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October 20, 2008

# 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**



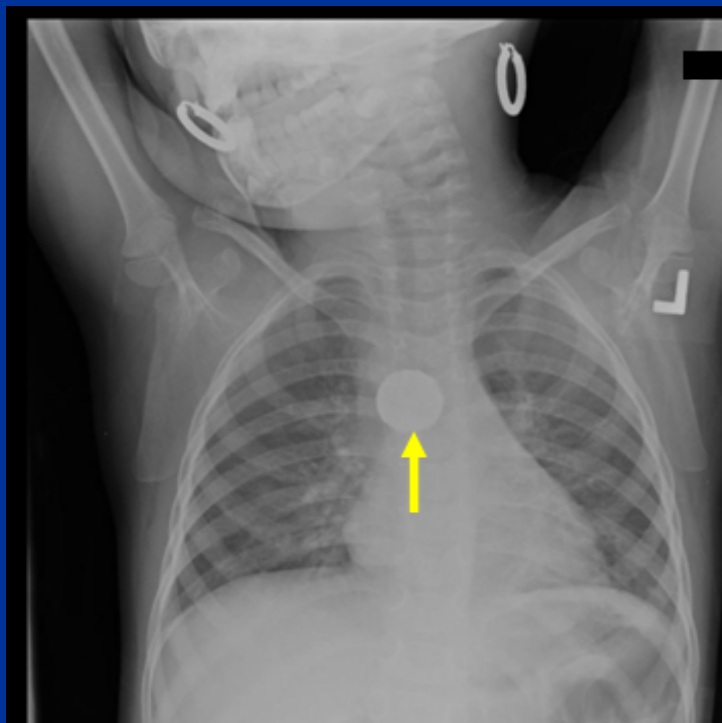
**PA CXR of FB in esophagus**

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

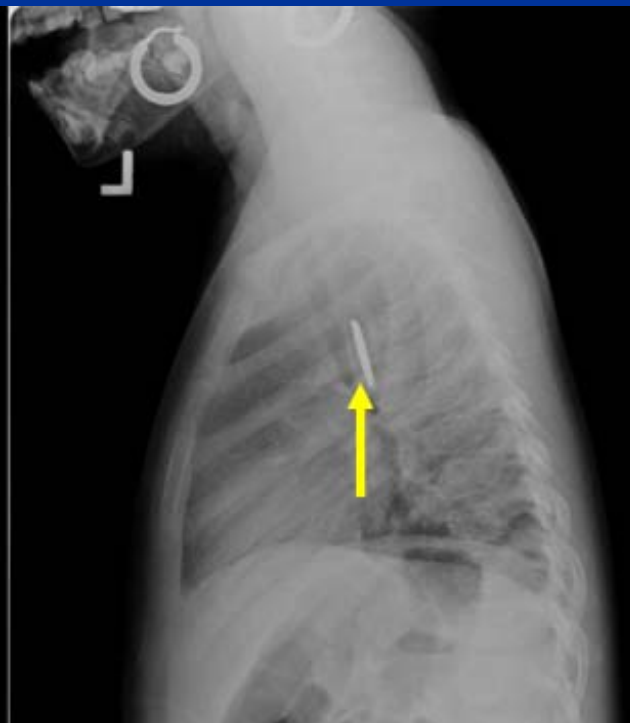


# Our third patient's presentation

- 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.

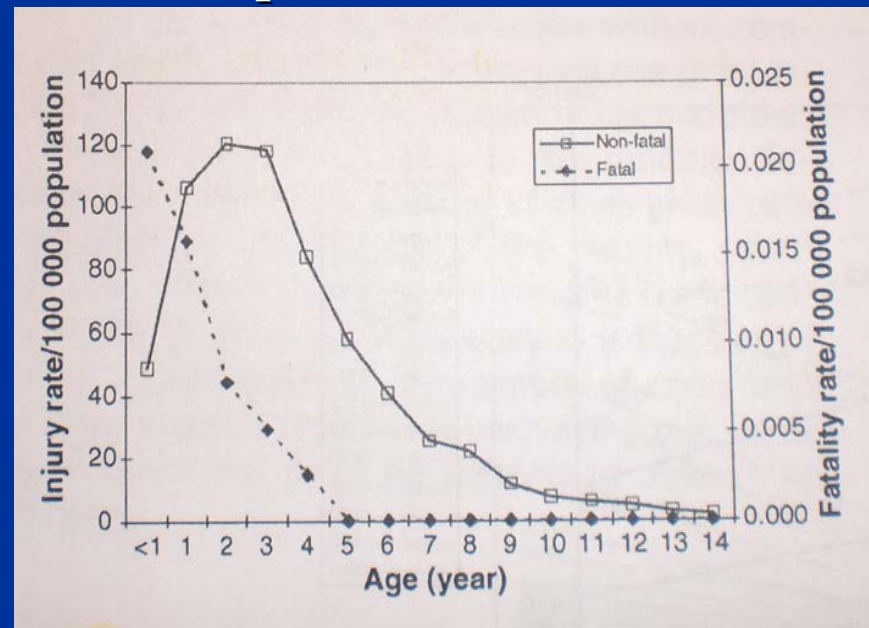


Diagram showing association of child's age with incidence of FB ingestion and injury rate

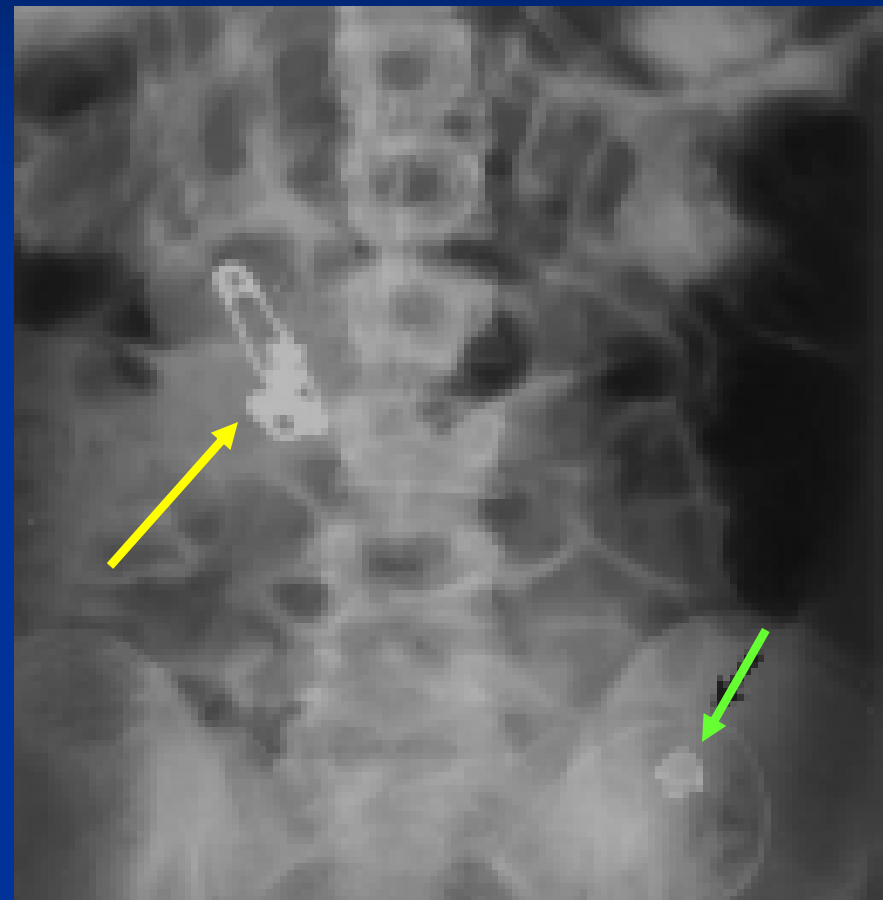
From: Chen, X., S. Milkovich, et al. (2006). "Pediatric coin ingestion and aspiration."  
Int J Pediatr Otorhinolaryngol 70(2): 325-9



# 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.



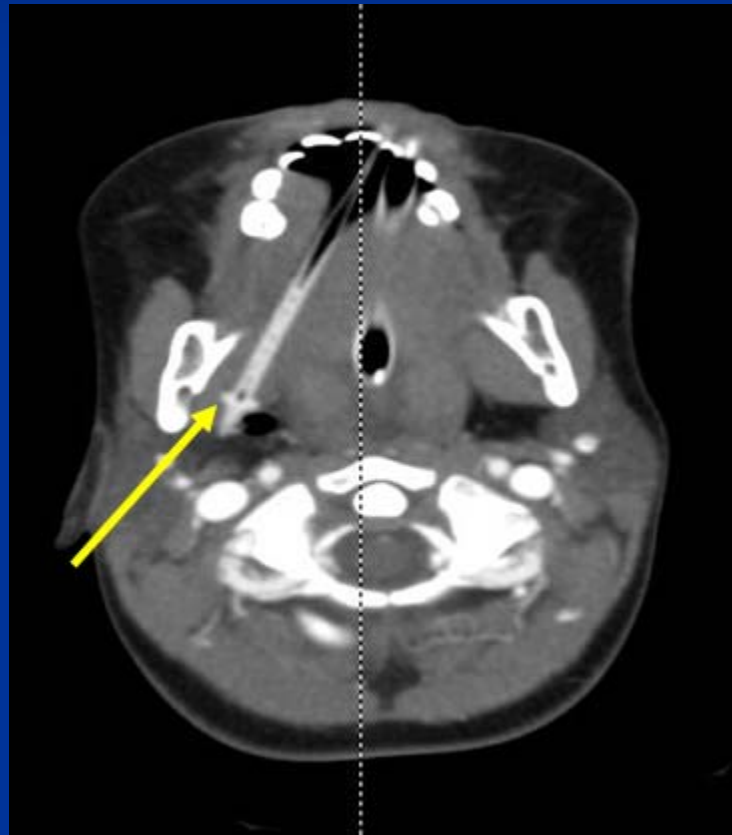
# Diagnosing Foreign Bodies

- 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

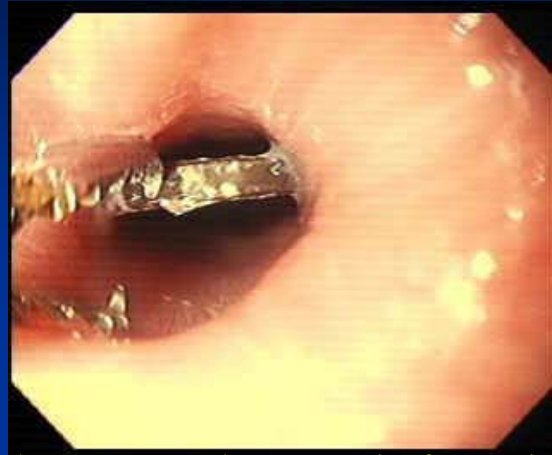
- Patient Symptomatic
- Sharp or long (>5cm)
- Magnet
- Disk battery in esophagus
- In esophagus >24 hours
- In stomach >4-6 wks





# 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



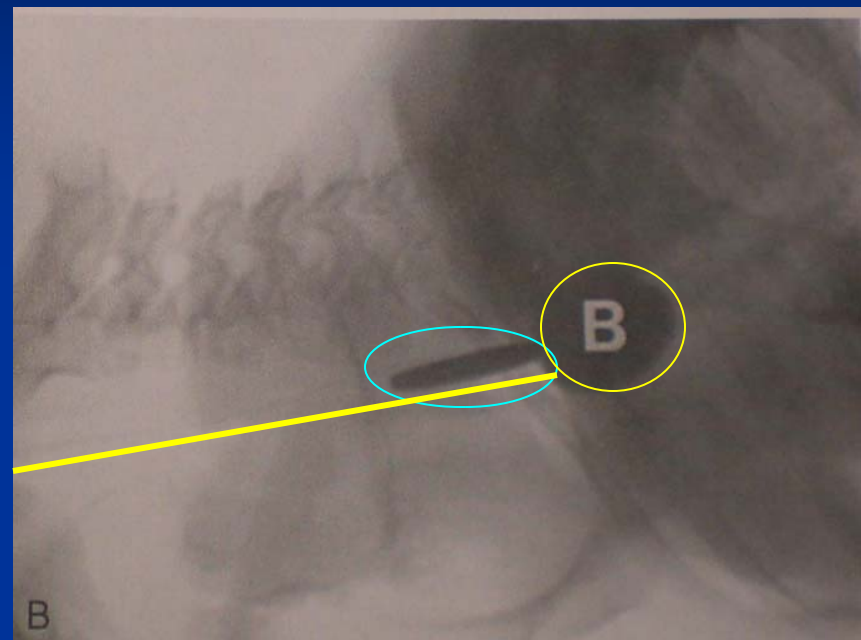
Magill forceps and laryngoscope From:

<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.



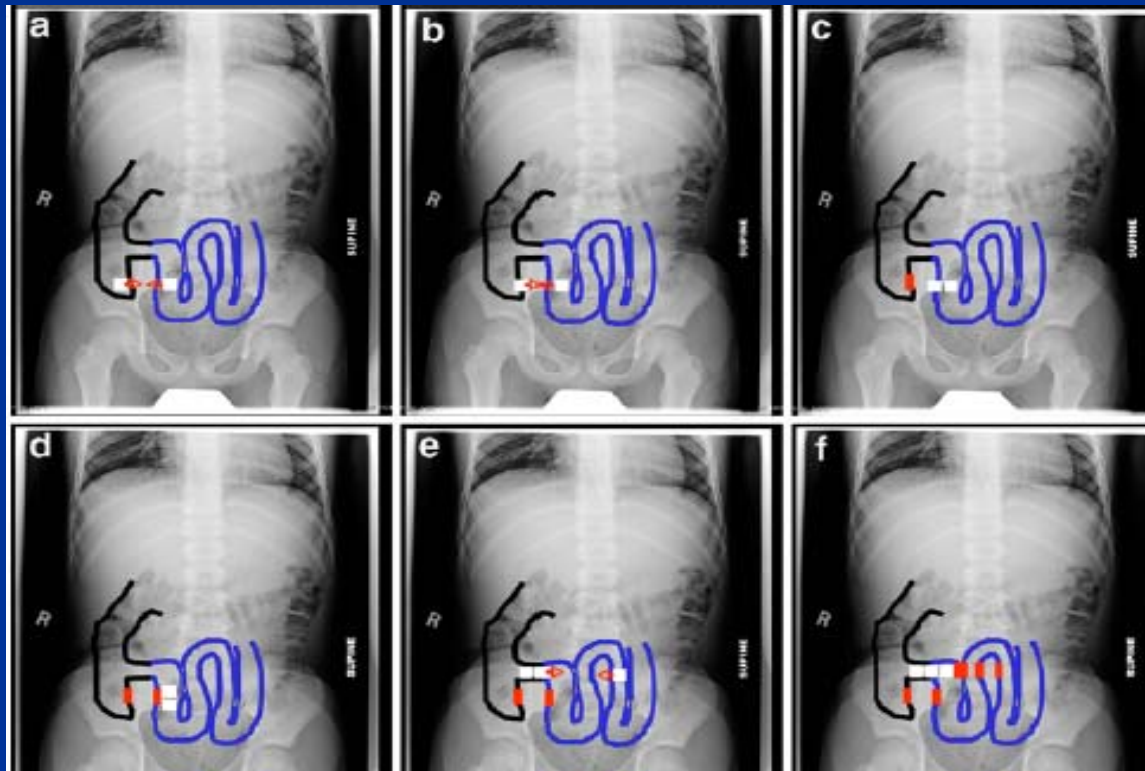
# Observation

- 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.



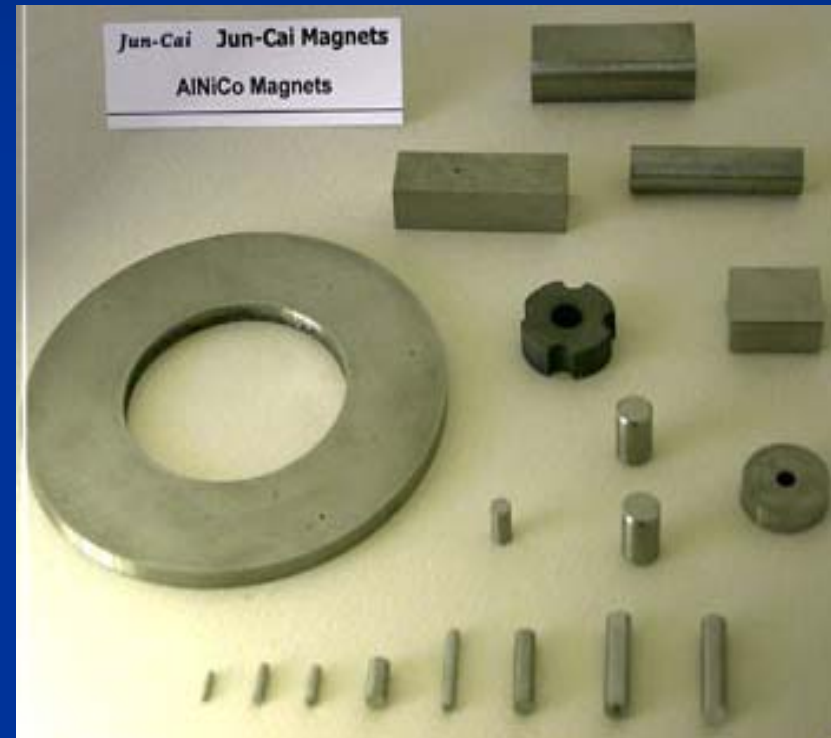
Serial supine KUB's showing three magnets attracting each other across multiple bowel loops and causing a total of 6 perforations of bowel wall.

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**

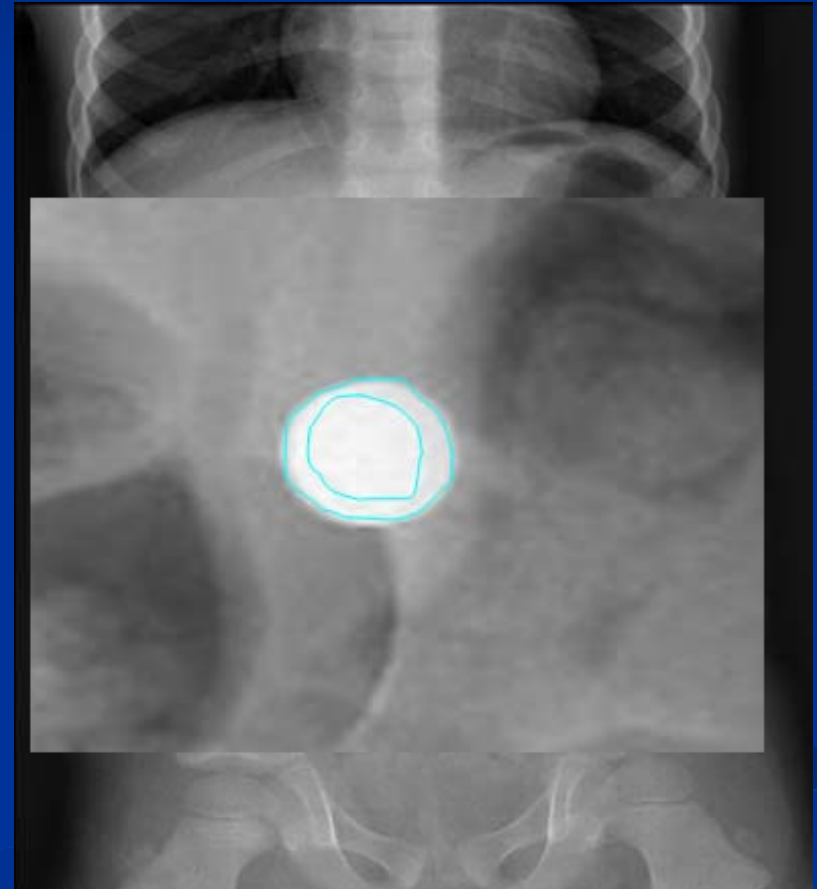
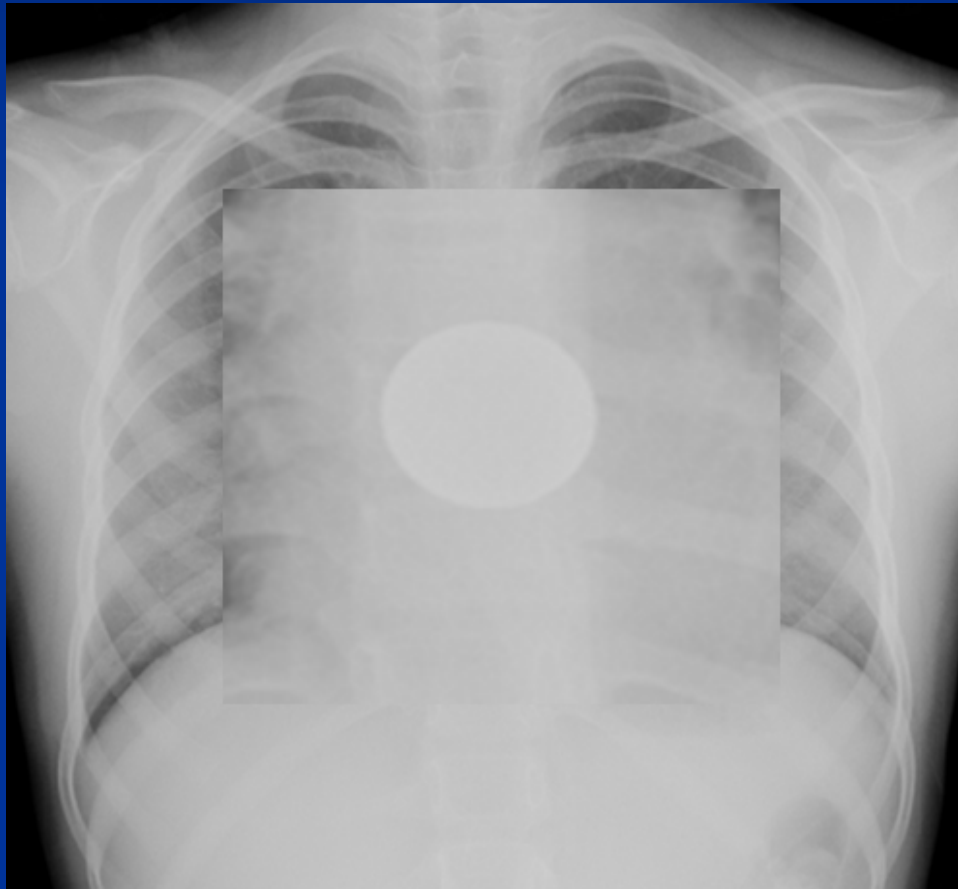
*From:*

[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”

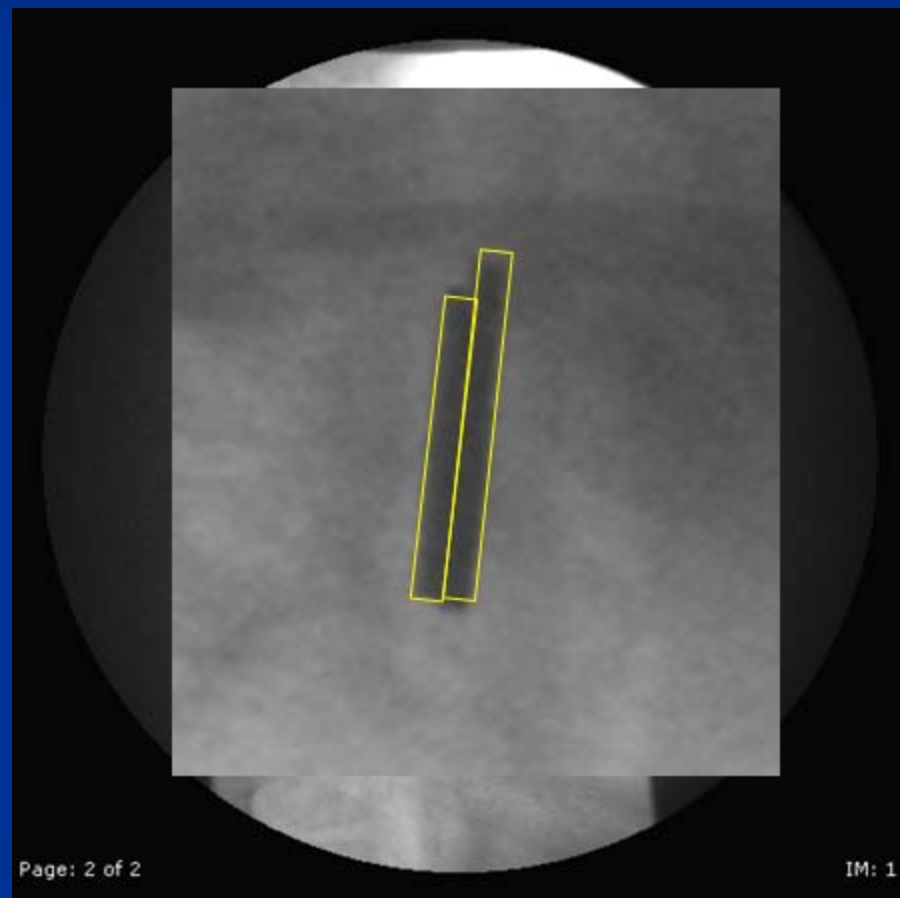
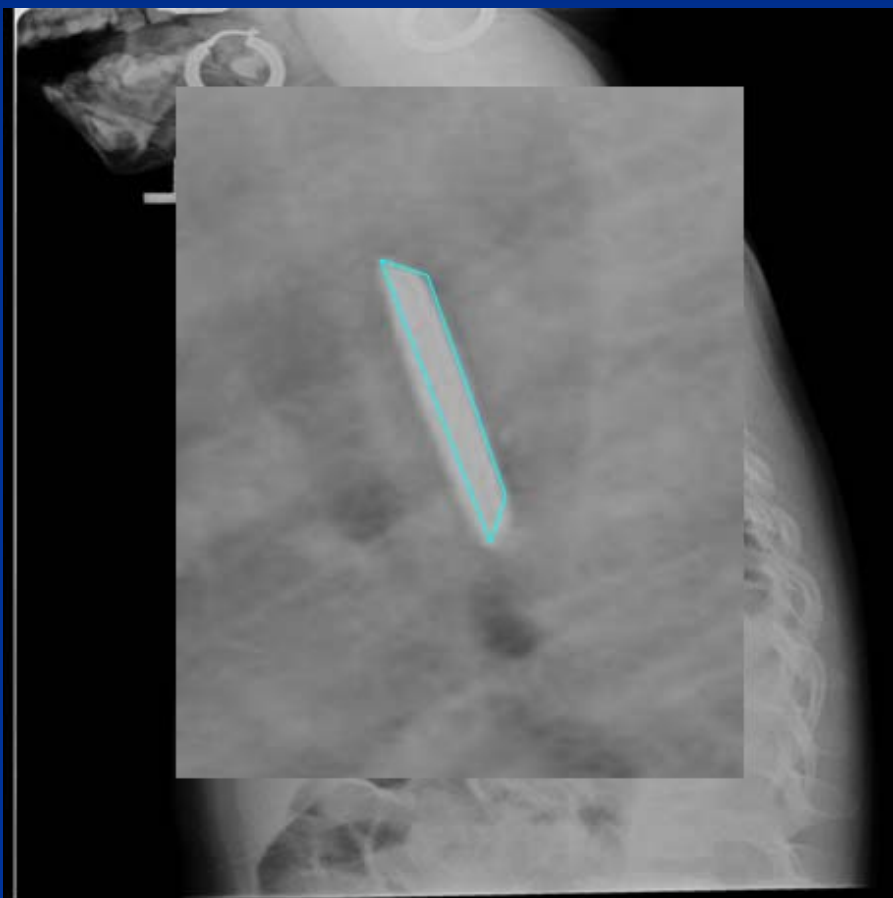
- Look for “Halo Sign” of button battery





# Button batteries: Beware the “coin fake out”

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



Lateral CXR of Battery ingestion

Courtesy of Dr. Marc Baskin, Children’s Hospital Boston

Lateral neck fluoroscopy of two coin ingestion,

Courtesy of Dr. Fargol Booya, BIDMC





# 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**



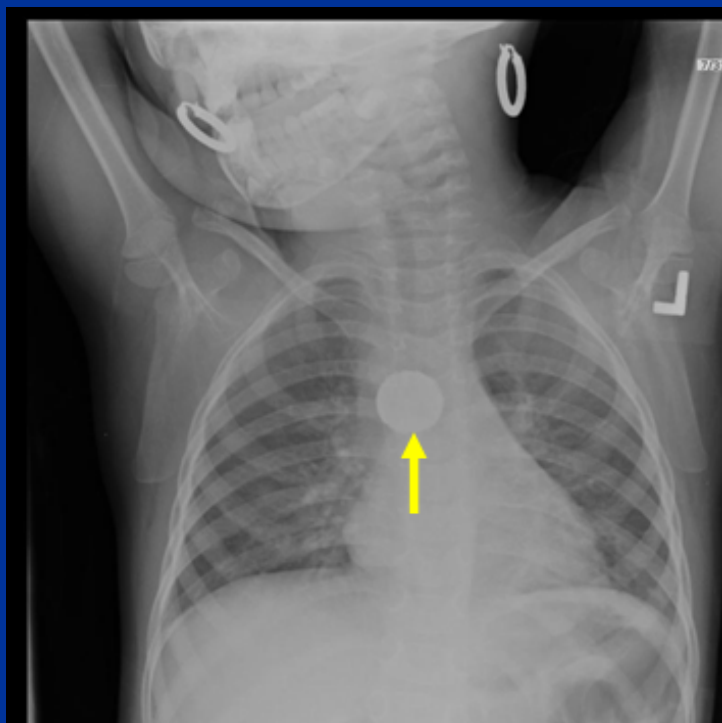
**PA CXR of FB in esophagus**

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

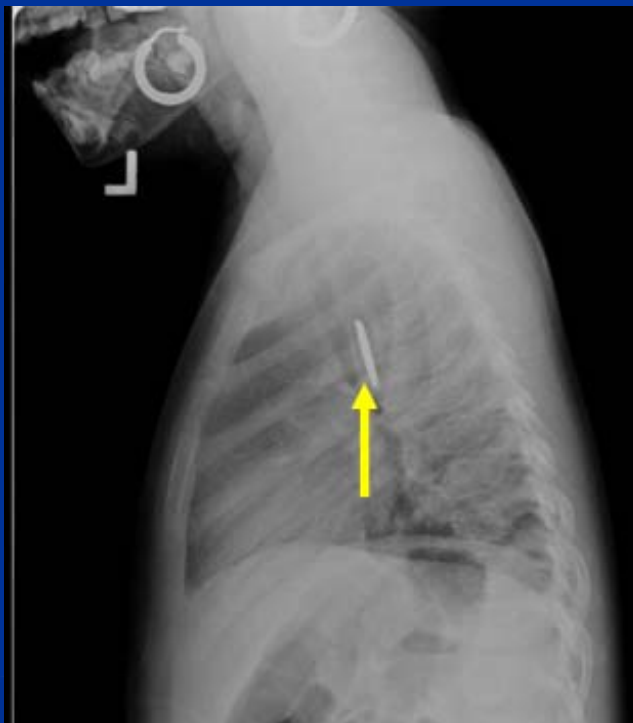


# Management of our third patient

- 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.



# Acknowledgements

- Dr. Mark Waltzman and Dr. Marc Baskin, Children's Hospital Boston Emergency Medicine
- Dr. Fargol Booya, BIDMC Radiology
- Dr. Gillian Lieberman, BIDMC Radiology
- Dr. Rivka Colen, Massachusetts General Hospital Radiology
- Maria Levantakis, BIDMC Radiology
- Larry Barbaras, BIDMC Webmaster



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