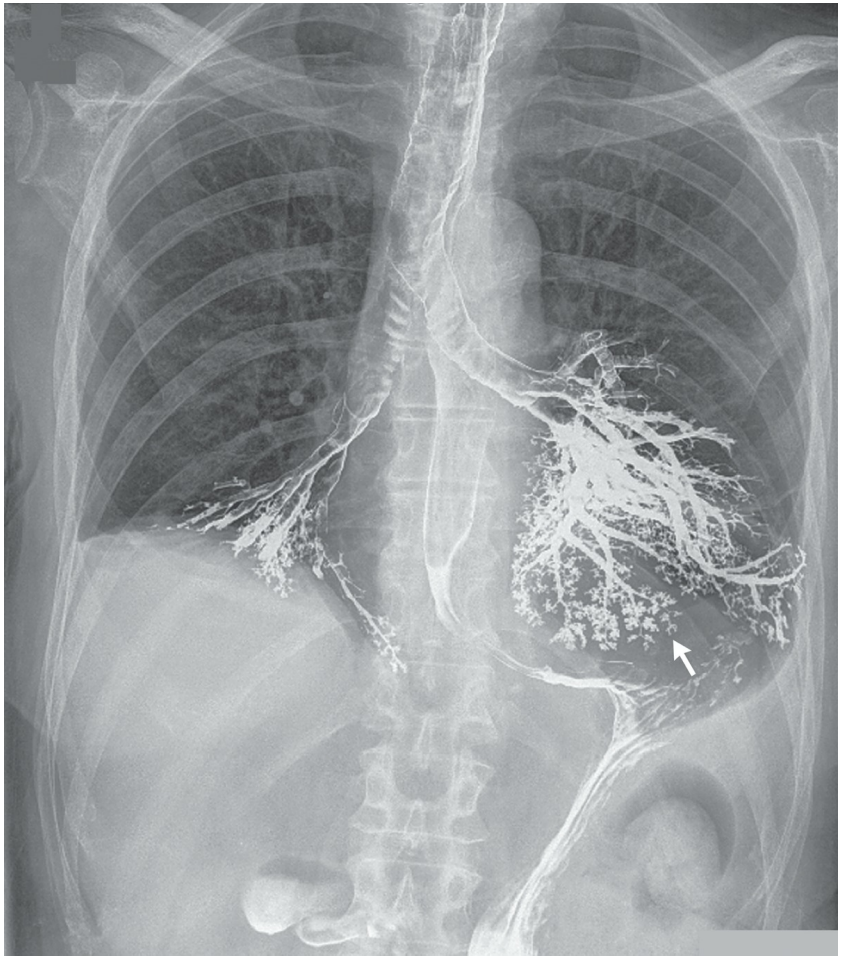

Pulmonary Aspiration

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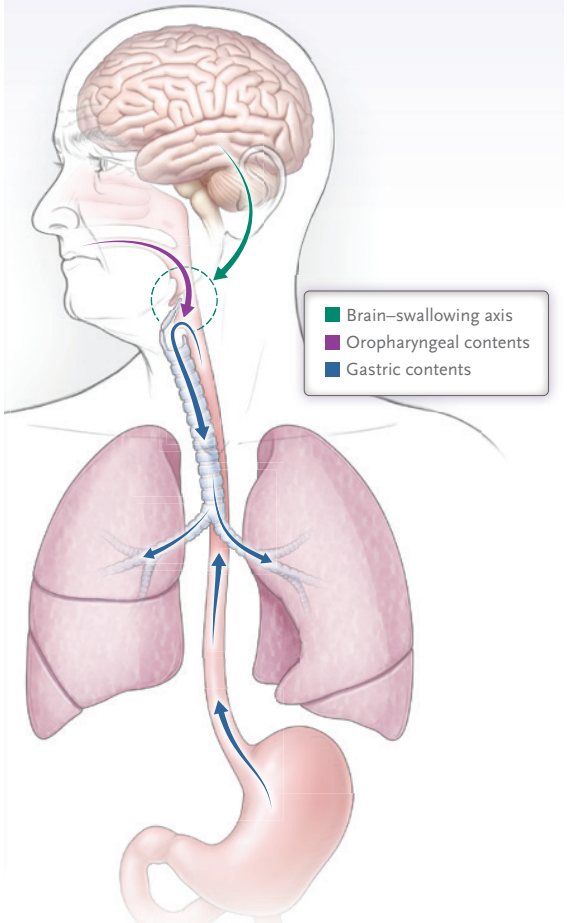
Introduction & Terminology

- Pulmonary aspiration is the entry of liquid and/or solid matter through the glottic opening (vocal cords) into the tracheobronchial tree of the lungs

- Origin of the liquid/solid matter can be from endogenous (i.e. gastric liquid/vomit, oropharyngeal secretions) or exogenous (i.e. food, dietary liquids) sources



"Pulmonary aspiration": Generally occurs as a consequence of one or more of the following conditions:

Dysphagia from neurologic conditions, regional mass effect, post-extubation, esophageal disease

Impaired consciousness with compromise of cough reflex and glottic closure (i.e. seizures, medications, alcohol, illicit drugs, anesthesia)

Mechanical disruption of glottic structures and/or protective mechanisms (i.e. endotracheal intubation, tracheostomy, nasogastric tube)

Increased gastric contents (i.e. GERD, obstruction, tube feeds)

Mandell LA, Niederman MS. Aspiration Pneumonia. *N Engl J Med*. 2019

Introduction & Terminology

- Consequences of pulmonary aspiration:
  - **Chemical pneumonitis**
  - **Bacterial infection**:
    - Pneumonia (or commonly referred to as "aspiration pneumonia")
    - Lung abscess
    - Empyema (infection of the pleural space)
  - **Foreign body aspiration**

Introduction & Terminology

- Technically, almost all pneumonias are “aspiration pneumonias”, exceptions:
  - Tuberculosis, Legionella PNA, and viral PNAs (i.e. Influenza, COVID19, etc.)
- Nasopharyngeal flora is the source
- Microaspiration - approximately 50% of healthy adults aspirate during sleep*
- Hence why we treat with different antibiotics for:
  - Community-acquired PNA (i.e. *Strep pneumoniae, Haemophilus,* etc.)
  - Hospital-acquired PNA and ventilator-acquired PNA (i.e. MRSA, *Pseudomonas,* etc.)
- PNAs develop as results of different factors:
  - Immunity status, h/o lung disease, mucociliary clearance, inoculum quantity & frequency, and virulence of organism

* Gleeson K, Eggli DF, Maxwell SL. Quantitative aspiration during sleep in normal subjects. *Chest*. 1997

Chemical Pneumonitis

- Macroaspiration of gastric contents (acid, generally pH<2.5, even as little as 25mL)
- Generally perioperative
- Acute injury and inflammatory cascade
- Generally presents with acute decompensation
- Hard to distinguish against aspiration pneumonia
- Supportive therapy, does not require antibiotic therapy (however empiric abx should be started at onset), and bronchoscopy

Aspiration Pneumonia

- **Inpatient Clinical Features:**
  - Acute/subacute onset of respiratory symptoms (wheezing, cough, SOB/DOE)
  - Abnormal vital signs (tachycardia, fever +/-, tachypnea)
  - Requiring O2 (or increased requirement)
  - Witnessed aspiration event (but commonly not present)

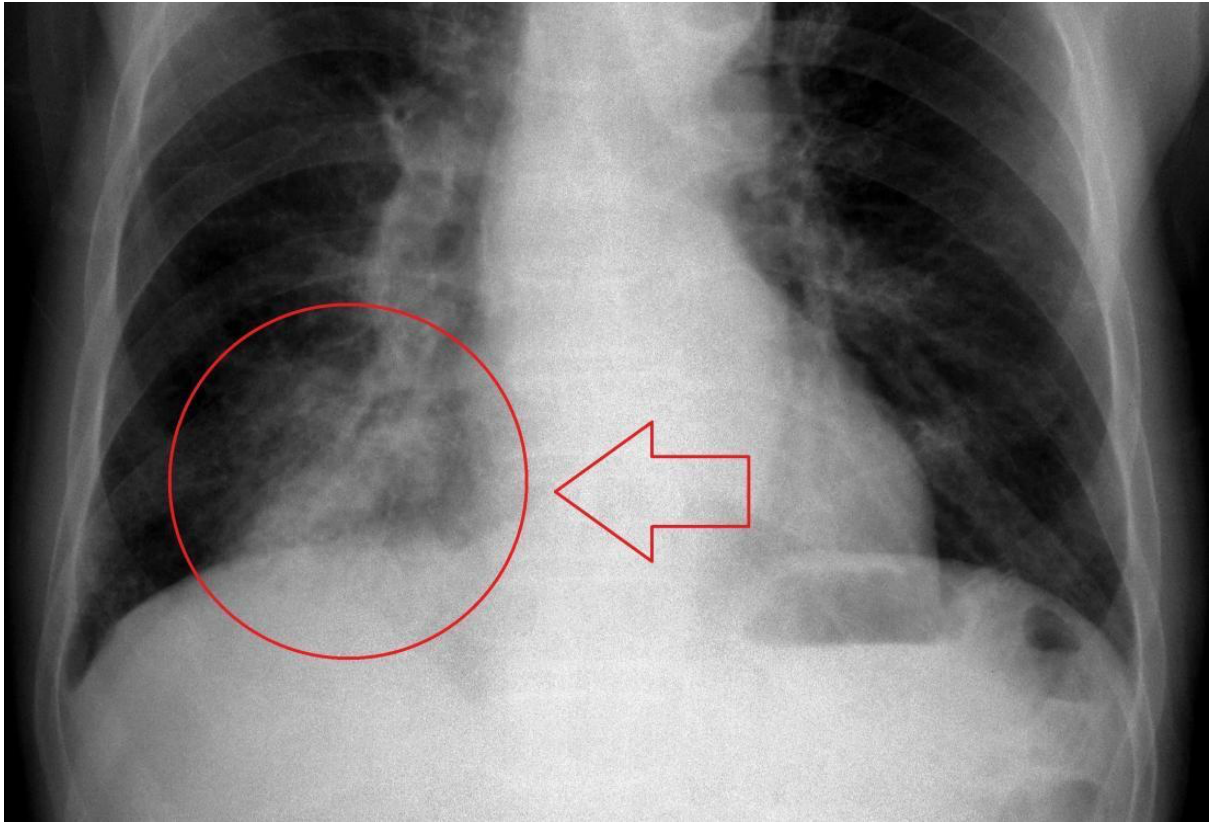
- **Outpatient Clinical Features:**
  - Asymptomatic to mild respiratory symptoms
  - Loss of appetite, fatigue
  - May or may not have recent history of recent pneumonia/hospitalization
  - Witnessed dysphagia symptoms are common (coughing with eating/drinking)

Aspiration Pneumonia

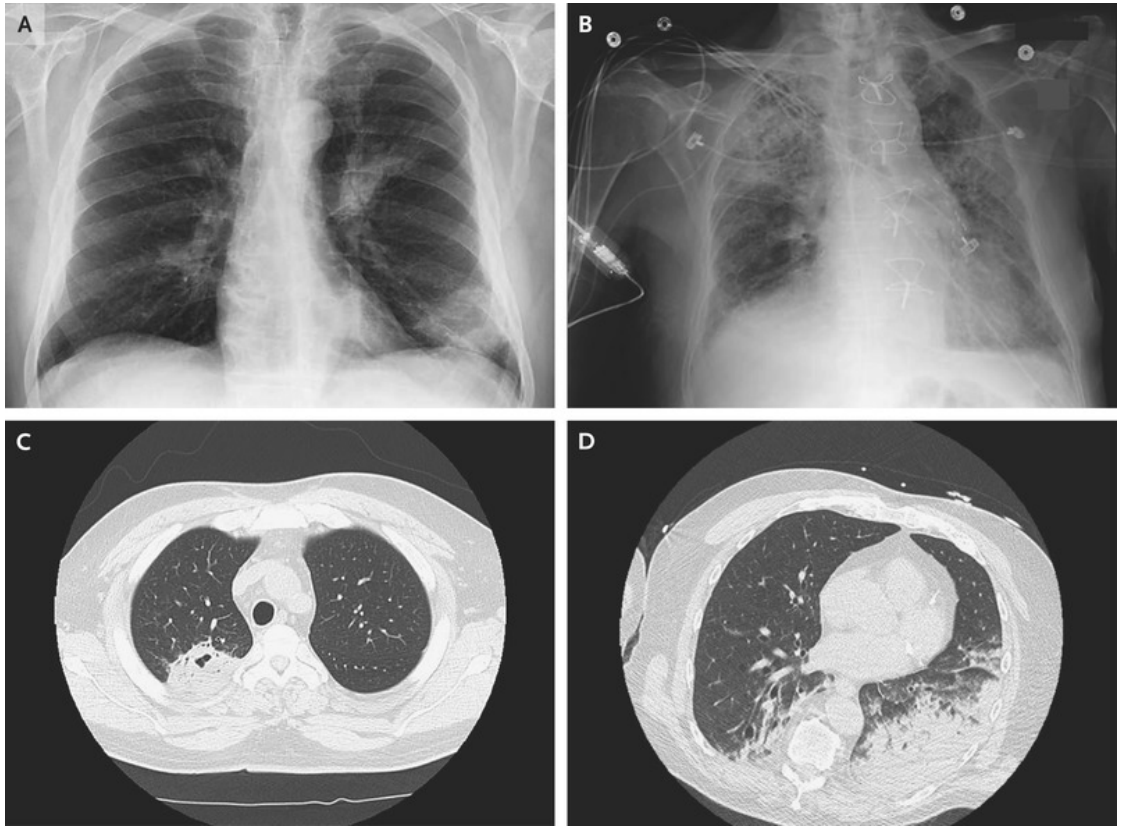
- **Diagnosis**
  - STRONG clinical suspicion
    - H/o risk factors for dysphagia
    - Witnessed dysphagia symptoms
    - Debilitated state?
    - Recent hospitalization/pneumonia?
  - Imaging and Swallow Studies
    - Normal CXRs can be see early on with aspiration PNA
    - Study showed that 28% of patients had normal CXR but abnormal CT chest*
    - Hallmark of aspiration: abnormalities in gravity-dependent regions of the lung (right>left lower lobe and posterior segments of upper lobes)
  - Microbiological studies (sputum culture and bronchoscopy)
    - Generally not needed and can be difficult to obtain
    - Consider bronchoscopy referral for recurrent PNAs in the same region of the lung

* Miyashita N, Kawai Y, Tanaka T, et al. Detection failure rate of chest radiography for the identification of nursing and healthcare-associated pneumonia. *J Infect Chemother*. 2015

Aspiration Pneumonia



Aspiration Pneumonia



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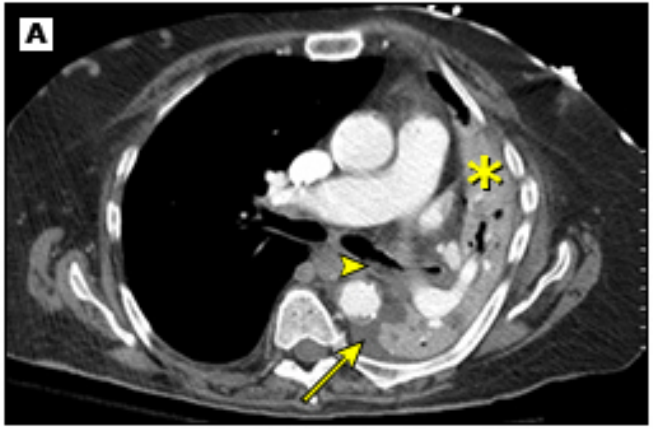
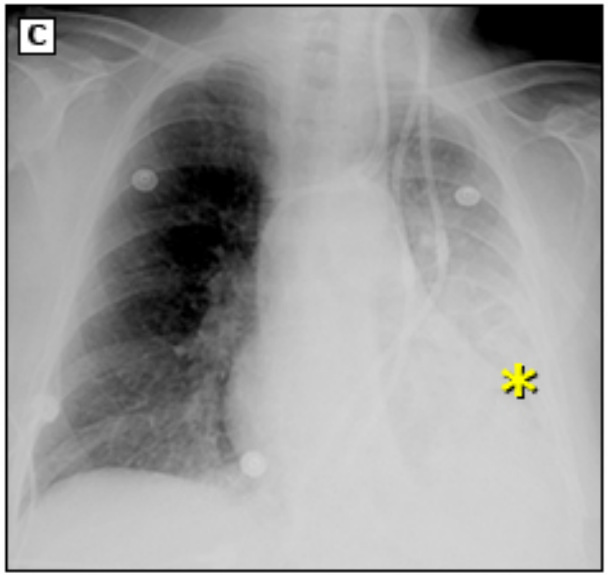
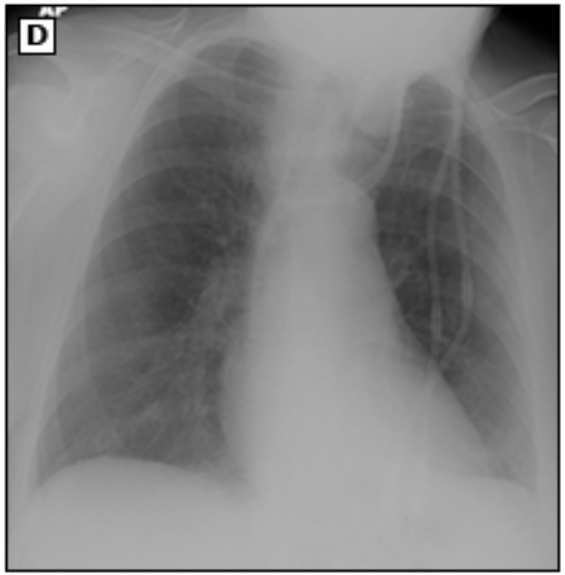
Aspiration Pneumonia

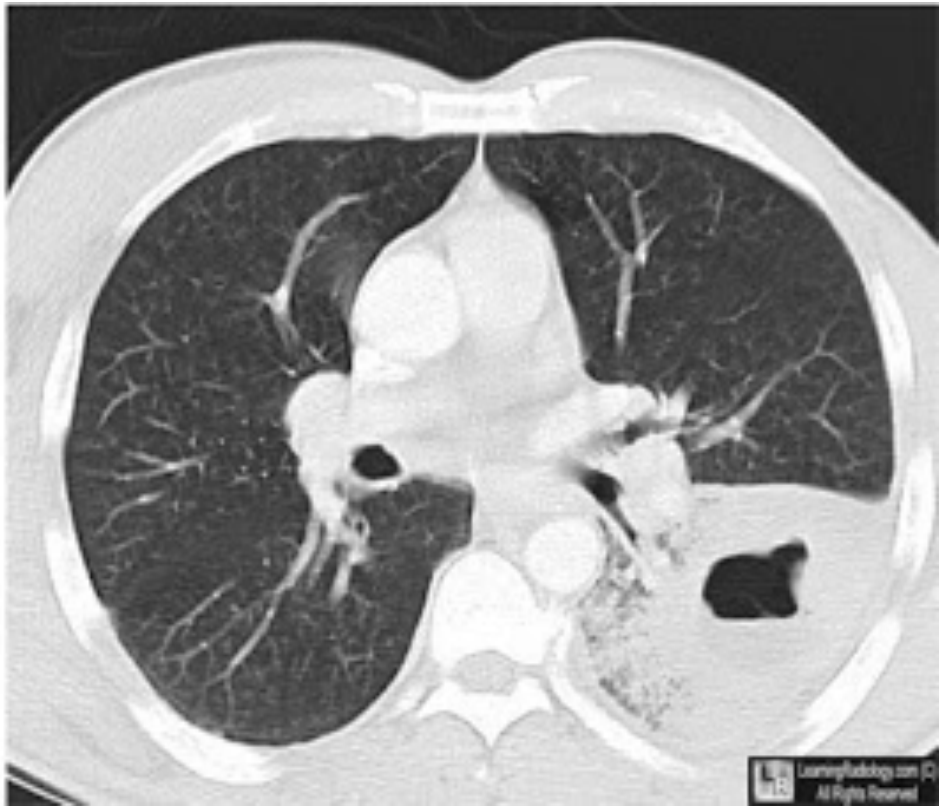




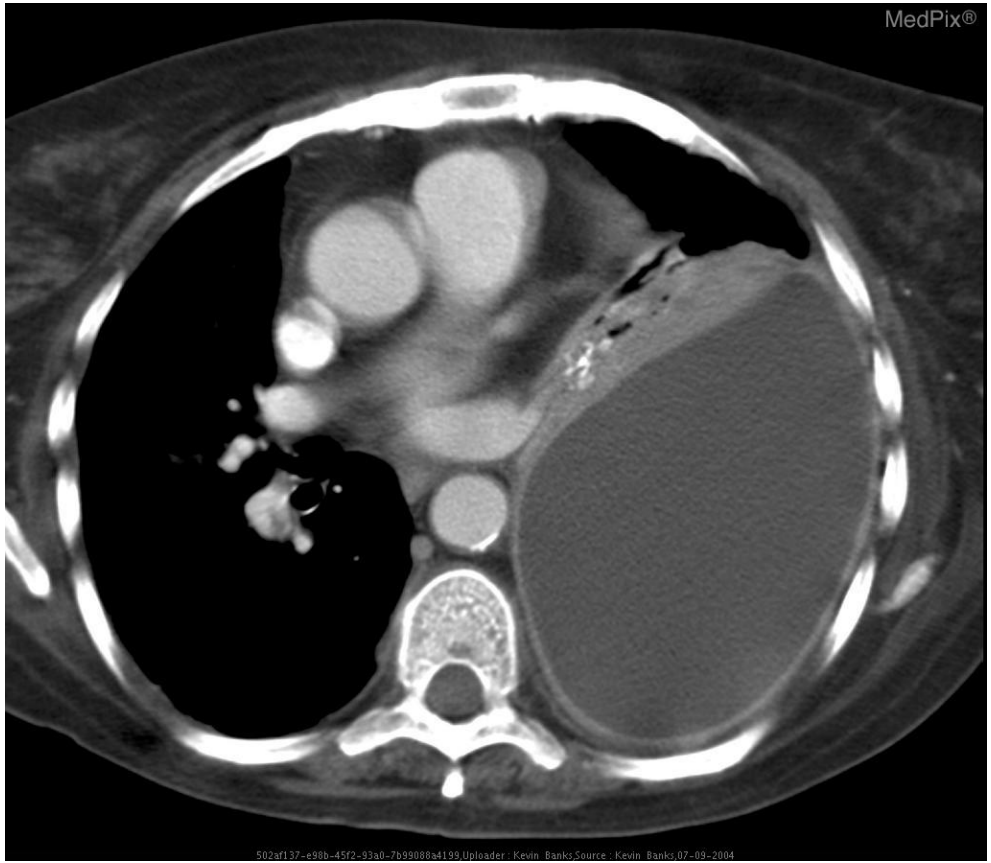


Aspiration pneumonia in adults – Uptodate.com

Lung Abscess



Empyema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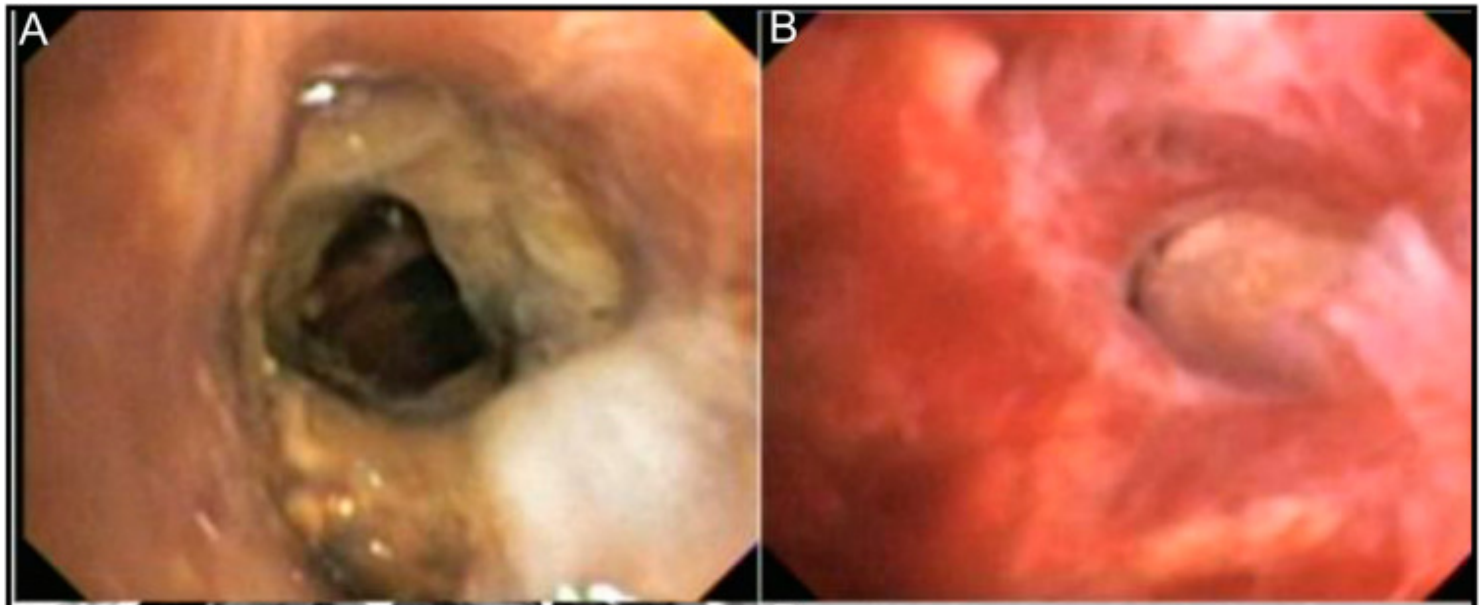
Aspiration Pneumonia

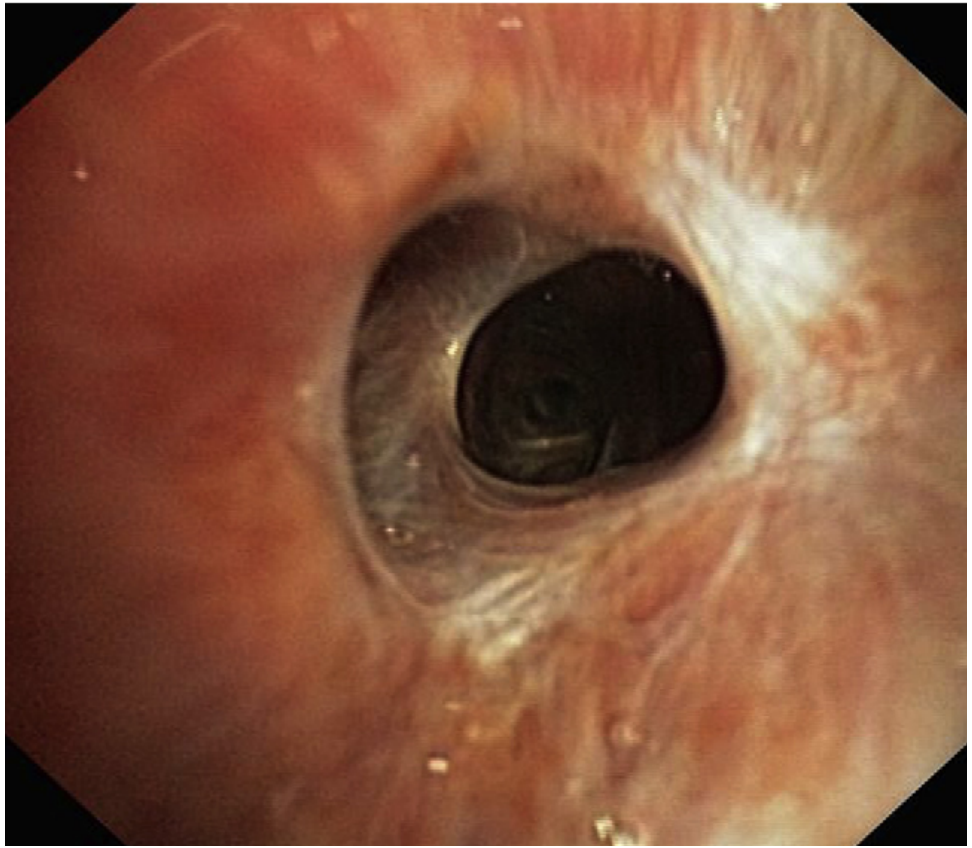
- **Microbiology**
  - Historically: anaerobes were considered the culprit
  - Current literature: very likely mixed with aerobic and anaerobic bacteria
  - Important: evaluate oral cavity and dentition
  - Culprit organisms are based upon community vs hospital-acquired risk factors

- **Treatment**
  - Treat underlying etiology of dysphagia and speech/swallow therapy
  - Outpatient (CAP profile): Augmentin (amoxicillin + clavulanate), if PCN allergic: clindamycin and consider adding fluoroquinolone
  - Inpatient (CAP profile): Unasyn (ampicillin + sulbactam), if PCN allergic: ceftriaxone + metronidazole
  - HAP or concern for MDR: Zosyn or a carbapenem, okay to start MRSA coverage with Vancomycin but discontinue if MRSA testing is negative

Foreign Body Aspiration – Iron Pill Aspiration Syndrome

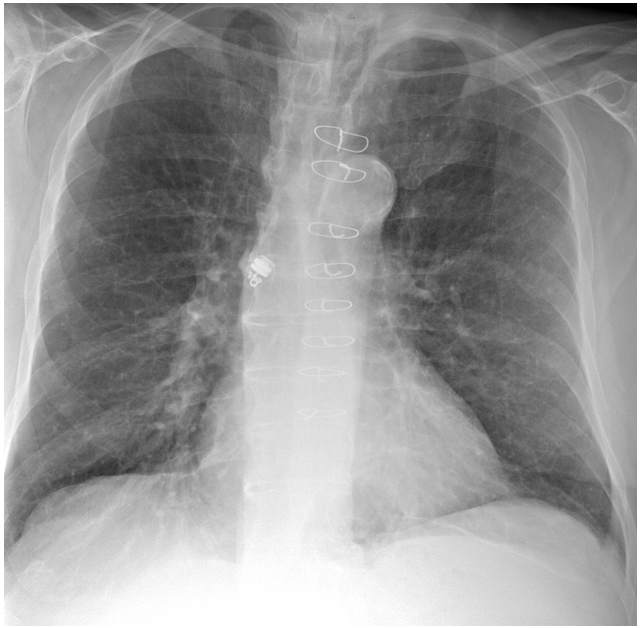


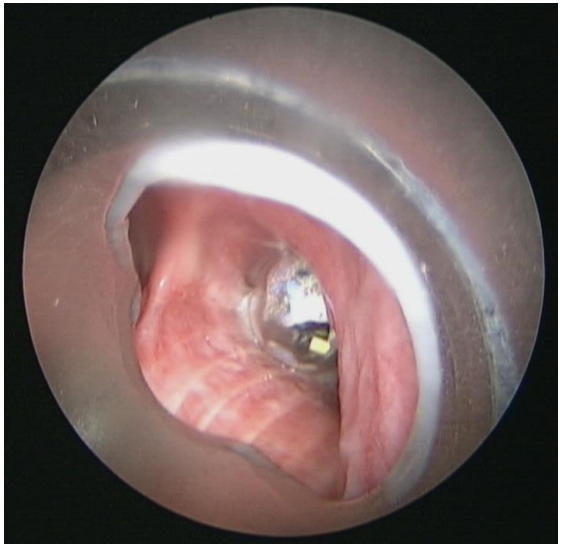
Foreign Body Aspiration – Iron Pill Aspiration Syndrome



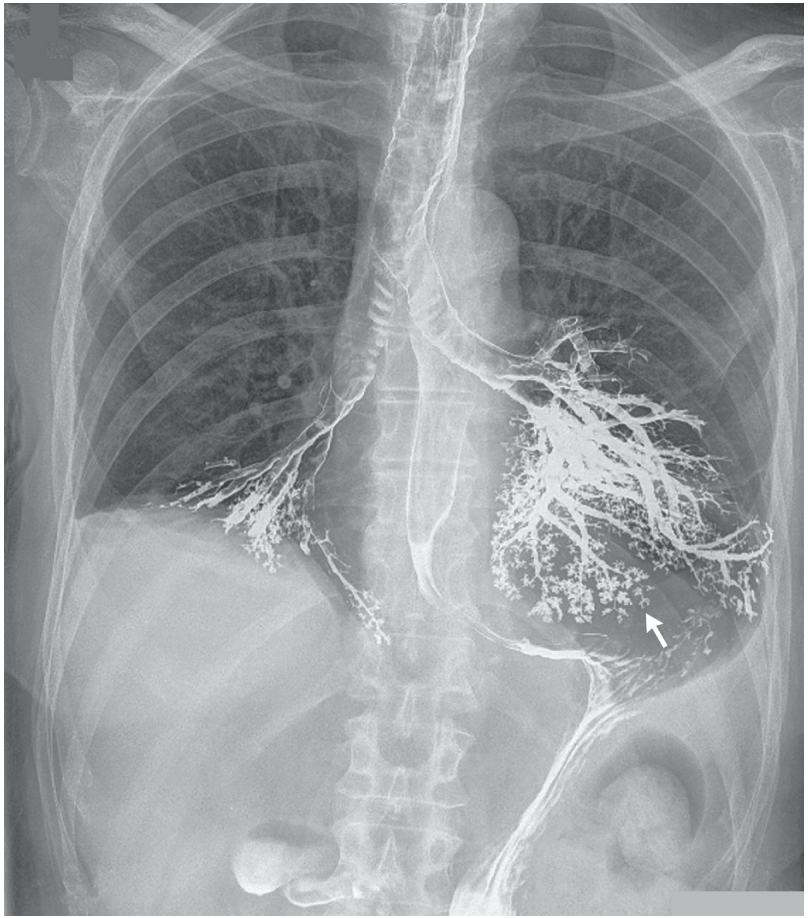
Foreign Body Aspiration – Dental Bridge

Foreign Body Aspiration – Capsule Endoscopy





Foreign Body Aspiration – Barium Aspiration



Prevention

- Chemical pneumonitis: pre-operative fasting for 8 hours for solids and 2 hours for clear liquids
- Minimize aspiration-promoting medications: sedatives, antipsychotics, antihistamines
- Speech & swallow evaluation + treatment
- Early mobilization for hospitalized and debilitated patients
- ACE inhibitors for acute stroke: reduced risk of aspiration (elevation of substance P)*
- Oral hygiene care studies have been been equivocal overall (i.e. chlorhexidine rinse, tooth extractions, oral care) – advise dental/oral care

* Shinohara Y, Origasa H. Post-stroke pneumonia prevention by angiotensin-converting enzyme inhibitors: results of a meta-analysis of five studies in Asians. *Adv Ther*.

Summary

- Maintain high clinical suspicion for this population of patients
- Gravity-dependent PNA on chest imaging should bring aspiration into your differential diagnosis
- Recurrent pneumonias in the same location (RED FLAG, warrants further investigation)
- Antibiotic coverage should be based upon patient's risk profile (community vs hospital/MDR organisms) and ensure anaerobic bacteria coverage
- Prevention is the best treatment (challenging in our population)

Thank You!