Non-resolving pneumonia: clinical review

Pneumonia and pneumonitis

Pneumonia is a term used to describe inflammation of the lung tissues caused by an infection, whereas pneumonitis is inflammation of the lung without the presence of an infection

<u>Causes of pneumonitis:</u>

- Chemicals and irritants
- Radiation
- Drugs
- Hypersensitivity
- Interstitial

Classification of pneumonia

- Community-acquired Pneumonia
- Hospital-acquired pneumonia
- Pneumonia of the immunocompromised
- Aspiration pneumonia

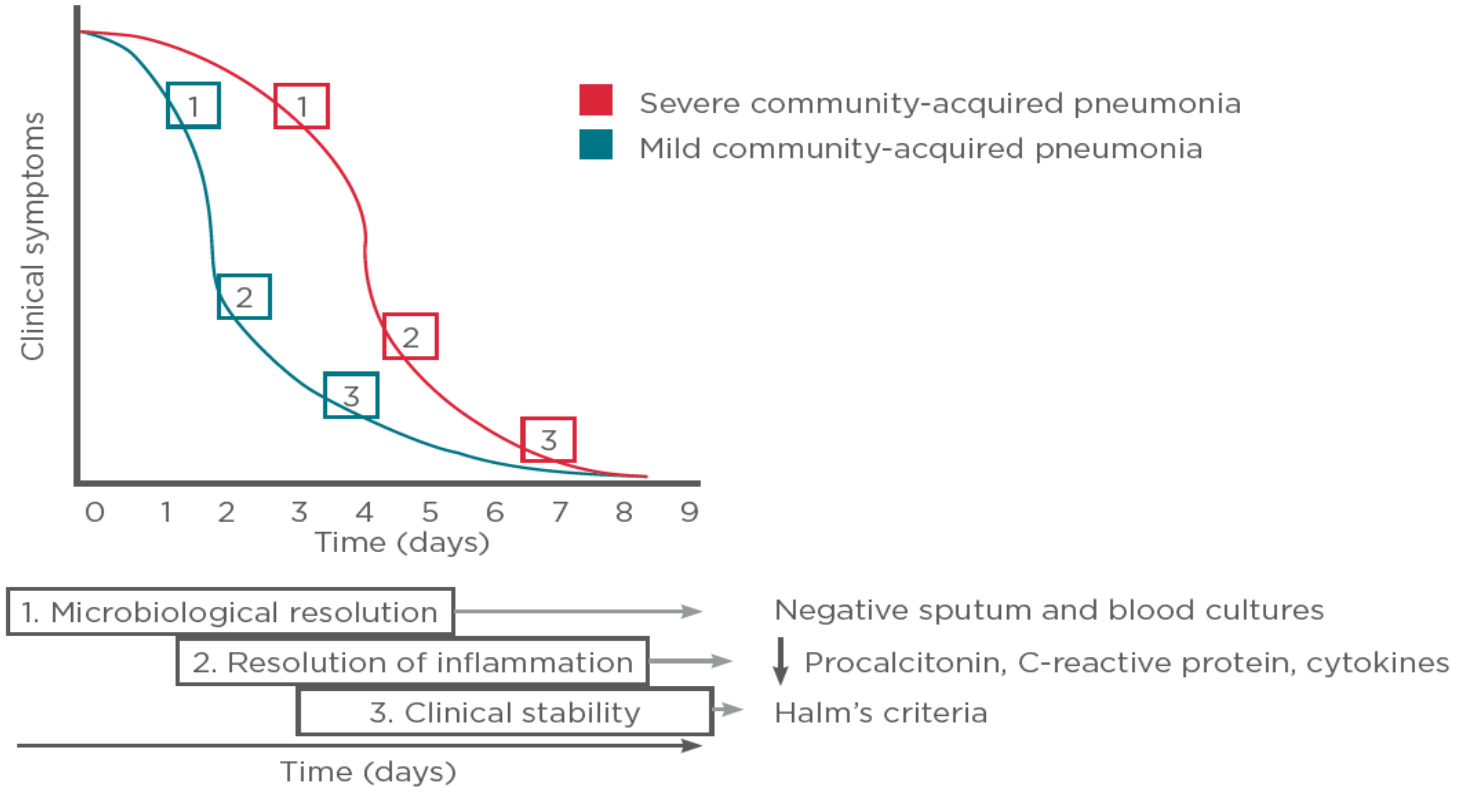
Community acquired pneumonia

- Affects 0.5 -1.0 % of adults in the UK every year
- Diagnosed in 5-12 % of adults presenting to their GPs with LRTI
- Of these 22-42% are admitted to Hospital
- In those admitted the mortality rate is 5-14%
- And 1.2-10% of adults admitted with CAP are managed in ITU

Causative Agents and Clearance of Pneumonia

Causative agent	Time to clearance	Residual radio graphical abnormalities
Pneumococcus		
Bacteremic	3 to 5 months	25% to 35%
Non bacteremic	1 to 3 months	Rare
Haemophilus influenzae	1 to 5 months	Occasional
Legionella	2 to 6 months	10% to 25%
Mycoplasma	2 weeks to 2 months	Rare
Chlamydia sp	1 to 3 months	10% to 20%
Staphylococcus aureus	3 to 5 months	Common
Gram negative	3 to 5 months	10% to 20%
Moraxella catarrhalis	1 to 3 months	Rare

Recovery from Community-Acquired Pneumonia



Non / slowly resolving pneumonia

- Associated with increased mortality and ITU requirement
- Affects 10 to 20% of patients hospitalised with CAP
- The terms NRP and treatment failure are quite different phenomena
- No uniform diagnostic or treatment approach for NRP
- Early intervention can improve outcome

Causes of non / slowly resolving pneumonia

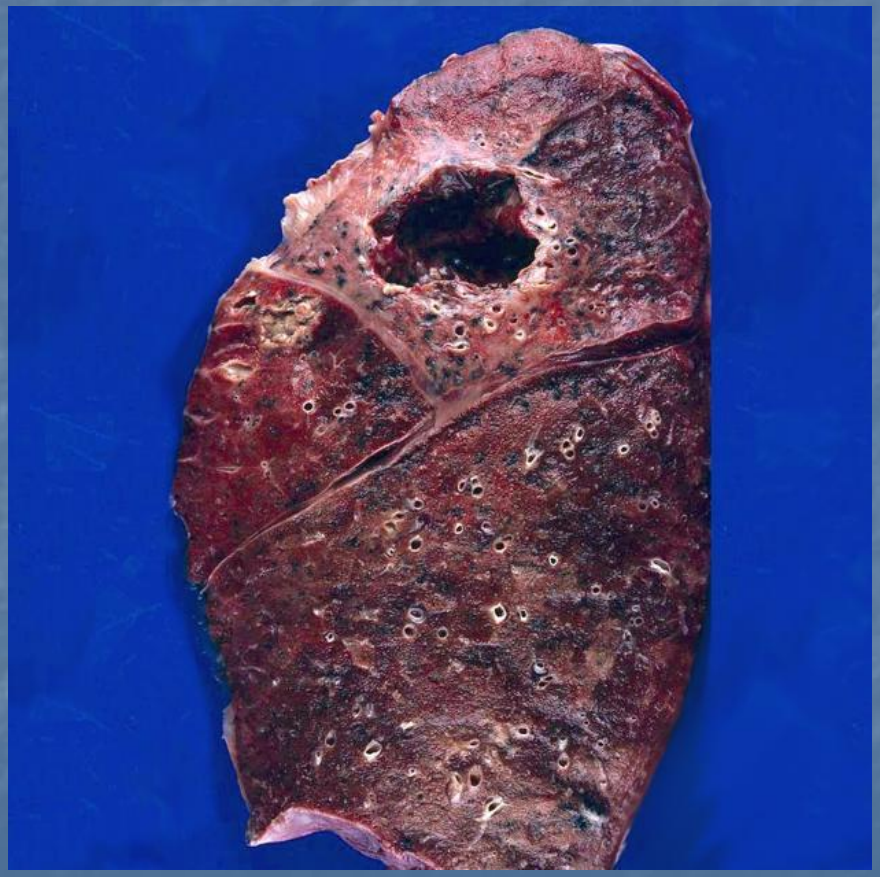
- Inadequate or inappropriate antibiotic therapy
- Host factors / immunocompromised patients
- Antibiotic resistant pathogens
- Unusual pathogens
- Incorrect diagnosis: non-infectious causes
- Infective complications:
  - parapneumonic effusion / empyema
  - lung abscess

British Thoracic Society.

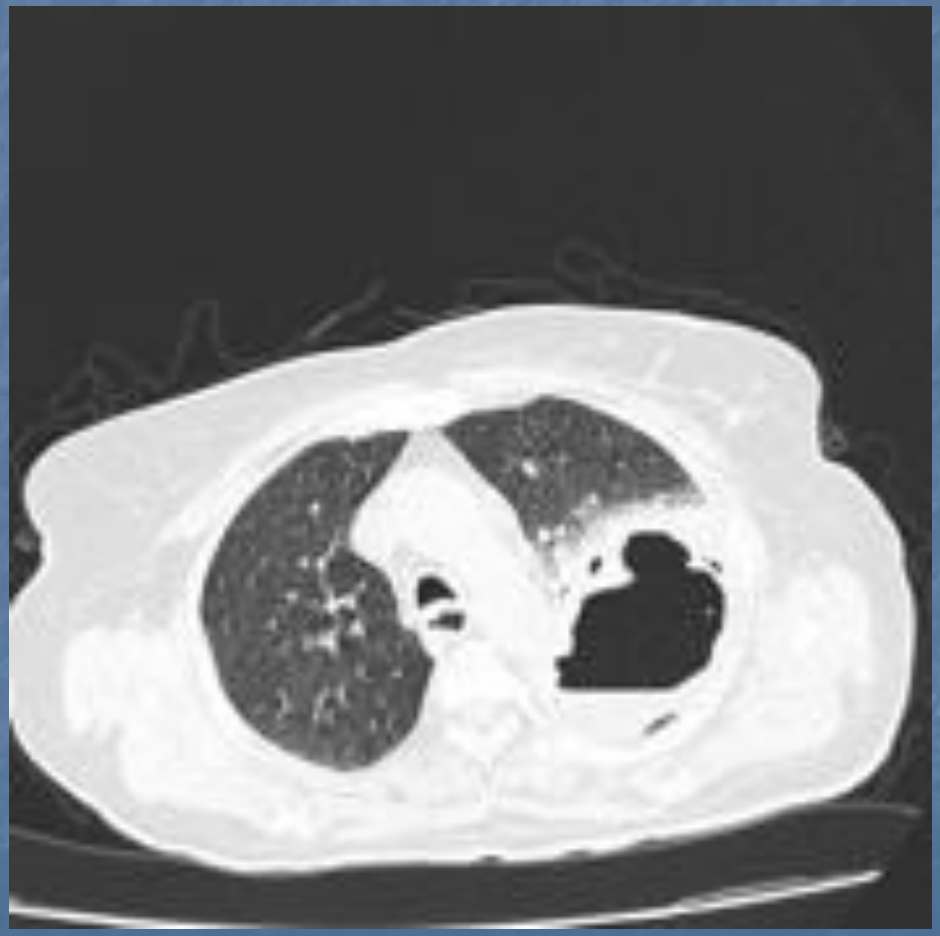
BTS guidelines for the management of empyema

Origin of infection	Intravenous antibiotic treatment	Oral antibiotic treatment
Community acquired culture negative pleural infection	Cefuroxime 1.5 g tds iv + metronidazole 400 mg tds orally or 500 mg tds iv	Amoxycillin 1 g tds + clavulanic acid 125 mg tds
	Benzyl penicillin 1.2 g qds iv + ciprofloxacin 400 mg bd iv	Amoxycillin 1 g tds + metronidazole 400 mg tds
	Meropenem 1 g tds iv + metronidazole 400 mg tds orally or 500 mg tds iv	Clindamycin 300 mg qds
Hospital acquired culture negative pleural infection	Piperacillin + tazobactam 4.5 g qds iv	Not applicable
	Ceftazidime 2 g tds iv, Meropenem 1 g tds iv ± metronidazole 400 mg tds orally or 500 mg tds iv	

Lung abscess



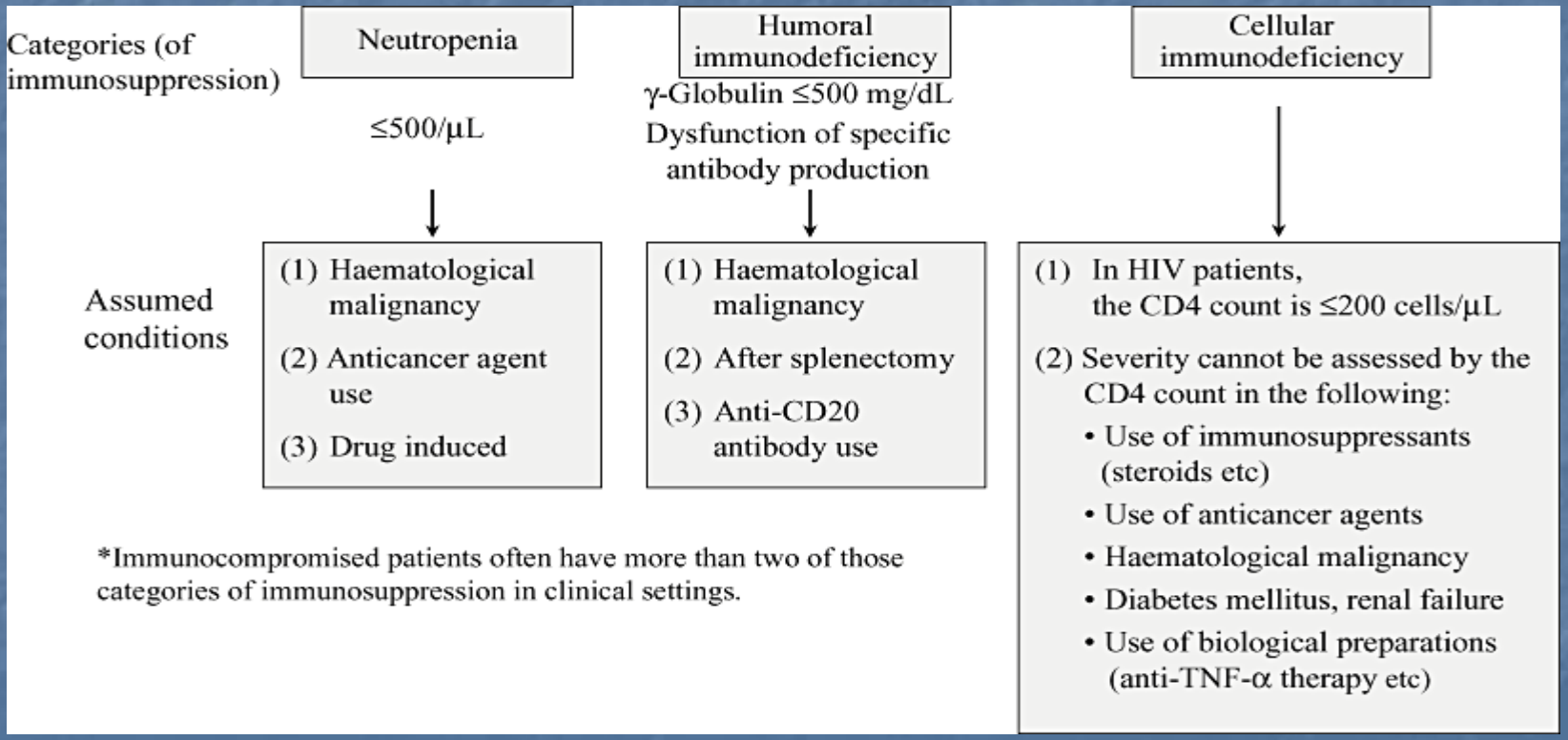
Lung abscess



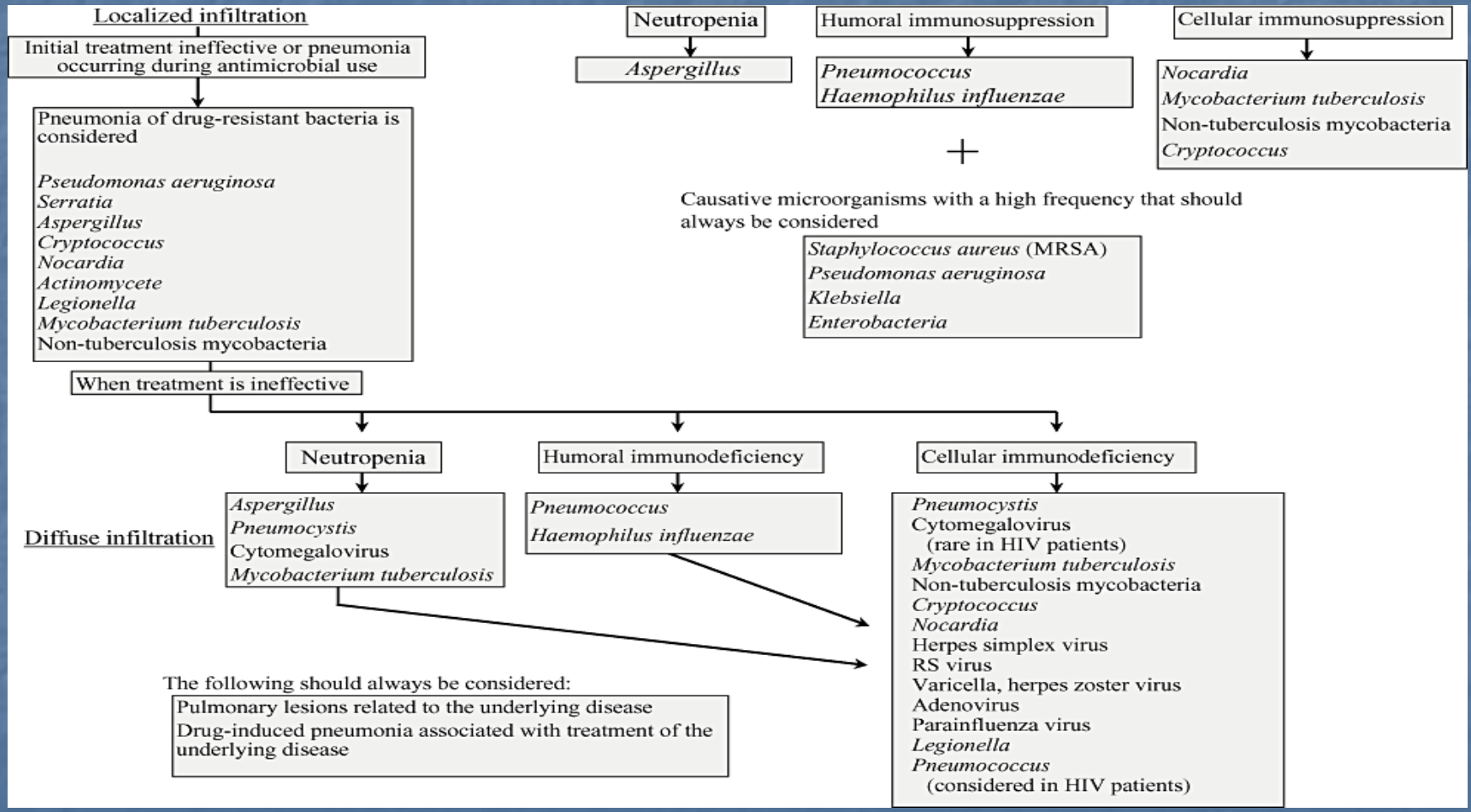
Host Factors for Poor Resolution

- Age > 60 years (radiographic clearance of pneumonic infiltrate on completion of antibiotic therapy decreases by 20% per decade after the age of 20 Years)
- Co-morbid illnesses like COPD, congestive heart failure, diabetes mellitus, renal failure
- Alcoholism
- Smoking
- Defects in defence (immunosuppressive/ cytotoxic therapy, use of feeding tube, endotracheal tube, tracheostomy or sedating drugs)
- Malnutrition

Types of immunosuppression



Causative pathogens in pneumonia of the immunocompromised



Presence of resistant organisms

- CAP : especially S pneumonia, S aureus
- Nosocomial pneumonia : especially MRSA, pseudomonas aeruginosa, Acinetobacter

Presence of resistant organisms

Drug-resistant Streptococcus pneumonia suspected if :

- Treated with beta-lactams within 6 months
- Close exposure to young children
- CAP in last 1 year
- HAP in last 2 months

Presence of resistant organisms

Methicillin -Resistant Staphylococcus Aureus (MRSA) suspected if :

- Advanced age
- Prior antibiotic coverage, indwelling IV catheters, tertiary care centre, dialysis
- Burns, surgical wounds

Presence of unusual organisms

- Tuberculosis, atypical mycobacteria
- Nocardia, Actinomyces
- Pneumocystis jirovecci
- Fungi; Aspergillus, Cryptococcus,
- Histoplasma, coccidiodomycosis
- Exposure to animals: Coxiella burnetii, Chlamydia, psitaci

Microbiology of HAP

Common pathogens associated with HAP

Early onset bacteria pneumonia	
Pathogens	**Frequency%**
Streptococcus pneumoniae	5 to 20
H. influenzae	<5-15
Late onset bacterial pneumonia:	
Aerobic Gram-negative bacilli: *P. aeruginosa* *Acinetobacter spp* *K. pneumoniae* *S. marcescens* *E. coli*	20-60
Gram-positive cocci	20-40
S. aureus	
Early and late onset pneumonia:	
Anaerobic bacteria	0-35
Virus	<1
Fungal	<1

Risk factors for hospital-acquired pneumonia

- Age >70
- Thoracic / abdominal surgery
- Comorbidities
- Malnutrition
- Depressed consciousness
- Immunocompromisation
- Chronic renal failure

Aspiration pneumonia

- Aspiration pneumonia is an **infection** caused by specific microorganisms
- Chemical pneumonitis – an **inflamatory** reaction to irritative gastric contents
- Aspiration pneumonia – 5-15% of CAP
- Large volume aspiration of Colonized oropharyngeal & Upper GI contents is must

Aspiration pneumonia - Pathogenesis

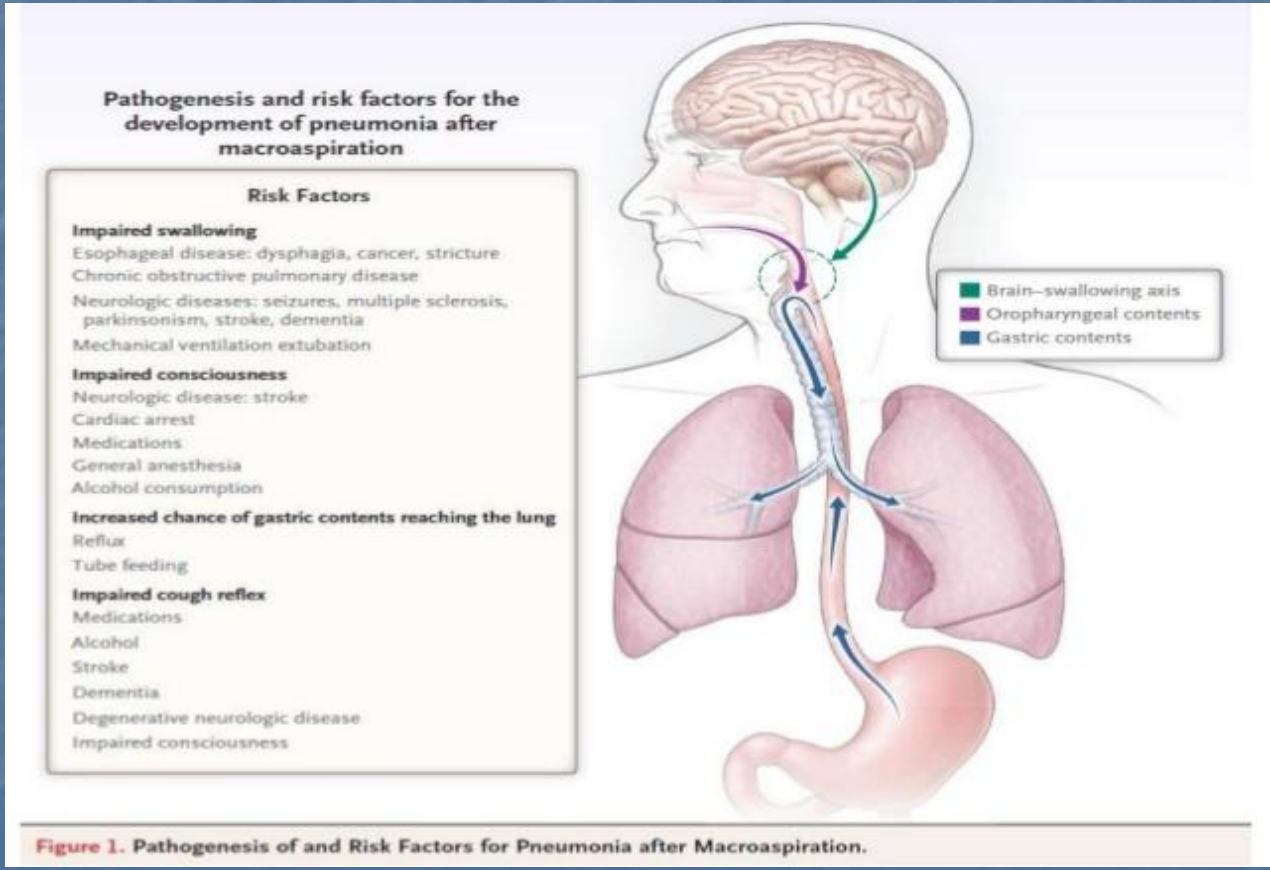


Figure 1. Pathogenesis of and Risk Factors for Pneumonia after Macroaspiration.

EPIDEMIOLOGY

- Aspiration pneumonia is the most common cause of death in patients with dysphagia due to neurologic disorders
- 5 to 15 percent of cases of community acquired pneumonia (CAP) are aspiration pneumonia
- Incidence of aspiration pneumonia is 18 percent in nursing home acquired pneumonia (HCA)
- Aspiration pneumonitis occurs in approximately 10 percent of patients who are hospitalized after a drug overdose
- Occurs in approximately 1 of 3000 operations in which general anesthesia is administered and accounting for 10 to 30 percent of all deaths associated with anesthesia

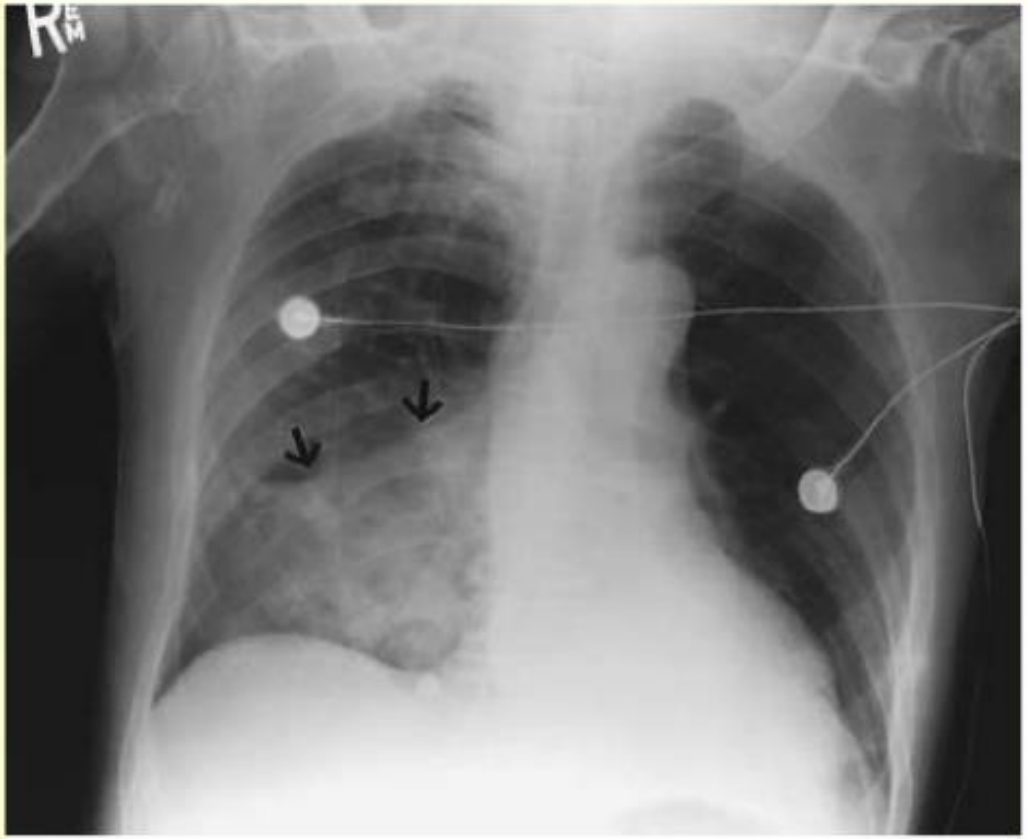


Figure 1. Anteroposterior Radiograph of the Chest, Showing Air-Space Consolidation (Arrows) in the Right Lower Lobe in a Patient Who Had Recently Had a Thrombotic Stroke.

Non-Infectious Causes of non-resolving pneumonia

Neoplasia	Bronchoalveolar cell carcinoma, Lymphoma, Lymphangitis carcinomatosis
Inflammatory disorders	Systemic Vasculitis, CTD (Connective Tissue Diseases), Diffuse alveolar hemorrhage, BOOP (Bronchiolitis Obliterance Organizing Pneumonia), Sarcoidosis
Drugs	Nitrofurantoin, Amiodarone, Methotrexate, Bleomcin
Cardiac causes	PTE, CHF

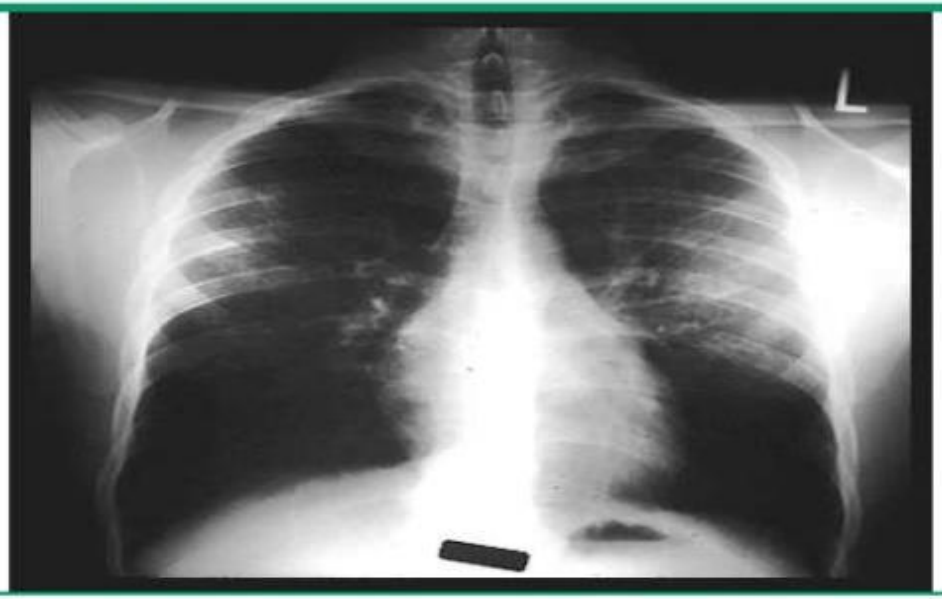
Alveolar Haemorrhage

- Diffuse bleeding from the pulmonary vasculature leading to blood-filled alveoli
- Causes a “classic” triad of haemoptysis, diffuse lung infiltrates and anaemia
- Erythrocytes and fibrin fill the airspaces; often with haemosiderin - filled macrophages

Alveolar Haemorrhage

- Diagnosis is aided by measurement of PFTs
- DCLO will be increased due to carbon monoxide binding to the erythrocytes in the alveoli

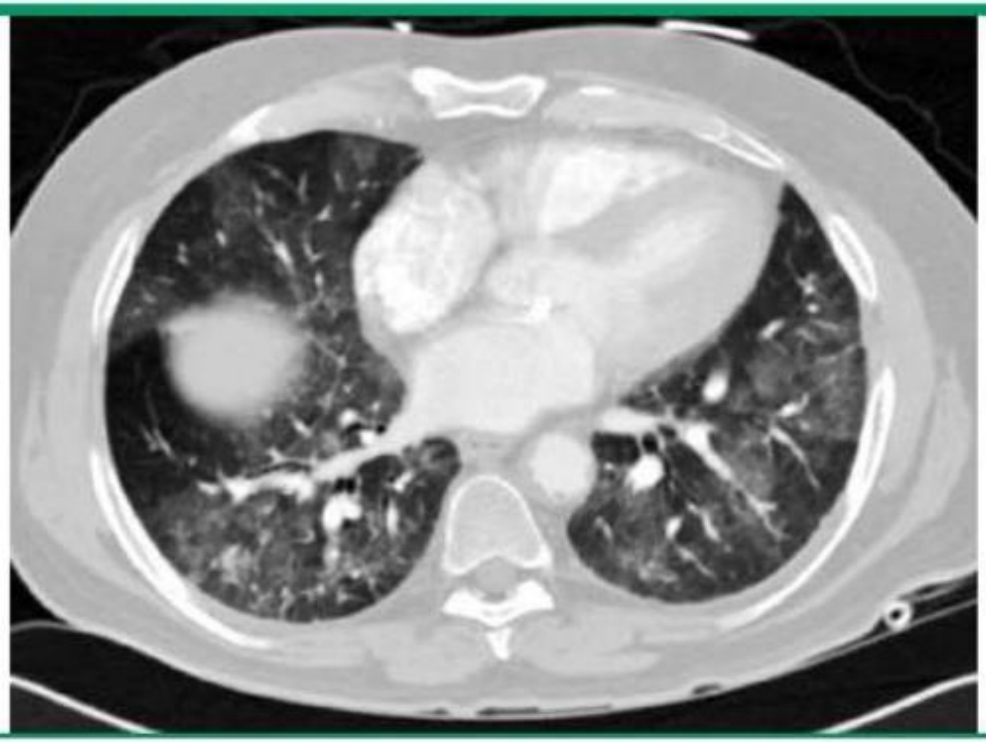
Diffuse alveolar hemorrhage due to inhalation of crack cocaine



Chest radiograph from a patient with diffuse alveolar hemorrhage due to inhalation of crack cocaine showing patchy upper zone opacities. The radiograph returned to normal in several days without specific treatment.

Courtesy of Marvin I Schwarz, MD.

Diffuse alveolar hemorrhage CT



Cryptogenic organizing pneumonia (COP)

- Number of studies have noted an association between collagen disorders and COP
- Study of open lung biopsies from 40 patients with parenchymal lung disease and RA : COP second most common finding following rheumatoid nodules
- Patients present with cough, SOB, malaise, weight loss and fever
- Crackles noted on physical examination

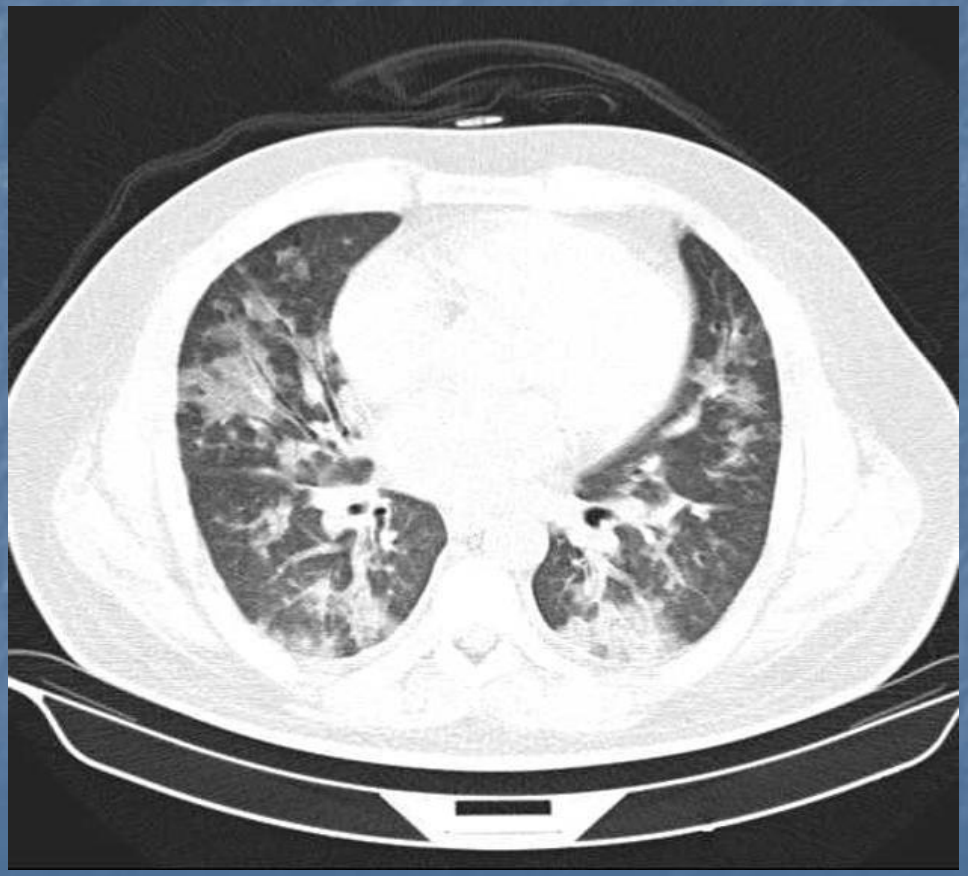
COP
Diagnostic tests

- ESR: usually elevated
- CXR: bilateral parenchymal opacities, often with preserved lung volume
- HRCT: uni- or bilateral consolidation; often patchy and peripheral
- PFTs: restrictive physiology with decreased DLCO and hypoxemia
- Biopsy: patchy intraluminal polypoid plugs of immature fibroblastic tissue within terminal bronchioles and peribronchiolar alveolar spaces

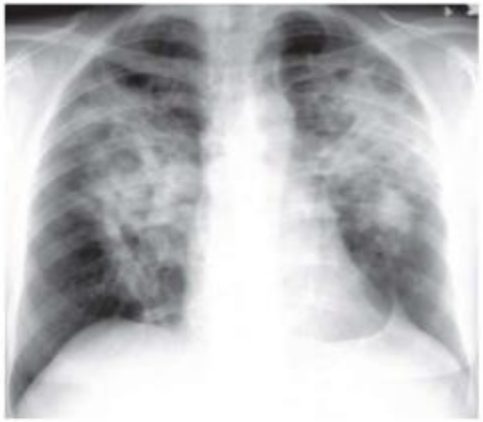
COP

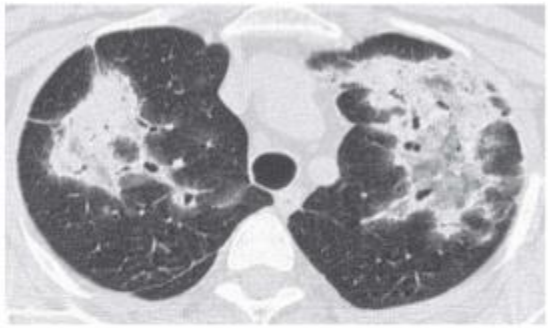
- Prognosis is good for those patients who receive treatment
- Most respond to oral corticosteroid therapy
- If not tolerated, cyclophosphamide is used
- Antibiotics are not helpful

COP



COP



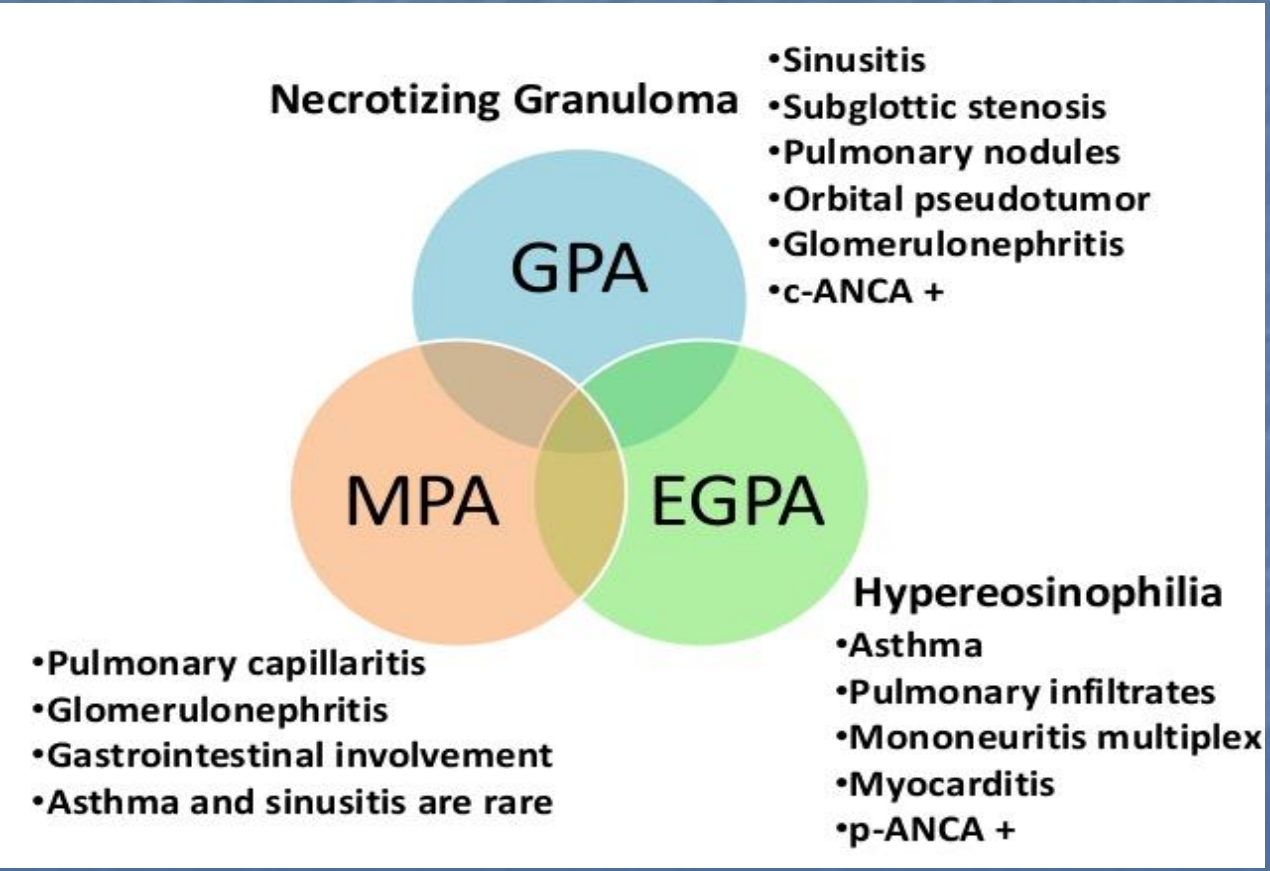


Primary idiopathic vasculitis

Small vessel

- Granulomatosis with polyangitis (formerly Wegener's granulomatosis)
- Eosinophilic granulomatosis with polyangitis (Churg-Strauss syndrome)
- Microscopic polyangiitis
- Isolated pauci-immune pulmonary capillaritis

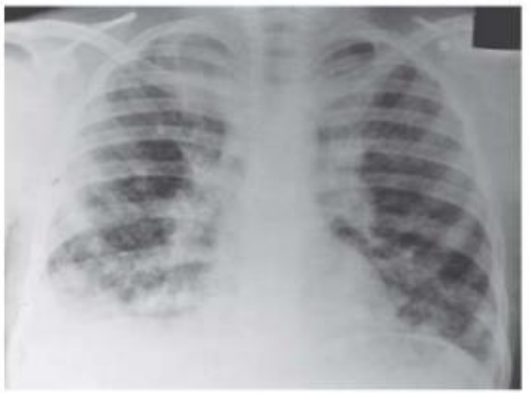
Vasculitis with likely lung involvement

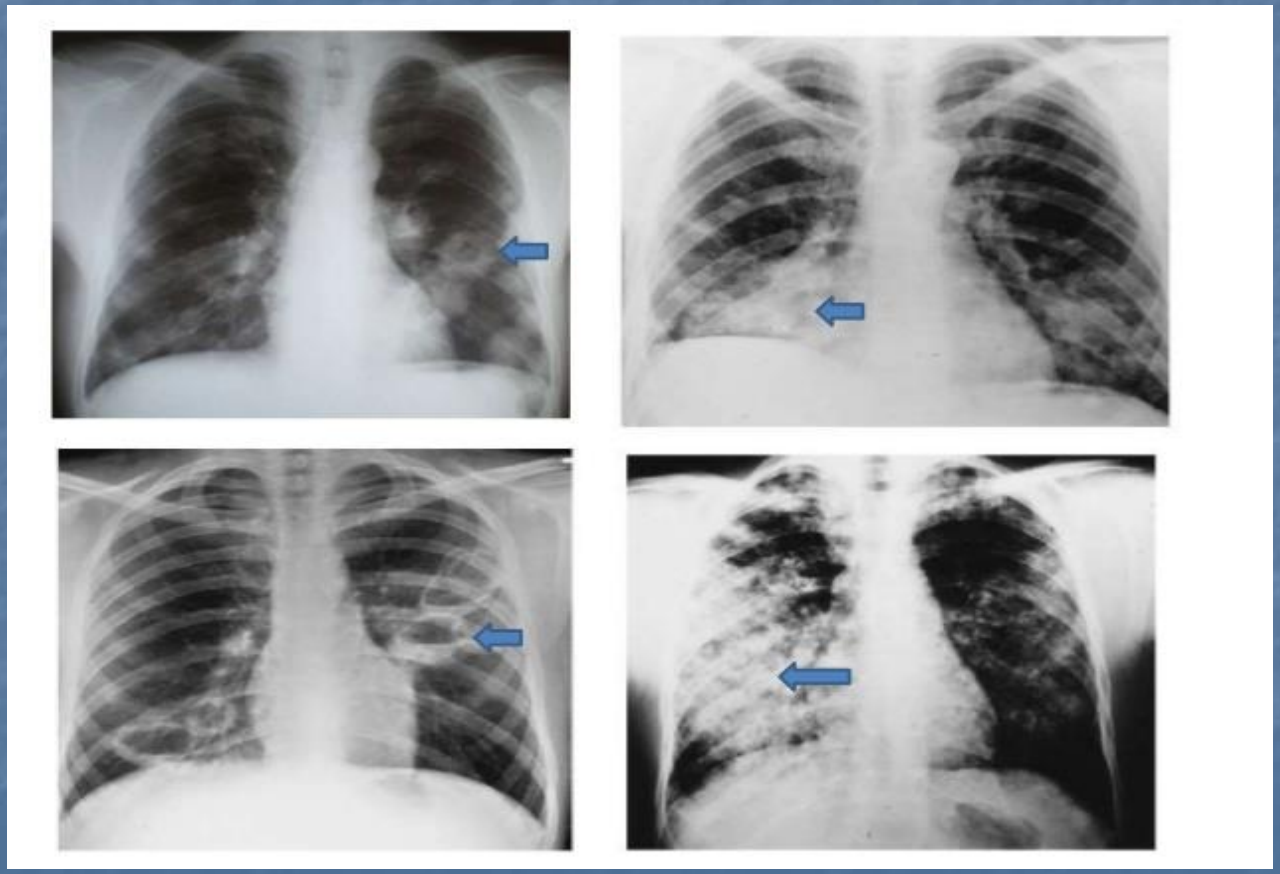


Pulmonary vasculitis

Radiology

- Transient alveolar-type infiltrates are most common
- Predominantly peripheral distribution
- Nodular lesions occasionally





Interstitial pneumonia

4a) INTERSTITIAL INFILTRATES / PNEUMONIA

- Diseases involving the space between the alveolus and capillary.
- The infiltrates consists of fluid and or cells that gather in the areas of the lungs

Drugs causing interstitial pneumonia:

- Epidermal growth factor receptor antagonist
- Tyrosine kinase inhibitors
- Methotrexate
- Nitrofurantoin

Hypersensitivity Pneumonitis –Clinical Course

- Acute hypersensitivity pneumonitis
- Subacute hypersensitivity pneumonitis
- Chronic hypersensitivity pneumonitis

Acute Hypersensitivity pneumonitis

Symptoms

- Cough
- Fever
- Sweating
- Myalgia
- Headache
- Nausea

JO A. DOUGLASS .et al .Middleton's allergy ; 8th edition 2013:1000-13

Acute Hypersensitivity pneumonitis

HRCT

- Ground-glass opacities
- Poorly defined centrilobular micronodules
- Mosaic attenuation
- Mediastinal lymphadenopathy

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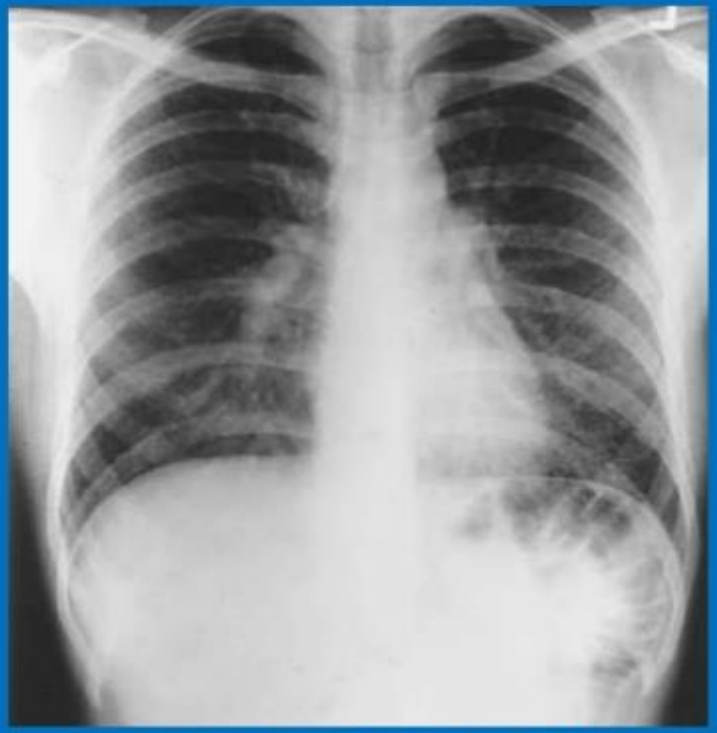
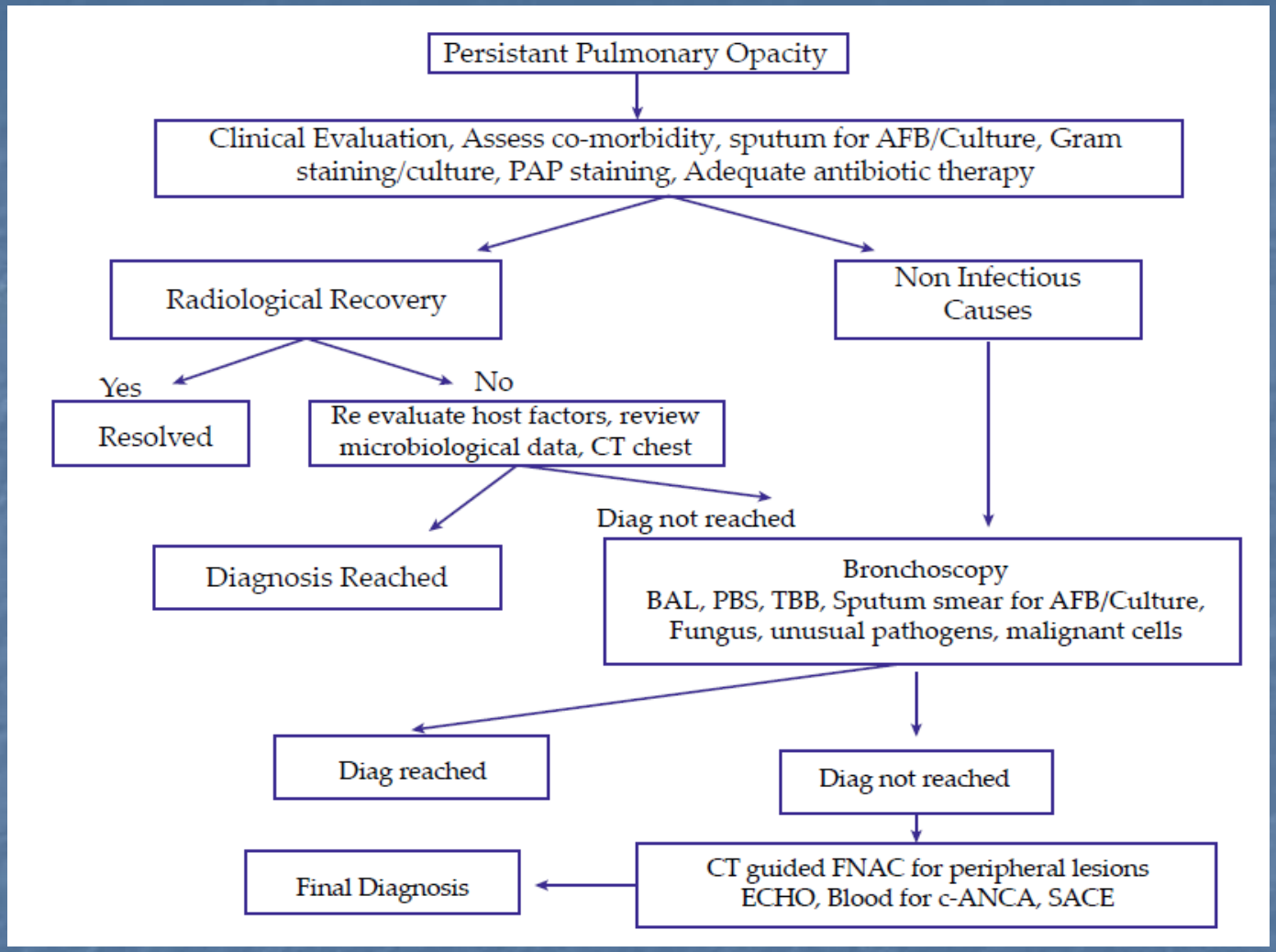
Hypersensitivity pneumonia



- Chest radiograph of a patient with acute pigeon breeder's disease.
- Note bilateral lower lobe nodular opacities.


Persistant Pulmonary Opacity
Clinical Evaluation, Assess co-morbidity, sputum for AFB/Culture, Gram staining/culture, PAP staining, Adequate antibiotic therapy
Radiological Recovery
Non Infectious Causes
Yes
No
Resolved
Re evaluate host factors, review microbiological data, CT chest
Diagnosis Reached
Diag not reached
Bronchoscopy
BAL, PBS, TBB, Sputum smear for AFB/Culture, Fungus, unusual pathogens, malignant cells
Diag reached
Diag not reached
Final Diagnosis
CT guided FNAC for peripheral lesions
ECHO, Blood for c-ANCA, SACE