopulmonary aspergillosis.

Drug reactions, particularly antibiotics including sulfa drugs.

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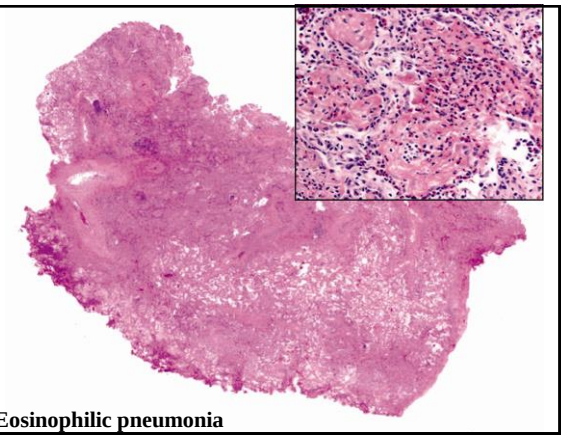
Eosinophilic pneumonia, acute.

Fibrin or hyaline membranes with eosinophils.

Etiology usually undetermined, probably a form of hypersensitivity reaction including rechallenge.



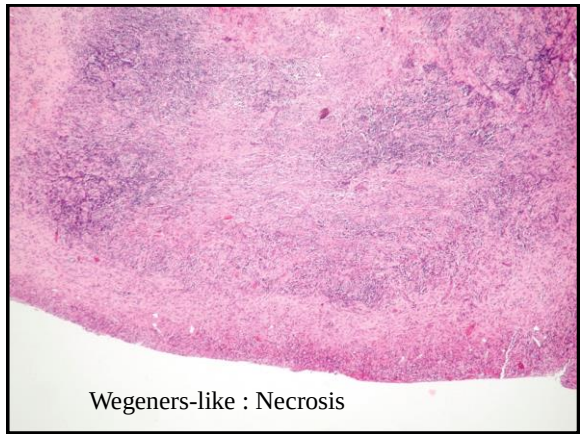
Eosinophilic pneumonia

LUNG CONDITIONS WITH INFLAMMATORY BOWEL DISEASE

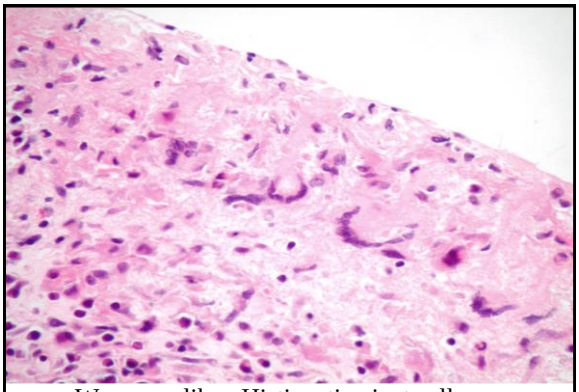
Interstitial lymphocytic infiltrate.
Chronic non-specific bronchiolitis.
Bronchiolitis obliterans organizing pneumonia.
Constrictive bronchiolitis.
Acute purulent bronchiolitis.
Bronchiectasis.
Granulomatous pneumonia.
Focal or diffuse fibrosis.
Vasculitis

Necrotizing nodules resembling Wegener's granulomatosis.

Sulfazalazine in inflammatory bowel disease.



Wegeners-like : Necrosis



Wegeners-like : Histiocytic giant cells

LUNG TRANSPLANT PATHOLOGY

- The biopsy is almost always a rush diagnosis, even if the biopsy is a "surveillance" biopsy.
- The big picture: rejection, infection, aspiration, normal (the most common diagnosis).
- The biopsies are generally tiny and squeezed but multiple.

Patient Name_____ Surgical Number_____

Note to pathologist: All sites should be reported separately; fill out page 1 for each biopsy site. Grades of rejection must be reported as either present or absent for each biopsy site.

[] **[LTBI]** LUNG TRANSPLANT BIOPSY, SITE:

[] **[BIFN]** NUMBER OF BIOPSY FRAGMENTS AT THIS SITE:

[] **[LRA0]** A. ACUTE REJECTION: GRADE A0 (NONE).
[] **[LRA1]** A. ACUTE REJECTION:GRADE A1 (MINIMAL ACUTE REJECTION).
[] **[LRA2]** A. ACUTE REJECTION: GRADE A2 (MILD ACUTE REJECTION).
[] **[LRA3]** A. ACUTE REJECTION: GRADE A3 (MODERATE ACUTE REJECTION).
[] **[LRA4]** A. ACUTE REJECTION: GRADE A4 (SEVERE ACUTE REJECTION).
[] **[LRAX]** A. ACUTE REJECTION: GRADE AX (UNGRADEABLE: INSUFFICIENT TISSUE OR OTHER IMPEDIMENT TO DIAGNOSIS).

[] **[LRB0]** B. AIRWAY INFLAMMATION: GRADE B0 (NO AIRWAY INFLAMMATION).
[] **[LRB1]** B. AIRWAY INFLAMMATION: GRADE B1R (LOW GRADE SMALL AIRWAY INFLAMMATION).
[] **[LRB2]** B. AIRWAY INFLAMMATION: GRADE B2R (HIGH GRADE SMALL AIRWAY INFLAMMATION).
[] **[LRBX]** B. AIRWAY INFLAMMATION: GRADE BX (UNGRADEABLE: INSUFFICIENT TISSUE OR OTHER IMPEDIMENT TO DIAGNOSIS).

[] **[LRC0]** C. CHRONIC AIRWAYS REJECTION: GRADE C0 (ABSENT).
[] **[LRC1]** C. CHRONIC AIRWAYS REJECTION: GRADE C1 (PRESENT).

[] **[LRD0]** D. CHRONIC VASCULAR REJECTION: GRADE D0 (ABSENT).
[] **[LRD1]** D. CHRONIC VASCULAR REJECTION: GRADE D1 (PRESENT).

[] **[ADPR]** ADDITIONAL FINDINGS: POST IMPLANTATION RESPONSE.
[] **[ADFO]** ADDITIONAL FINDINGS: *(Describe)*

NOTE:
[] **[LTBX]** The biopsy is inadequate for grading of rejection because
[] **[DLT5]** The biopsy is adequate for grading, but the diagnosis was based on fewer than 5 biopsy fragments.

[] **[HLMA]** Intra-alveolar hemosiderin-laden macrophages are absent.
[] **[HLMP]** Intra-alveolar hemosiderin-laden macrophages are present.
[] **[HLMI]** Iron stain was used to evaluate for hemosiderin-laden macrophages.

[] **[C4DN]** Immunostain for C4d is negative.
[] **[C4DPL]** Immunostain for C4d is positive. (The significance of a positive C4d and acute humoral rejection in the lung are not well established.)

[] **[TAES]** Trichrome and elastic stains were used to make the diagnosis.
[] **[GMSN]** GMS stain is negative for fungi.

2007 Revision of the Working Formulation for the Classification and Grading of Pulmonary Allograft Rejection

A. Acute rejection	Grade 0—None Grade 1—Minimal Grade 2—Mild Grade 3—Moderate Grade 4—Severe
B. Airway inflammation—lymphocytic bronchiolitis	Grade 0—None Grade 1R—Low-grade Grade 2R—High-grade Grade X—Ungradeable
C. Chronic airway rejection—bronchiolitis obliterans	Grade 0—None Grade 1—Present
D. Chronic vascular rejection—accelerated graft vascular sclerosis	

Based on Stewart S, Fishbein MC, Snell GI, et al. Revision of the 1996 working formulation for the standardization of nomenclature in the diagnosis of lung rejection *J Heart Lung Transplant.* 2007;26:1229-42.

Zander & Farver: Pulmonary Pathology, 1st ed.

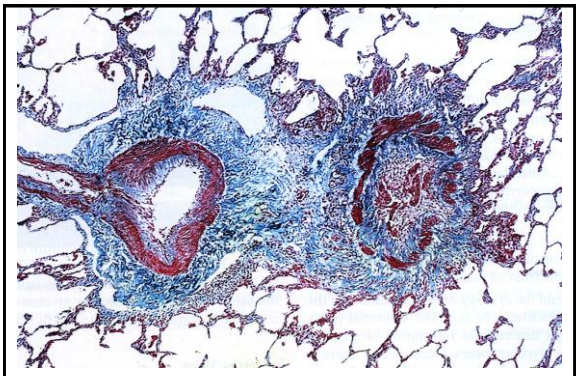
LUNG ALLOGRAFT REJECTION—PATHOLOGIC FEATURES

Gross Findings
- Hyperacute rejection: hyperemic and heavy lungs
- Acute rejection: unknown
- Chronic rejection: large airways with bronchiectasis; patchy consolidation, hyperinflation, and variable fibrosis of lung parenchyma

Microscopic Findings
- Hyperacute: alveolar hemorrhage, interstitial neutrophilia, diffuse alveolar damage, vasculitis
- Acute: inflammatory infiltration around blood vessels and in the bronchiolar submucosa
  - Minimal acute rejection: 2 to 3 layers of perivascular lymphocytes
  - Mild acute rejection: more than 3 layers of perivascular lymphocytes (some activated), plasma cells, eosinophils, and few neutrophils
  - Moderate acute rejection: extension of perivascular inflammatory infiltrates into adjacent alveolar septa
  - Severe acute rejection: diffuse predominantly mononuclear inflammatory cell infiltrates with hemorrhage, hyaline membranes, necrosis
- Lymphocytic bronchiolitis also represents rejection in some cases
  - Low-grade: predominantly lymphocytic infiltrates in the bronchiolar submucosa without epithelial injury
  - High-grade: predominantly lymphocytic infiltrates in the bronchiolar submucosa with epithelial injury and sometimes ulceration
- Chronic
  - Bronchiolitis obliterans (BO): patchy submucosal fibrosis resulting in partial or complete occlusion of bronchiolar lumen, with or without inflammatory infiltrates
  - Vascular: intimal fibrosis and thickening of small blood vessels

Pathologic Differential Diagnosis
- Hyperacute rejection:
  - Ischemia-reperfusion injury
  - Donor-transmitted infections
- Acute rejection:
  - Infections (bacterial, viral, or fungal)
  - Periphery of post-transplant lymphoproliferative disorder lesion
- Chronic rejection:
  - Nonspecific large airway fibrosis
- Organizing pneumonia

Zander & Farver: Pulmonary Pathology, 1st ed.



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Take Home Messages

Lung pathology relevant to clinical emergencies can arise in various arenas: medical, surgical, legal, public health.

The evaluation of pulmonary hemorrhage is central in emergency lung pathology, particularly to include or exclude capillaritis.

AFOP and acute eosinophilic pneumonias rarelycan be important clinical issues.

Infections and graft versus host disease are common emergencies but not covered in this lecture.

Drug reactions rarely are an emergency diagnosis; the approach to their evaluation by lung biopsy poses special problems, which is covered in this lecture.

DISCLOSURE STATEMENT

I have no disclosures to make for this lecture.

THE END

EMERGENCY LUNG BIOPSY INTERPRETATION

Most common in MGH experience

- Adult respiratory distress syndrome (most common).
- Vasculitis / Capillaritis (most essential for histopathology).
- Graft-versus-Host Disease.
- Severe rejection or post-implantation response in a lung transplant patient.
- Drug pneumonitis.
- Fulminant infectious pneumonia.
- Tuberculosis (especially MDR) in an immunodeficient patient.
- Acute exacerbation in UIP or NSIP.
- Thromboemboli or embolic tumor.

EVALUATION OF BLOOD IN THE LUNG

- Is it real (that is, hemorrhage, not just blood).
- Requirement for hemosiderin?
- Is there vasculitis?
- Is there capillaritis?
- What is the cause of the capillaritis?