



FOREIGN BODY INGESTION & ASPIRATION

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Agenda

- Patient presentation
- Overview of foreign body ingestion & aspiration
- Review of anatomy
- Radiography
- Complications
- Management
- Pt outcome



First, our patient!



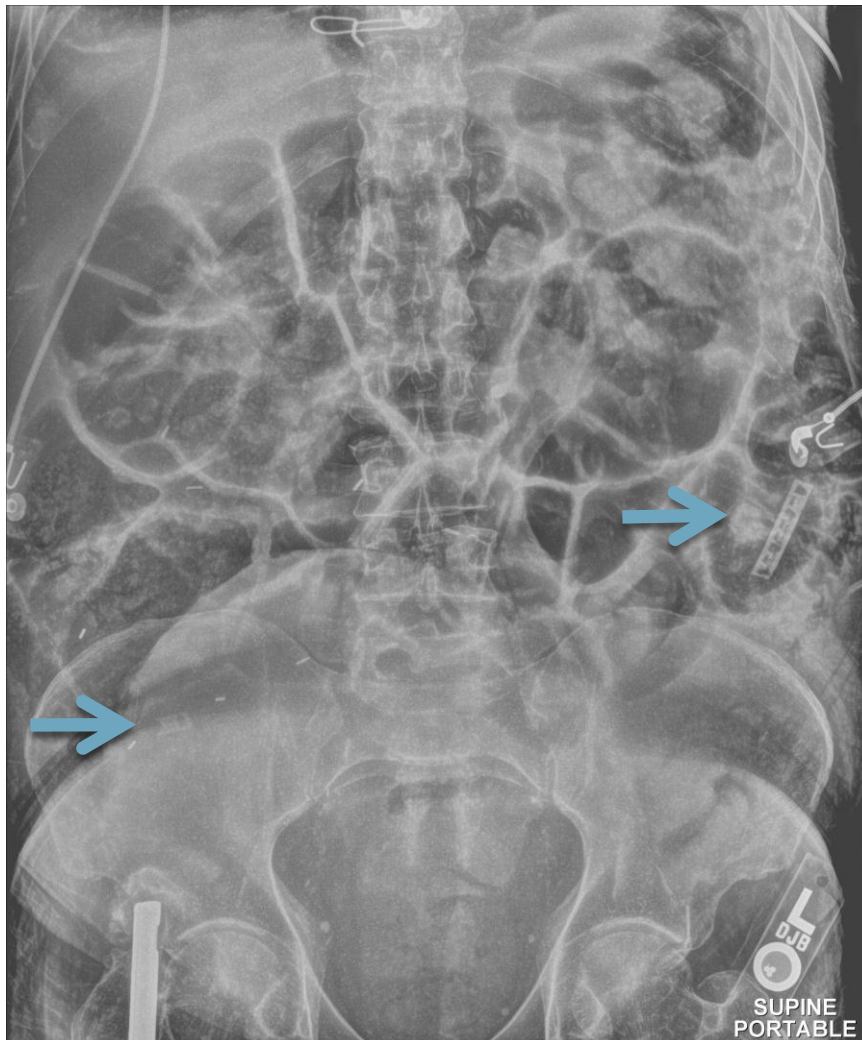
Our Patient: Clinical Presentation

- 56 yo M w/ h/o schizophrenia who presents to ED w/ abdominal pain and suicidal ideation
- HPI: Pt brought from group home after threatening to commit suicide. Admits to a plan but refuses to divulge the details. Abd pain of unclear duration.
- PE:
 - VS: T 97.9 BP 139/99 HR 69 RR 20 O₂Sat 99%RA
 - Abd: generalized tenderness to palpation w/o rebound or guarding



Our Patient: Abdominal Plain

Film



PACS, BIDMC

Findings:

- 6.9 cm and 1.1 cm radiopaque foreign bodies in the LLQ and RLQ
- Mild gaseous distention of small and large bowel loops
- No pneumoperitoneum



Our Patient: Added History

- On further questioning pt admitted to swallowing 6 razor cartridges



From: www.stockngo.com



Overview



Pediatrics

- Foreign body ingestion: over 125,000 cases per year in US amongst children 19 & under
 - ▣ Often asymptomatic; drooling, inability to swallow, chest pain, or respiratory distress; obstructive symptoms
 - ▣ Most commonly coins
- Foreign body aspiration: 5th most common cause of death in infants <1 year of age
 - ▣ Most commonly infants and children between 6 months & 3 years old
 - ▣ Coughing, wheezing, and stridor
 - ▣ Most commonly nuts and other organic material



Adults

- Foreign body ingestion: usually elderly who are edentulous or mentally impaired – food bolus impaction above esophageal stricture/ring
 - ▣ Intentional ingestion in inmates or psychiatric pts
 - ▣ Pill ingestion
 - ▣ Most commonly acute onset of dysphagia, inability to swallow saliva, or neck tenderness; signs of obstruction or perforation
- Foreign body aspiration: rare
 - ▣ Coughing most commonly; usually no acute presentation due to distal obstruction; dyspnea is less common

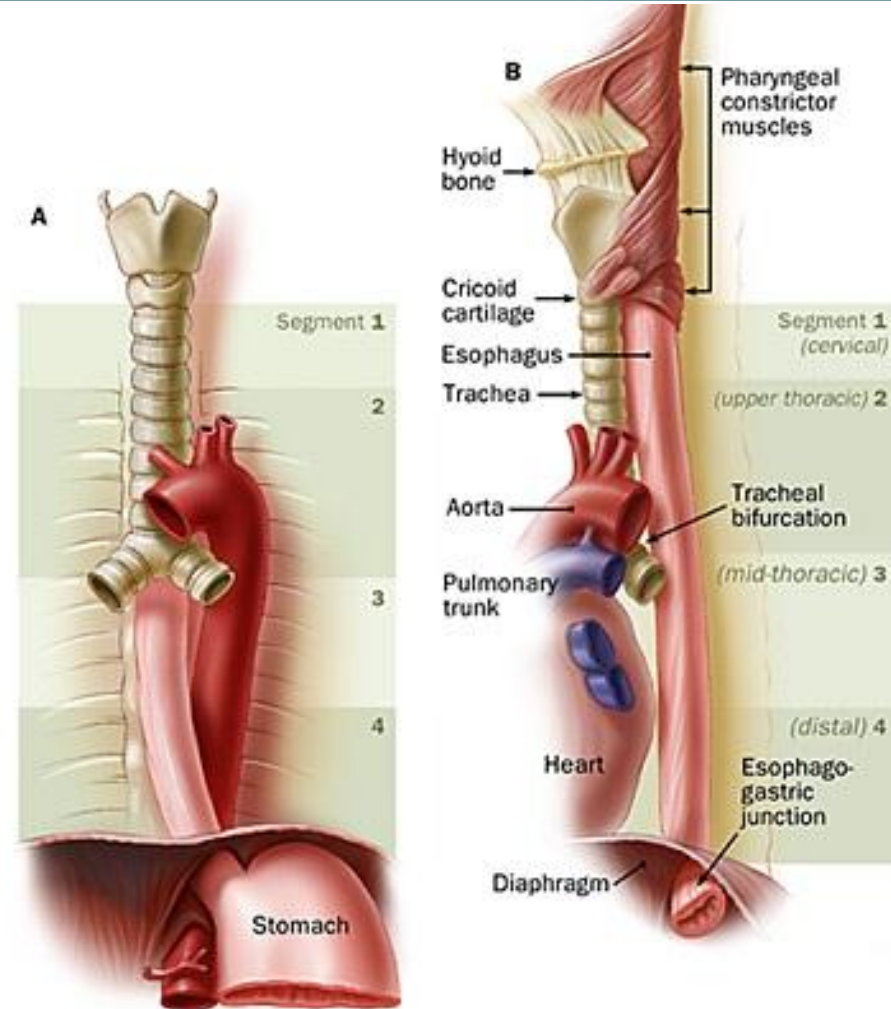


Review of Relevant Anatomy



Esophagus

- Begins at lower border of cricoid cartilage
- Descends anterior to vertebral column in the superior & posterior mediastinum
- Midline placement w/ 2 leftward curvatures:
 - B/t commencement and 5th thoracic vertebrae
 - Distal esophagus approaching gastroesophageal junction
- Most contracted at commencement and at level of diaphragm

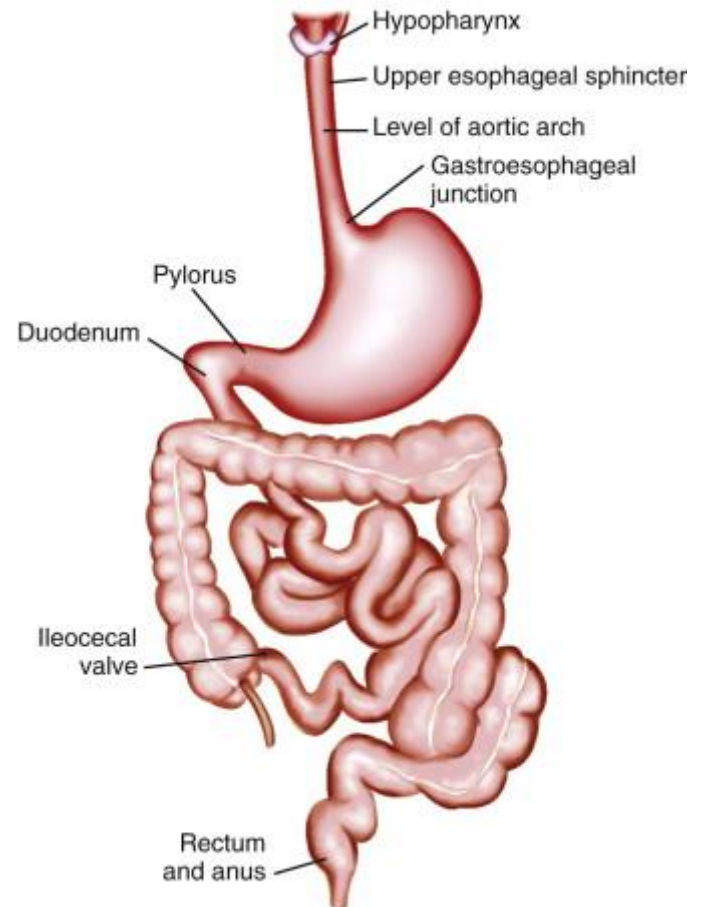


From: Hopkins-gi.org



Common Sites of Impaction & Obstruction

- Esophagus: level of thoracic inlet, aortic arch/left mainstem bronchus, and just above GE junction
- Areas of narrowing or angulation in the remainder of the GI tract, including the pylorus, duodenal sweep, ileocecal valve, and rectum

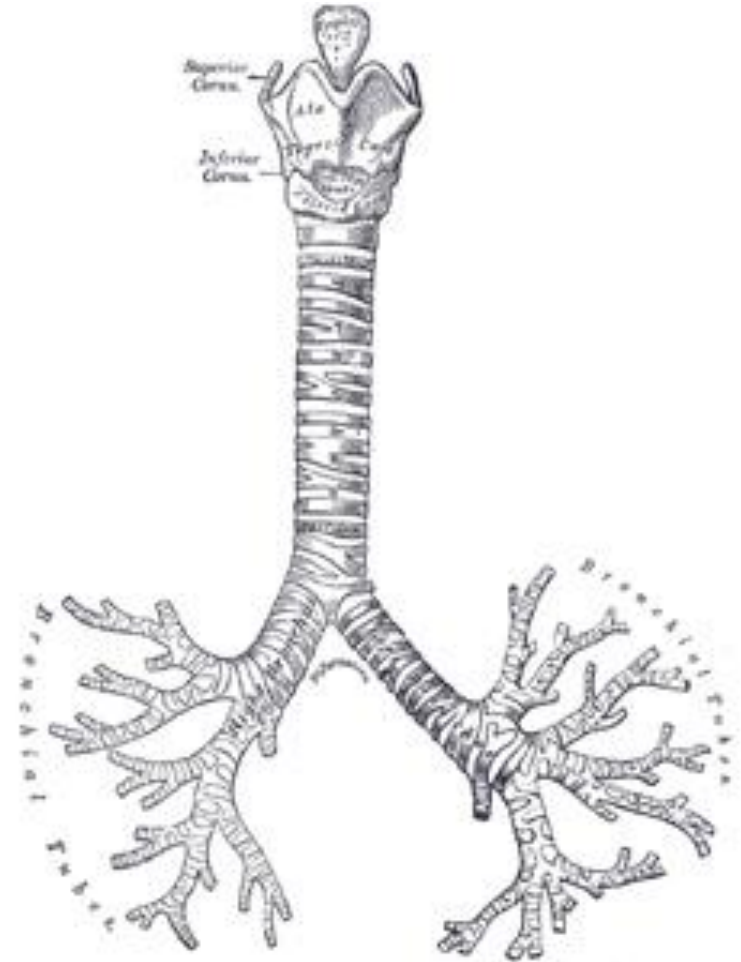


From: Ginsberg & Pfau,
<http://www.mdconsult.com.ezp-prod1.hul.harvard.edu/books>



Trachea

- Bounded by C-shaped cartilaginous rings, which confers a convex anterior surface w/ posterior flattening
- Divides into R and L mainstem bronchi at the carina
- R mainstem more vertically oriented and wider in caliber compared to L
 - R mainstem more prone to foreign body aspiration (60% of cases involve R lung)



From: *Gray's Anatomy*,
<http://www.bartleby.com/107/237.html>



Radiologic Approach



Menu of Tests

- **Plain radiograph**
- Contrast esophagram
- CT
- Less commonly MRI



Plain Radiograph

- Initial evaluation for anyone suspected of foreign body ingestion or aspiration
- Ingestion: anteroposterior and lateral views of the chest as well as KUB
 - 60% of ingested foreign bodies are radiopaque: coins, metal (except aluminum), magnets
 - Radiolucent: fish bones, chicken bones, wood, aluminum, glass, food impactions



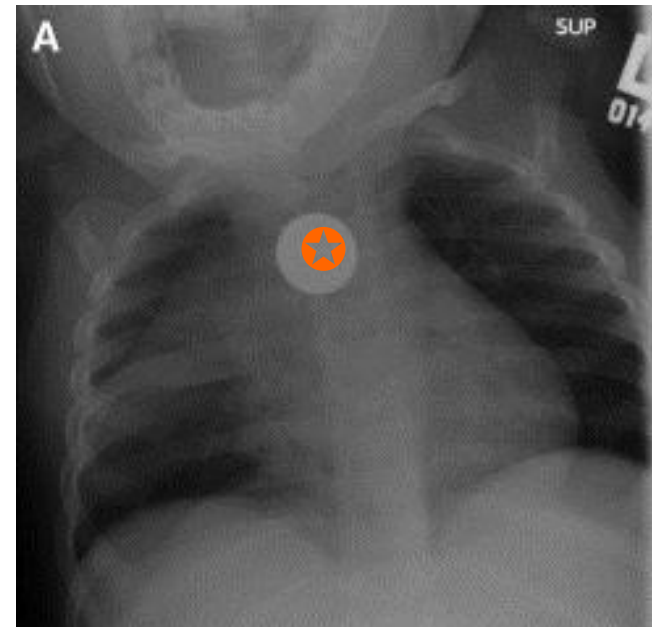
Plain Radiograph (Continued)

- Aspiration: AP and lateral films of chest
 - ▣ Only 10% of objects children aspirate are radiopaque
 - ▣ May see subglottic density or swelling
 - ▣ Air-trapping may result in hyperinflation of the affected lung, which can be demonstrated by lack of lung compression on dependent lateral decubitus view
 - ▣ Sensitivity and specificity of 68-74% and 45-67%, respectively, in kids



Comparison Pt #1: Coins on CXR

- Toddler with respiratory distress: coin ingestion or aspiration?
 - ▣ When in esophagus, coin is en face on frontal radiograph because of compression of esophagus between the trachea and spine
 - ▣ When in trachea, coin is en face on lateral radiograph because of C-shaped cartilaginous rings

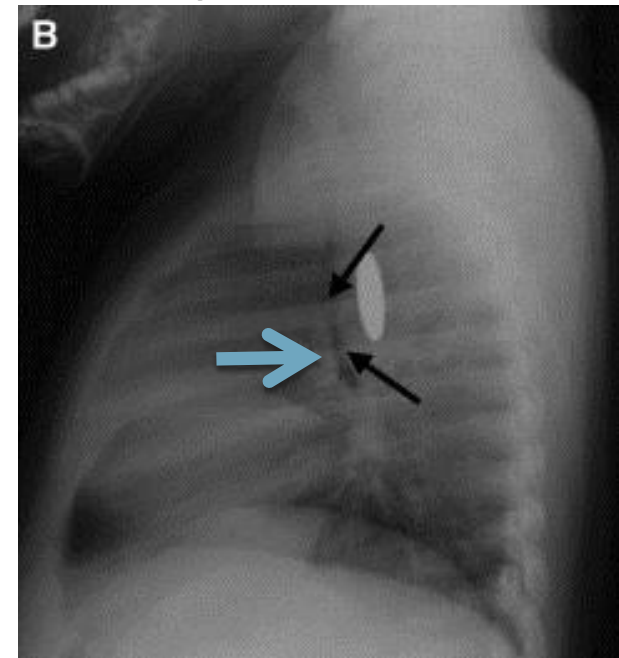


Findings:

-Coin en face on frontal radiograph (A) → esophagus

-Lodged at level of aortic arch

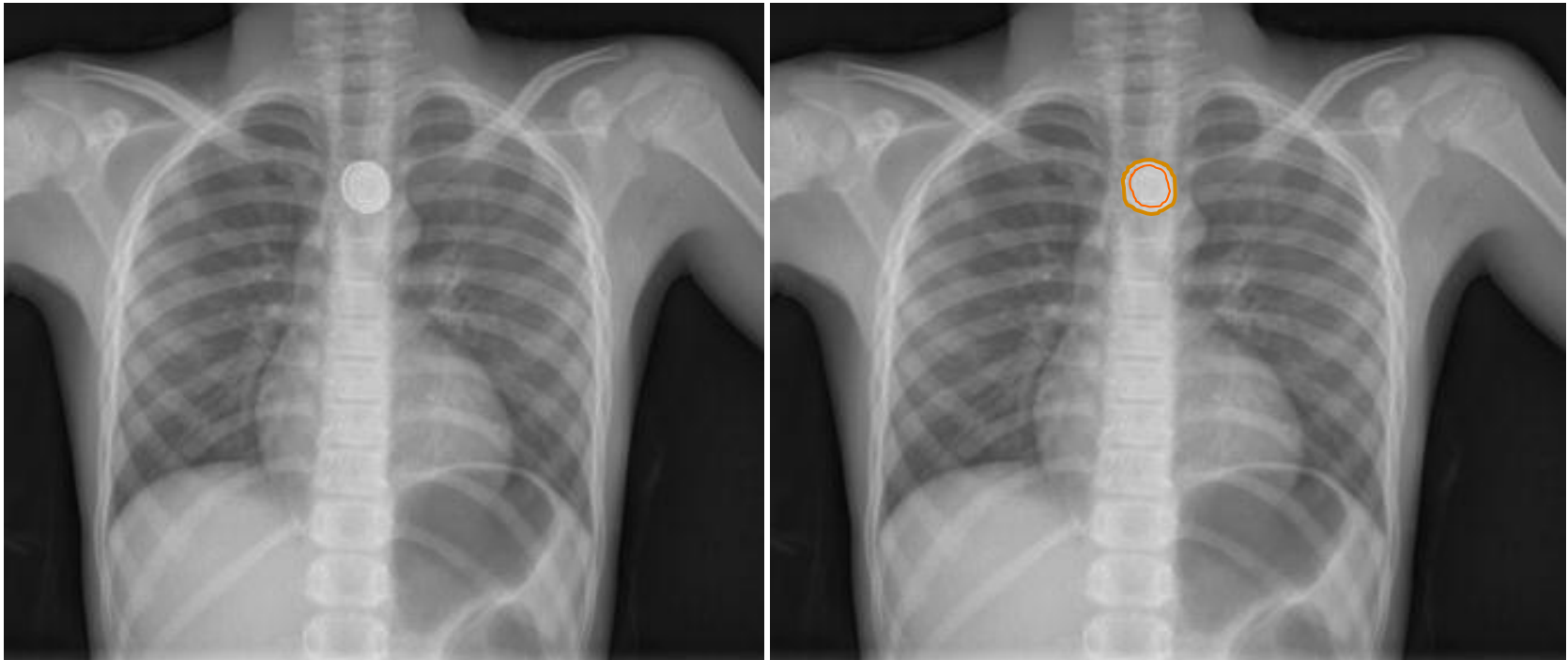
-Associated edema resulting in airway compression





Comparison Pt#2: Disc Battery on CXR

- Can easily be mistaken for a coin
- Step-off between anode and cathode confers a targetoid appearance



From: Marom T et al. Battery ingestion in children. International Journal of Pediatric Otorhinolaryngology 74 (2010): 849-854.



Contrast Esophagram

- Can identify non-radiopaque foreign body ingestions
- Generally not indicated:
 - May obscure subsequent endoscopy
 - If obstructed, risk for aspiration of contrast
- May be helpful post-removal of foreign body to identify posttraumatic pseudodiverticulum or underlying stricture



CT

- Ingestion: CT with 3-D reconstruction can identify radiolucent foreign bodies
- Aspiration: near 100% sensitivity
 - Indicated in pts with typical symptoms and high clinical suspicion with negative or equivocal radiographic findings
 - Findings: endoluminal mass with various attenuation; may also see post-obstructive air-trapping, atelectasis, or consolidation



MRI

- Less commonly used
- May identify radiolucent foreign bodies
- Contraindicated if the suspected foreign body is metallic



Complications

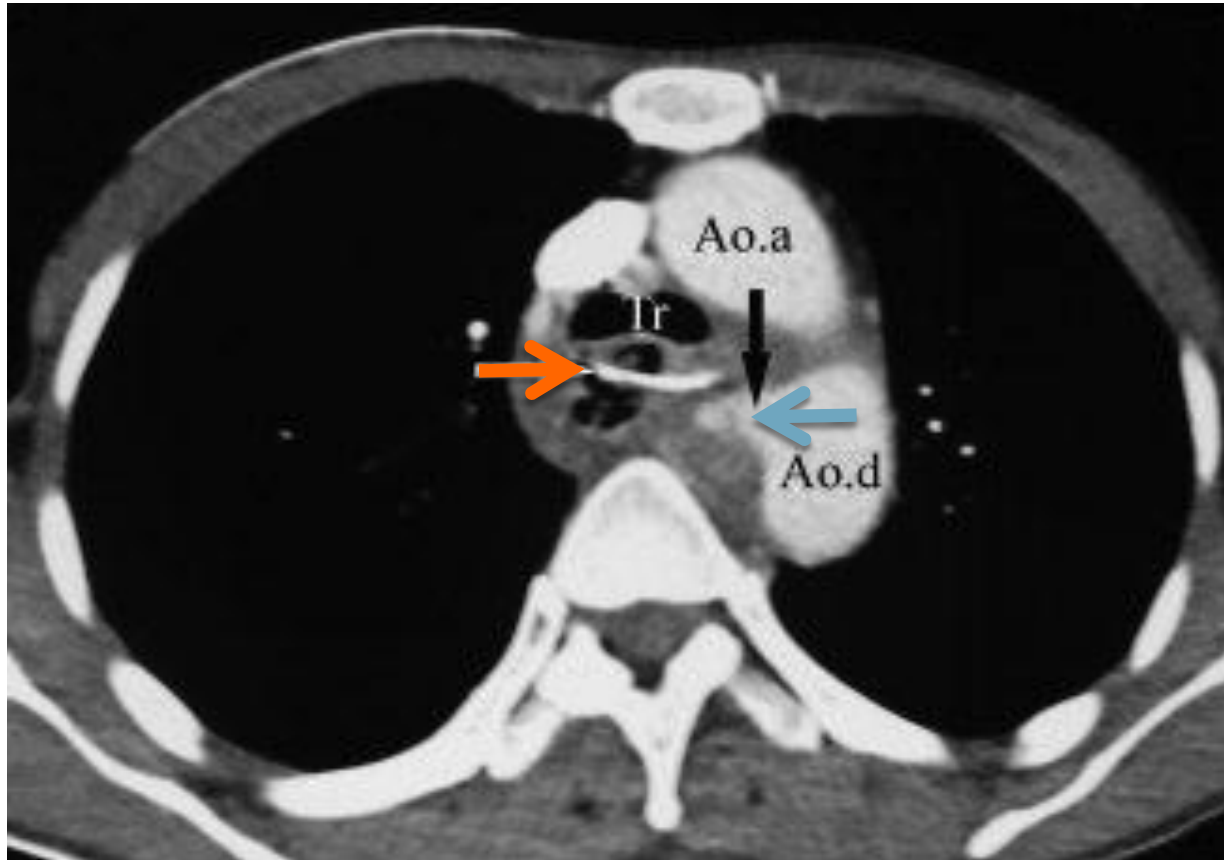


Complications of Ingestion

- Aspiration pneumonia from obstruction
- Trauma leading to esophageal stricture, ulceration, perforation, aortoesophageal fistula, or tracheoesophageal fistula



Comparison Pt#3: Esophago-aortic Fistula on CT



Findings: fistula formed between esophagus and 1st portion of descending aorta (Ao.d); **foreign body lodged in esophagus**

From: Xiaoli Z et al. Diagnosis and treatment of 32 cases with aortoesophageal fistula due to esophageal foreign body. The Laryngoscope. 121 (2011): 267-272.

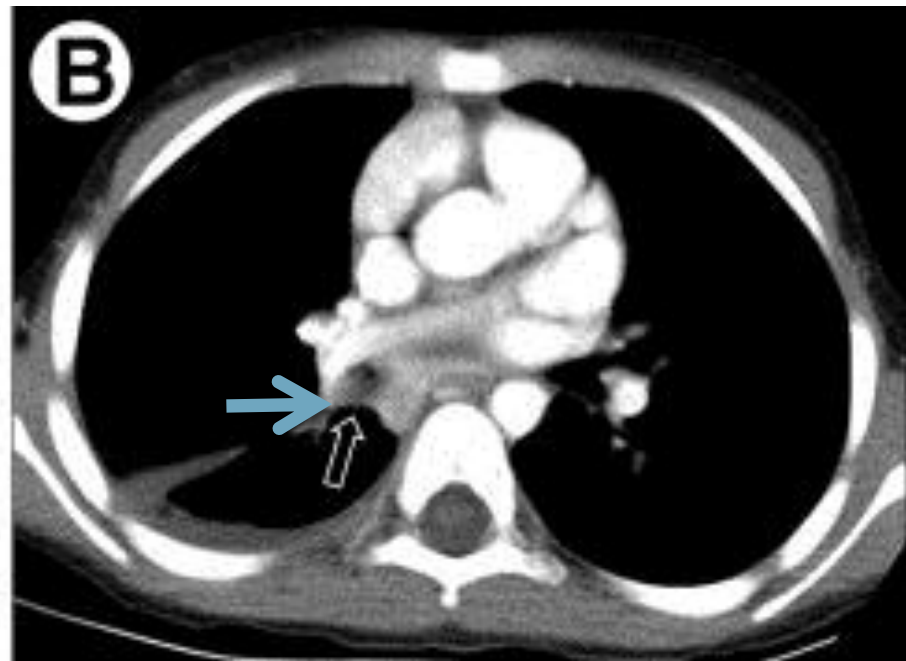
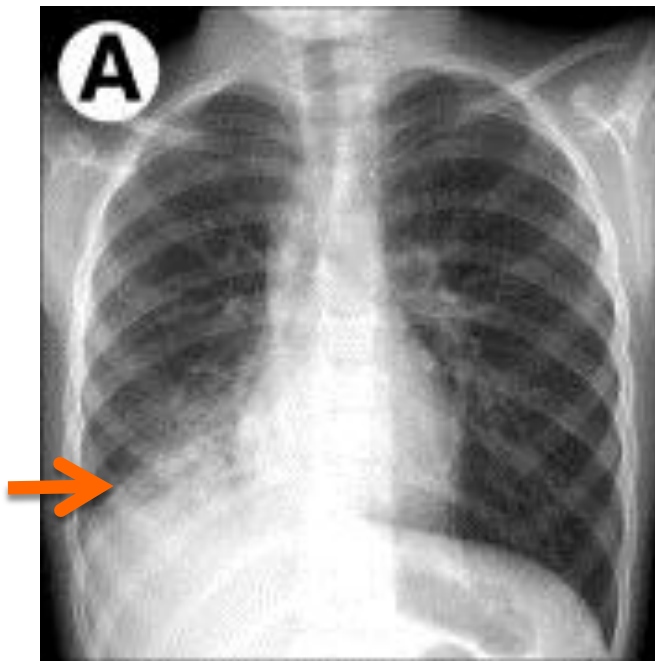


Complications of Aspiration

- Complete airway obstruction, respiratory distress, atelectasis, post-obstructive pneumonia
- Long-standing aspiration may lead to bronchiectasis



Comparison Pt#4: RLL Collapse from FB on CXR & CT



Findings on imaging of 3 yo girl with respiratory distress: (A) Plain chest radiograph demonstrates RLL airspace opacity with volume loss suggestive of atelectasis. (B) Axial chest shows luminal mass with low attenuation obstructing R bronchus intermedius

From: Lee E et al. Imaging evaluation of pediatric trachea and bronchi: systematic review and updates. Seminars in Roentgenology. 47 (2012): 182-196.



Management



Indications for Endoscopy Following FB Ingestion

- Foreign object should *not* remain in esophagus >24h after presentation
- Emergent endoscopy: esophageal obstruction, sharp-pointed objects in esophagus, and disk batteries in esophagus
 - Contact of poles of disk battery with esophageal wall leads to electrical conduction with liquefactive necrosis and perforation!
- Urgent: Sharp-pointed objects in stomach
- Nonurgent removal: coins in esophagus, long objects (>5 cm) in the stomach, blunt objects failing to pass stomach in 3-4 wks, blunt objects distal to duodenum remaining in same location for >1 wk
- Most ingested foreign bodies will otherwise pass spontaneously once clearing esophagus



Comparison Pt#5: Magnet Ingestion on Abdominal Plain Film

- Magnets in separate bowel loops may adhere to each other, tethering loops of bowel together. Can lead to bowel obstruction, volvulus, and perforation secondary to pressure necrosis
- Rapid surgical consultation

2 yo M with mildly dilated proximal small bowel loops and clustered radiopaque foreign bodies representing magnets; pt required surgical removal and was found to have small perforations of the small bowel



From: Hryhorczuk AL & Lee EY. Imaging evaluation of bowel obstruction in children: updates in imaging techniques and review of imaging findings. Seminars in Roentgenology. 47 (2012): 159-170.



Management of Aspirated Foreign Body

- Complete airway obstruction (inability to speak or cough): back blows and chest compressions in infants; Heimlich in older children
- Otherwise removal by rigid bronchoscopy with ventilation under general anesthesia



Back to our patient...



Our Patient: Outcome

- Non-urgent EGD did not visualize the razors, suggesting passage distally
- Managed conservatively with serial KUBs
- Eventually razors passed the ileocecal valve and pt was given laxatives
- Upon discharge 3 of 6 razors had passed, with 3 remaining in cecum
- Scheduled for KUB 5 days post-discharge, but was lost to follow-up



THE END



Acknowledgements

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References

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