



# Pediatric Foreign Body Ingestions

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# Agenda

- Presentation of our patients
- Epidemiology
- Symptoms and Complications
- Approach to FB Ingestion
  - Radiological diagnosis
  - Therapy: Observation vs Intervention
  - Special situations (magnets, batteries)
- Management of our patients



# Our first patient's presentation

- 7 year old boy p/w accidental ingestion of Monopoly battleship. Denies chest pain, ab pain, or SOB.
- Vitals AFFS, PE unremarkable.
- KUB obtained revealing metallic object in stomach.



Supine KUB of FB in stomach



# Our second patient's presentation

- 11 month old girl p/w accidental ingestion of hair clip. No drooling, cough, vomiting, stridor, or respiratory distress.
- Vitals AFFS. PE unremarkable.
- KUB and lateral neck films reveal foreign body in esophagus.



**Lateral neck plain film of FB in esophagus**



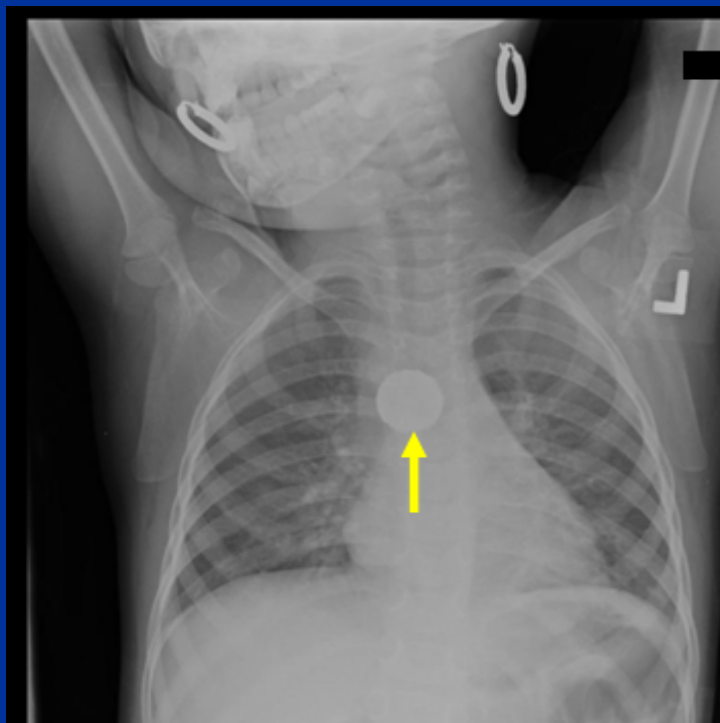
**PA CXR of FB in esophagus**

*Courtesy of Dr. Mark Waltzman, Children's Hospital Boston*



# Our third patient's presentation

- 3 year old girl p/w with fever, abdominal pain, decreased oral intake. Mother believes she may have swallowed a quarter.
- PE unremarkable except for refusal to take oral intake.
- KUB reveals round metallic object in esophagus



**PA CXR with FB in esophagus**



**Lateral CXR with FB in esophagus**

*Courtesy of Dr.  
Marc Baskin,  
Children's  
Hospital Boston*



# Approach to evaluation of FB

## Ingestion:

### Questions to Consider

- How are FB ingestions diagnosed and identified ?
- Which patients need intervention and which patients can be observed?
- What are the possible outcomes ?



# Epidemiology

- Over 100,000 cases of foreign body ingestion reported per year in US. Many go un-reported or un-discovered.
- 80% of cases occur in children and infants, who are prone to sticking objects in their mouth and less able to control their oropharynx and airways.
- Fatalities have been reported for children under age 4.

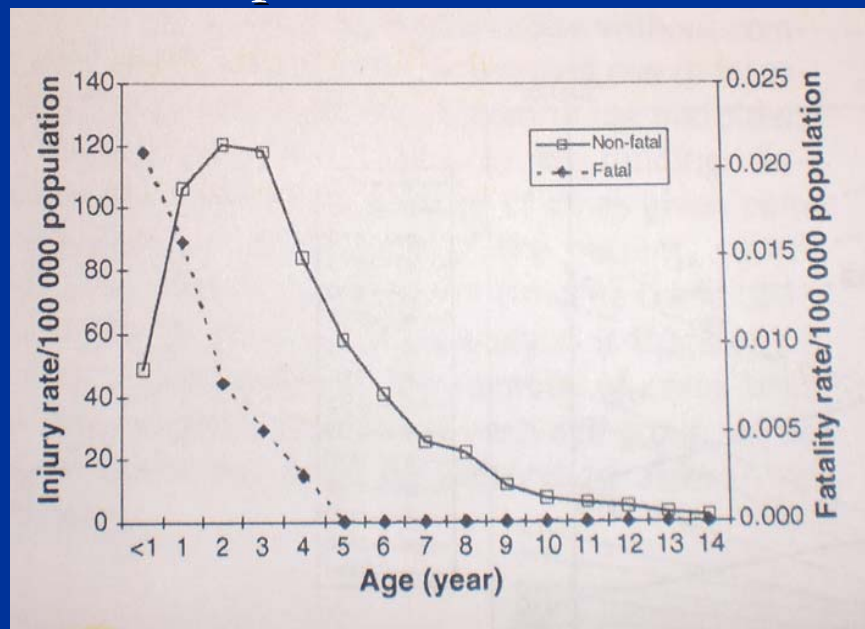


Diagram showing association of child's age with incidence of FB ingestion and injury rate

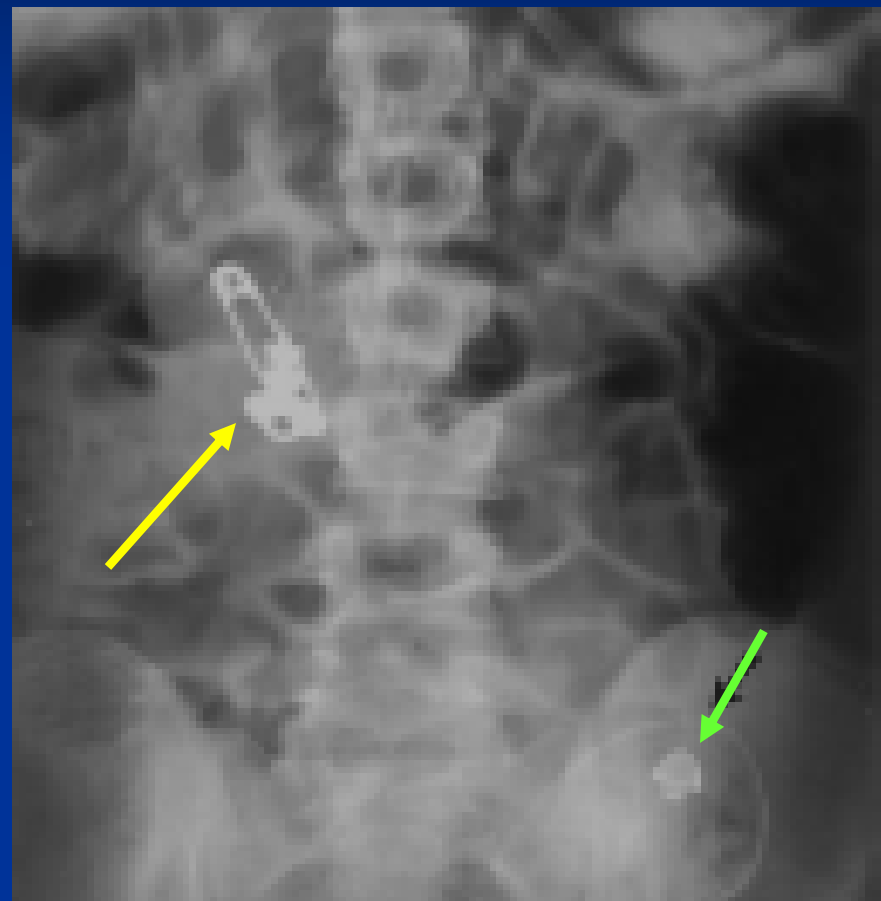
From: Chen, X., S. Milkovich, et al. (2006). "Pediatric coin ingestion and aspiration."  
Int J Pediatr Otorhinolaryngol 70(2): 325-9



# Menu of FB Ingestions

- Frequently found objects include coins (most common), safety pins, batteries, toy parts, magnets, bones.
- Anything a child can possibly grab and swallow is fair game!

Supine KUB of child with  
**safety pin and key** in  
jejunum and **rubber doll  
head** in descending colon



From: Hunter, T. B. and M. S. Taljanovic (2003).  
"Foreign bodies." *Radiographics* 23(3): 731-57.





# FB ingestions by the numbers

- At diagnosis, 60% located in stomach, 20% located in esophagus.
- Older children and male children more likely to spontaneously pass FB.
- 60-90% spontaneously pass when located in distal esophagus or below GE junction.
- Only 10-20% require endoscopic removal.
- 66% of spontaneously passed FB's are never found in stool by parents.
- Previous surgery or congenital malformations (TEF's) increase risk of obstruction and complications.



# Symptoms of FB ingestion

- Most are asymptomatic! History is most important clue.
- Symptoms most often associated with location in upper esophagus.
- Acute Esophageal: retrosternal pain, cyanosis, dysphagia, drooling, wheezing, stridor, choking, vomiting, hemoptysis, decreased PO intake, gagging.
- Chronic Esophageal: weight loss, recurrent aspiration PNA.
- Stomach or Bowel: Abdominal pain, bloody stool.



# Complications of FB Ingestion

- Aspiration and airway obstruction
- Stricture or fistula formation
- GI obstruction, perforation, or bleeding
- Erosion into esophagus, aorta, or other structures
- Death



# Approach to FB Ingestion

We have our history, now what do we do?



# Indications for imaging

- Previous recommendations: asymptomatic children tolerating PO intake do not need radiographs.
- However, 20% of asymptomatic patients had an esophageal FB.
- 28% of esophageal coins pass spontaneously within 24 hours.
- Risk of complications increases with esophageal FB.
- Current recommendations: ALL suspected foreign body ingestion patients need radiographs.
- Frontal radiograph of chest, KUB, and lateral radiograph of neck needed to image entire length of GI tract.



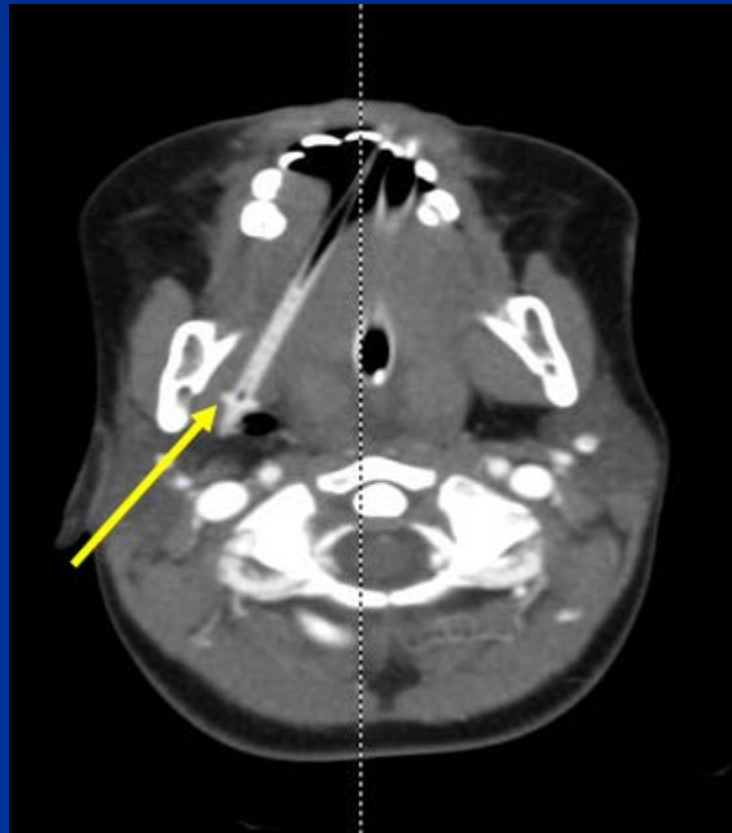
# Diagnosing Foreign Bodies

- Opaque: glass, most metal except aluminum, animal bones, food, soil.
- Nonopaque: Fish bones, wood, plastics, aluminum.
- Consider CT, US, or oral contrast for non-opaque objects.



# Patient with non-radio-opaque FB

- 20 month old boy with plastic spear in parapharyngeal space seen on axial CT with contrast.



*Courtesy of Dr. Mark Waltzman, Children's Hospital Boston*



# Indications for removal of FB

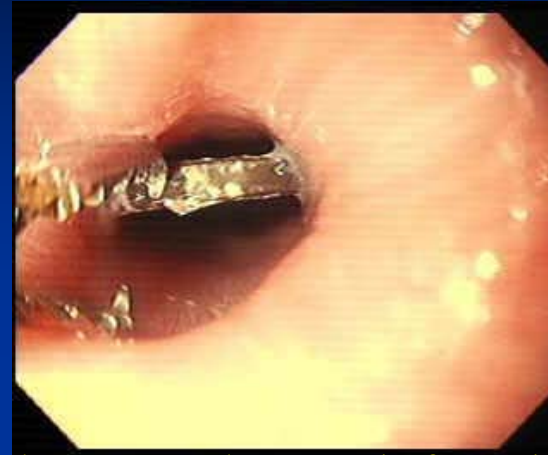
- Patient Symptomatic
- Sharp or long (>5cm)
- Magnet
- Disk battery in esophagus
- In esophagus >24 hours
- In stomach >4-6 wks





# Techniques for Removal

- Choice depends on patient's condition, surgeon's experience, location and type of FB.
- **Flexible or rigid endoscopy**
  - Most successful method
  - Allows visualization of object (good for sharps)
  - Risks: pharyngeal bleeding, bronchospasm, accidental extubation, stridor, hypoxia, esophageal perforation, mediastinitis
- **Magill forceps and laryngoscope**
  - Allows visualization of object (good for sharps)



**Endoscopy and removal of esophageal coin**

From:

<http://www.gastrointestinalatlas.com/ForeignbodyCoin3.jpg>  
10/18/08



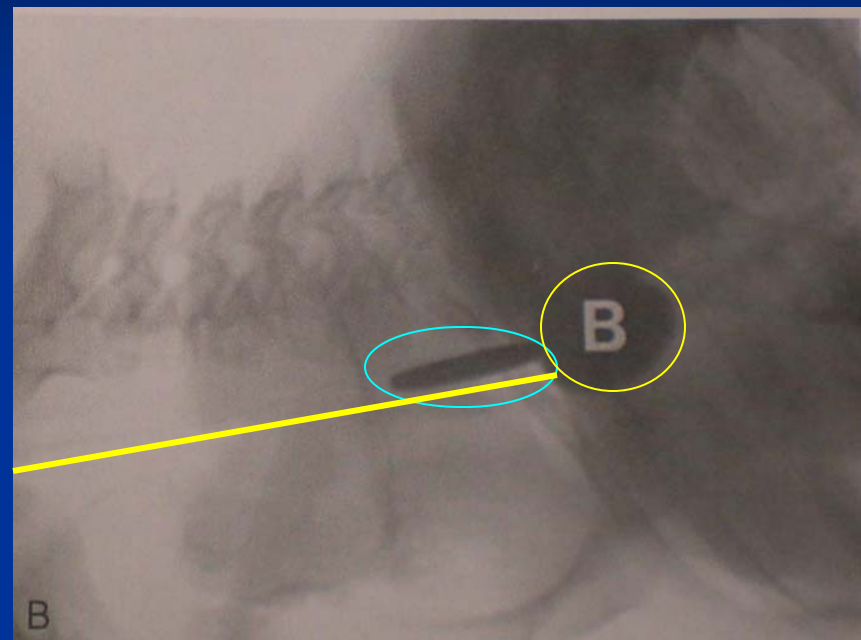
**Magill forceps and laryngoscope** From:

<http://www.ispub.com/xml/journals/ijorl/vol4n2/body-fig4.jpg>  
10/18/08



# Techniques for Removal

- Bougienage
  - Dilater used to push object in esophagus into stomach
  - No reported complications
- Foley catheter
  - Deflated catheter passed distally to FB, inflated, and withdrawn under fluoroscopy
  - 1.8% complication rate: epistaxis, emesis, transient respiratory distress
- Penny pincher
  - Grasping object with forceps through NGT under fluoroscopy



Lateral neck fluoroscopy showing **Foley catheter** extraction of **coin** under fluoroscopy

From: Donnelly, L. F. (2001). Fundamentals of Pediatric Radiology. Philadelphia, W.B. Saunders Company.



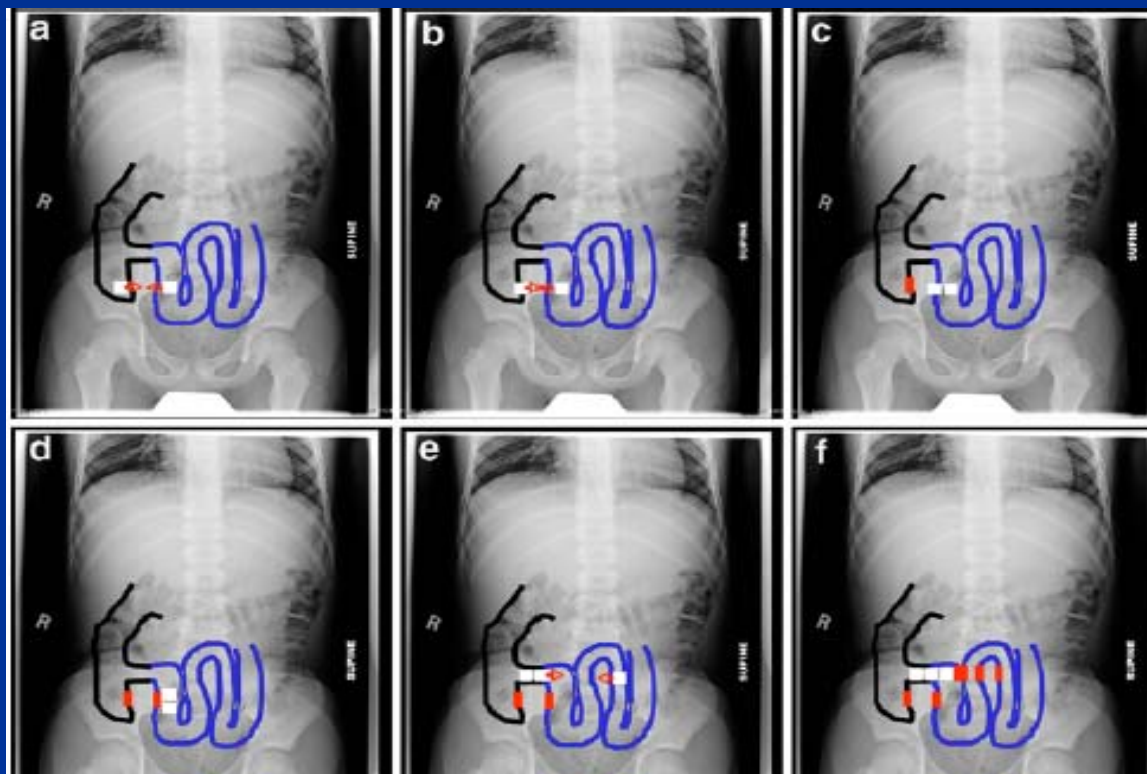
# Observation

- Acceptable if patient asymptomatic, FB not sharp or long (>5cm), not magnet, not esophageal battery.
- 20-30% of esophageal FB's pass spontaneously.
- Most FB's pass spontaneously after passing the narrow esophagus, pylorus and duodenal sweep.
- Repeat radiograph in 8-16 hours for esophageal FB. Serial radiographs weekly for distal FB until it passes.
- Endoscopic removal of FB if retained in esophagus >16 hours or retained in stomach >4 weeks, or if patient becomes symptomatic.



# Special considerations for magnets

- Multiple magnets attract across multiple loops of bowel and cause pressure necrosis, ischemia, perforation, volvulus.



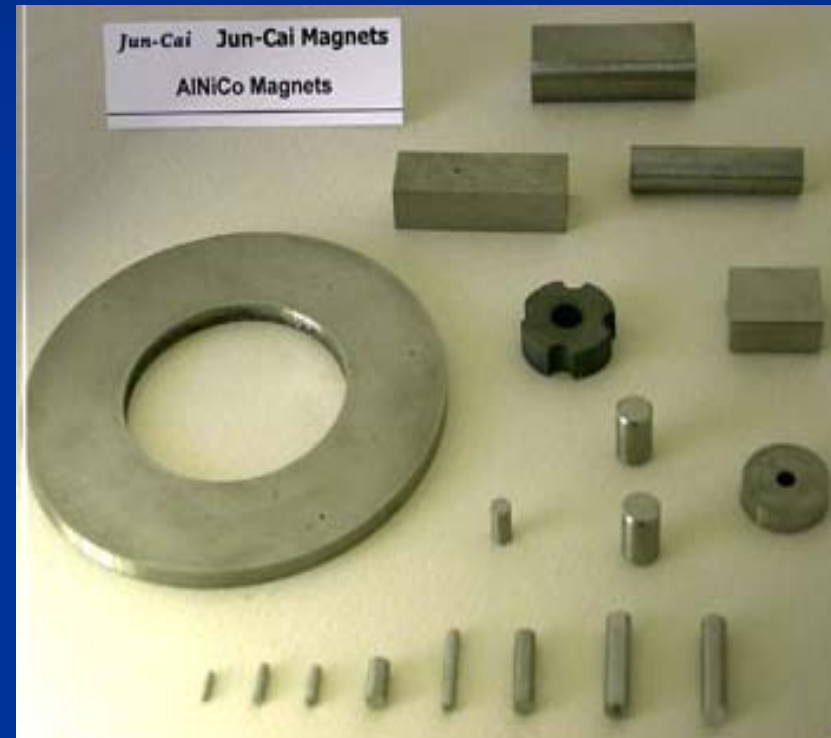
Serial supine KUB's showing three magnets attracting each other across multiple bowel loops and causing a total of 6 perforations of bowel wall.

From: Kircher, M. F., S. Milla, et al. (2007). "Ingestion of magnetic foreign bodies causing multiple bowel perforations." *Pediatr Radiol* 37(9): 933-6. 20



# Special considerations for magnets

- Single magnet shouldn't cause problems.
- Difficult to tell whether a single or multiple magnets have been ingested.
- Suspect magnet ingestion if metallic object fails to progress.
- Current recommendation: ANY suspected magnet ingestion should be removed.



*Various Magnets*

From: [http://www.global-b2b-network.com/direct/dbimage/50242200/Alnico\\_Magnet.jpg](http://www.global-b2b-network.com/direct/dbimage/50242200/Alnico_Magnet.jpg)



# Special considerations for button batteries

- Higher risk of perforation, erosion, fistula, stenosis if lodged in the esophagus.
- Electricity flow between both battery poles through contact of the tightly surrounding esophageal walls may cause liquefaction necrosis and perforation.
- Leakage of contents: acidic environment may erode seal of battery and release heavy metals and cause necrosis of membranes.
- Lithium cell ingestions associated with most severe outcomes.
- Esophageal batteries should be removed immediately.
- Distal batteries can be managed with observation and weekly radiographs to ensure passage.



**Lithium button battery**

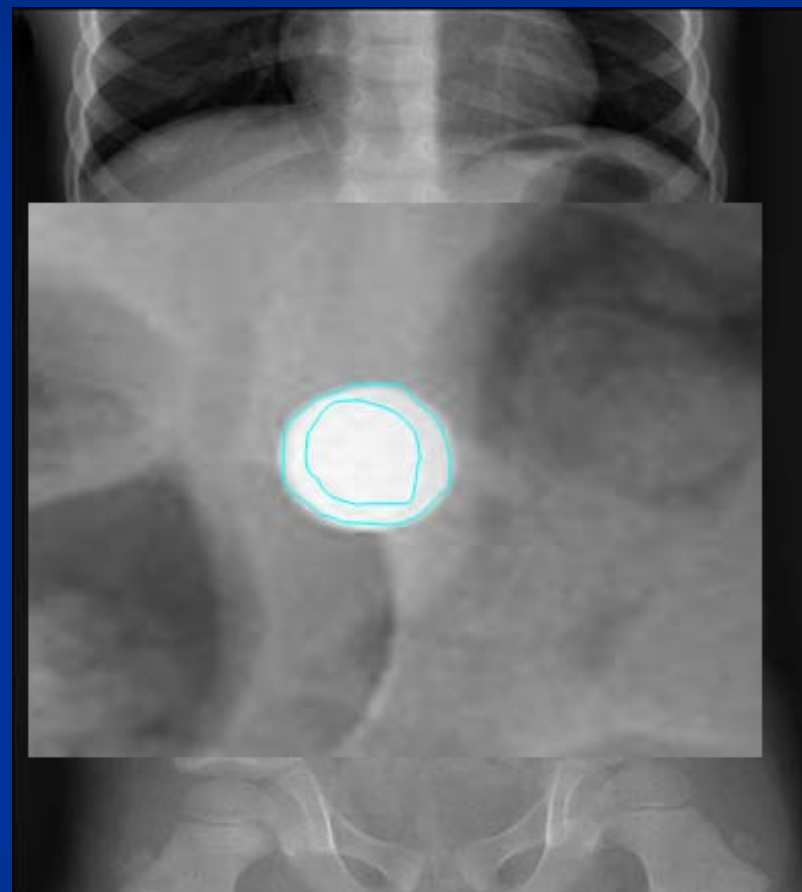
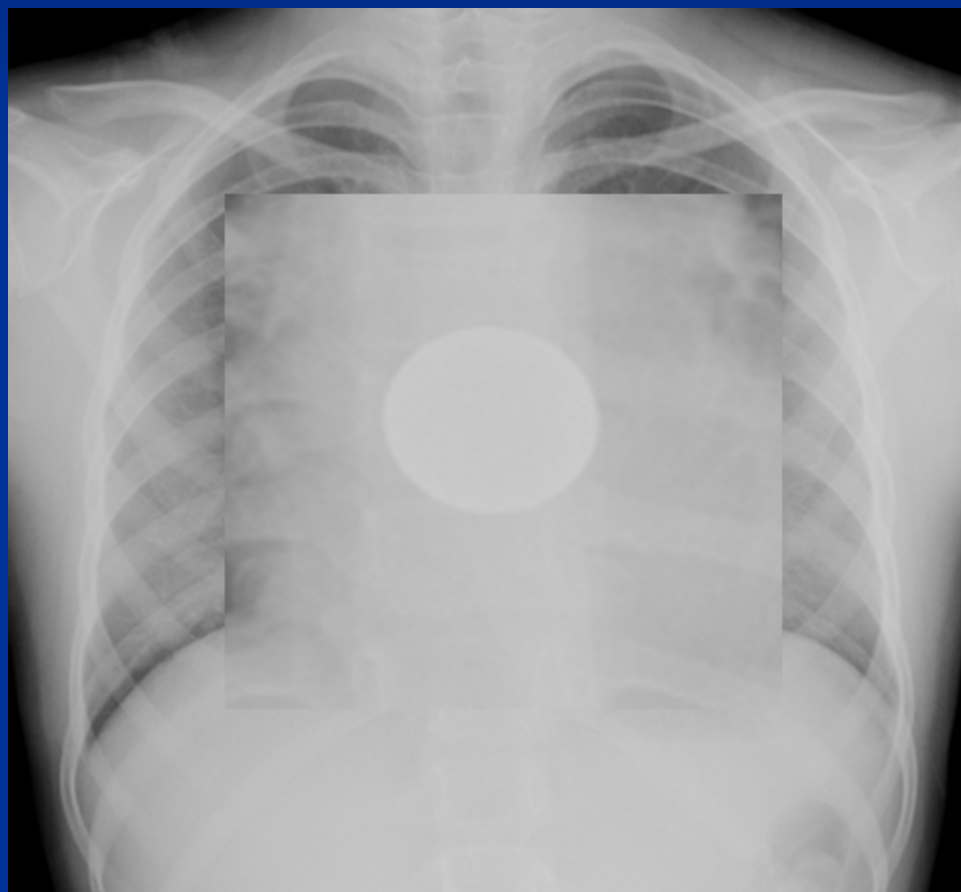
*From:*

[http://img.alibaba.com/photo/10122824/Recharge\\_Lithium\\_Ion\\_Button\\_Battery.jpg](http://img.alibaba.com/photo/10122824/Recharge_Lithium_Ion_Button_Battery.jpg)



# Button batteries: Beware the “coin fake out”

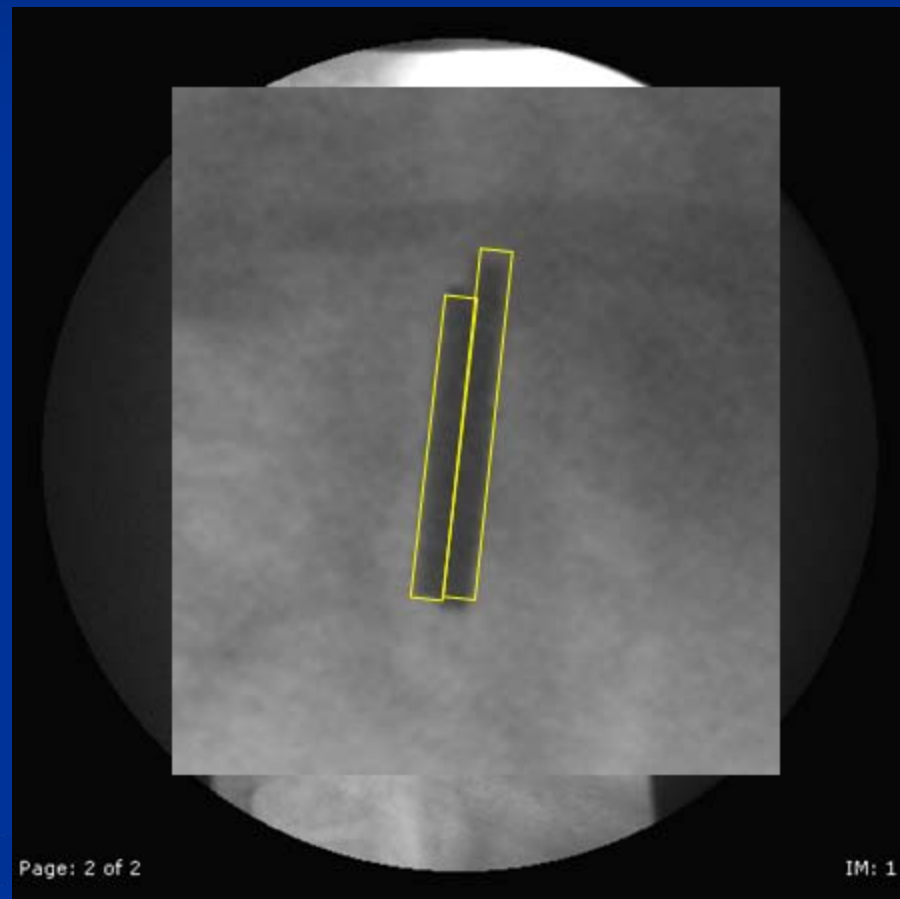
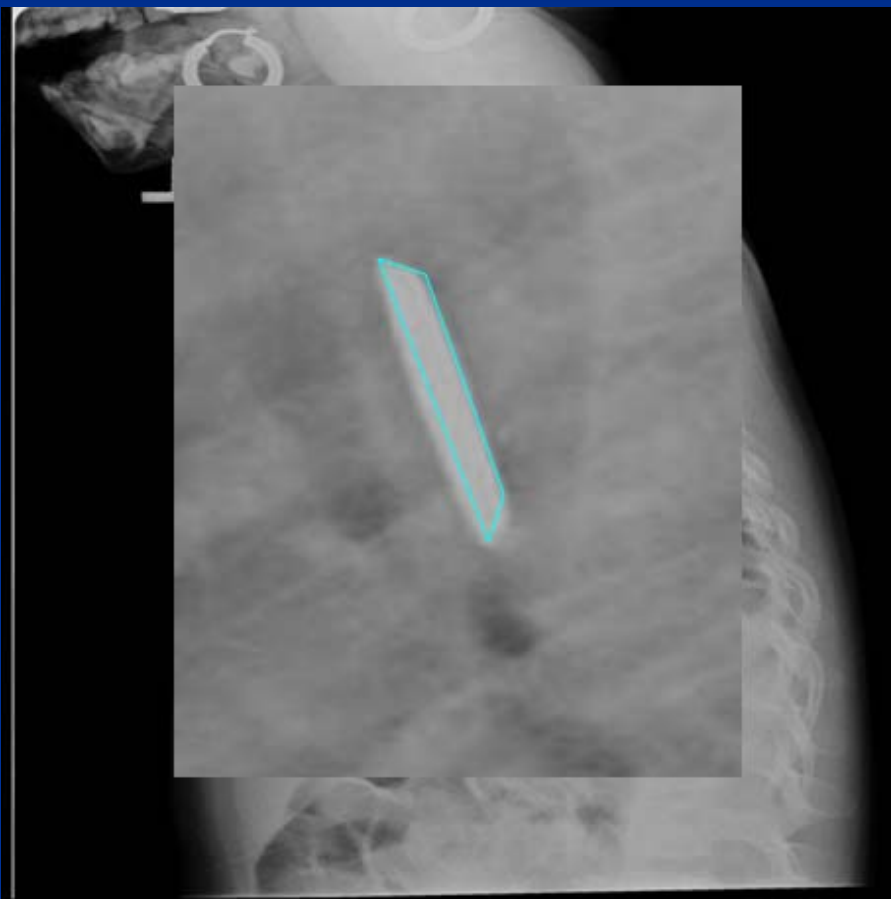
- Look for “Halo Sign” of button battery





# Button batteries: Beware the “coin fake out”

- On lateral, battery shows “step off appearance of edges” while coin has sharp edges







# We have a systematic approach to pediatric FB ingestions

- Now let's go take care of our patients



# Management of our first patient

- 7 year old asymptomatic boy with small, non-sharp, gastric metallic toy on KUB.
- Patient discharged home with instructions to return if he became symptomatic.
- F/u KUB in 1 week.

Battle ship



Supine KUB of FB in stomach



# Management of our second patient

- 11 month old asymptomatic girl with esophageal hair clip on CXR.
- Admitted to surgery for rigid endoscopic removal of sharp, long object.



**Lateral neck plain film of FB in esophagus**



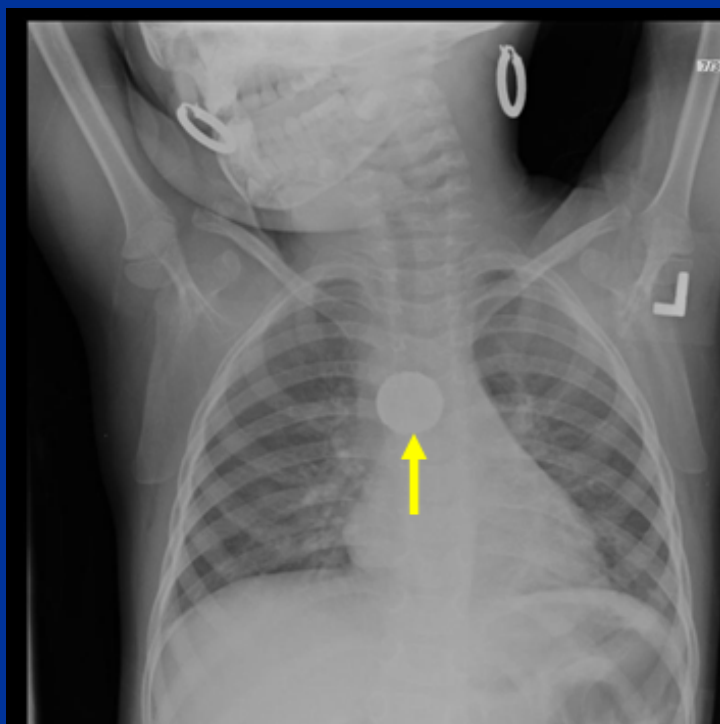
**PA CXR of FB in esophagus**

*Courtesy of Dr. Mark Waltzman, Children's Hospital Boston*

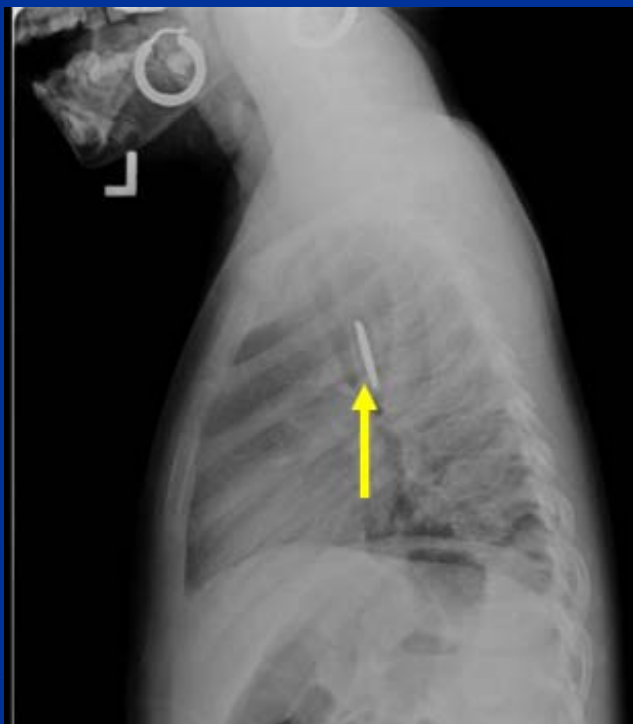


# Management of our third patient

- 3 year old symptomatic girl with esophageal FB on CXR.
- ORL consulted for endoscopic removal and discovered lithium battery surrounded by friable mucosal tissue.
- Barium swallow normal, no sign of stricture or fistula.



**PA CXR with FB in esophagus**



**Lateral CXR with FB in esophagus**

*Courtesy of Dr.  
Marc Baskin,  
Children's  
Hospital Boston*



# Summary of Approach to Pediatric FB Ingestion

1. Radiographs are indicated for ALL patients with suspected FB ingestion. Consider CT or US for non-opaque FB's.
2. Immediate removal indicated for all symptomatic patients or for sharp, long (>5cm), magnet, or esophageal battery FB's.
3. Patients who do not meet these criteria may be observed with repeat CXR in 8-16 hrs for esophageal FB's and weekly KUB for distal FB's.
4. Endoscopic removal indicated if FB remains in esophagus >16 hours or in stomach >4 weeks or if patient becomes symptomatic.



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