



Ingestion/Aspiration of Foreign Bodies

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Esophageal Foreign
Bodies



Gastrointestinal
Foreign Bodies



Special Topic
Ingestions



Airway Foreign
Bodies



Esophageal Foreign Bodies



Esophageal Foreign Bodies

Introduction

- More common in children ≤ 5 years of age.
- Vast majority are accidental.

Esophageal Foreign Bodies

Introduction

- Most common type of ingested FB varies by geographic region.
 - United States and Europe → coins
 - Marine areas → fish bone
- Other commonly ingested FBs:
 - toys, batteries, needles, straight pins, safety pins, screws, earrings, pencils, erasers, glass, fish and chicken bones, and meat.

Esophageal Foreign Bodies

Hx & PEx

- Hx:
 - Witnessed event Or disappearance of an object
 - Symptoms can vary:
 - Completely asymptomatic
 - Drooling
 - Neck and throat pain
 - Dysphagia
 - Emesis
 - Wheezing, or respiratory distress
 - Abdominal pain/ distention

Esophageal Foreign Bodies

Hx & PEx

- PEx:
 - Normal physical exam (majority).
 - Signs of complications, as:
 - oropharyngeal abrasions
 - crepitus
 - signs of peritonitis

Esophageal Foreign Bodies

Anatomy

- Esophagus is the narrowest portion of the alimentary tract (common site for FB impaction)
- Within the esophagus, three areas of anatomical narrowing:
 - the cricopharyngeus sling (70%)
 - the level of the aortic arch in the mid esophagus (15%)
 - the lower esophageal sphincter (GE junction) (15%)
- Other areas of potential impaction:
 - underlying esophageal pathology (i.e., strictures or eosinophilic esophagitis)
 - prior esophageal surgery (i.e., esophageal atresia)

Esophageal Foreign Bodies

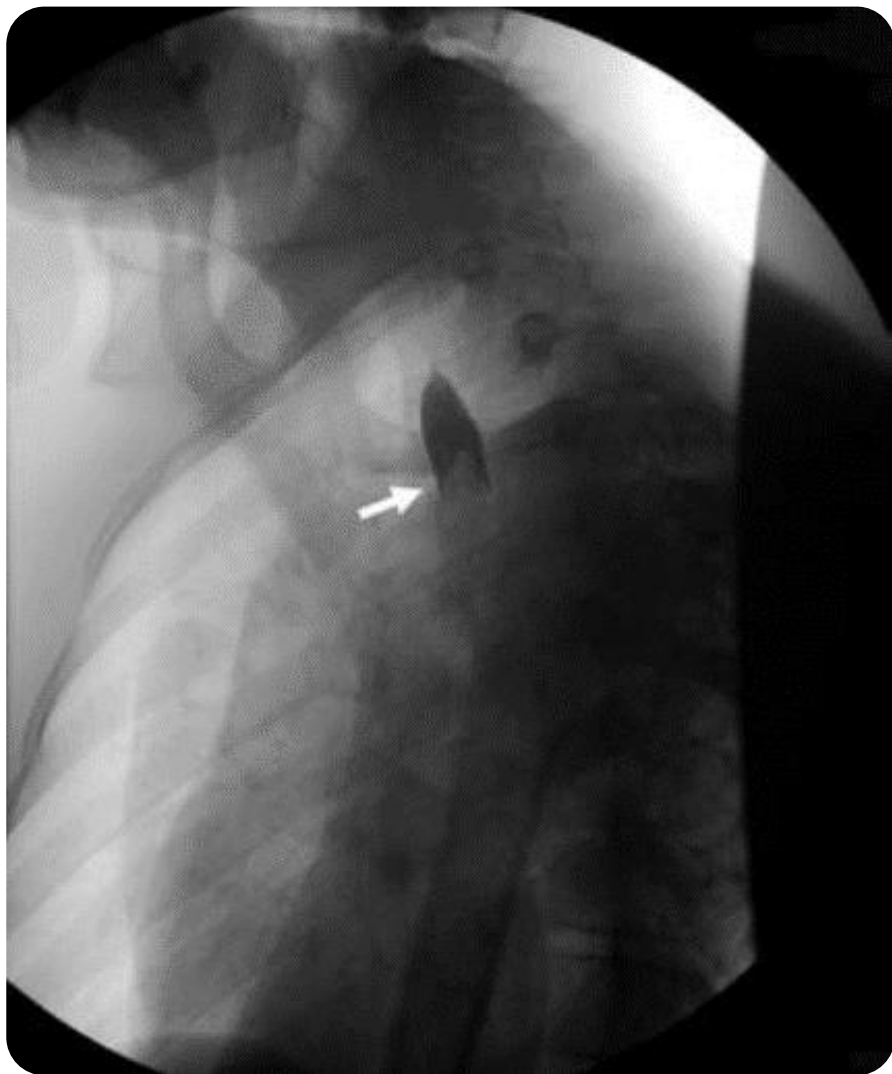
Anatomy

- Sharp FBs may penetrate the mucosa at any level and cause:
 - Mediastinitis
 - Aortoenteric fistula
 - Peritonitis

Esophageal Foreign Bodies

Diagnostic studies

- X-ray (AP and lateral neck and chest radiographs)
- Gastrografin esophagogram
- Esophagoscopy



Esophageal Foreign Bodies

Coins

- The majority appear en face in the AP view, and from the side on the lateral radiograph.
- Most are located in the proximal esophagus at the level of the upper esophageal sphincter or thoracic inlet.

Esophageal Foreign Bodies

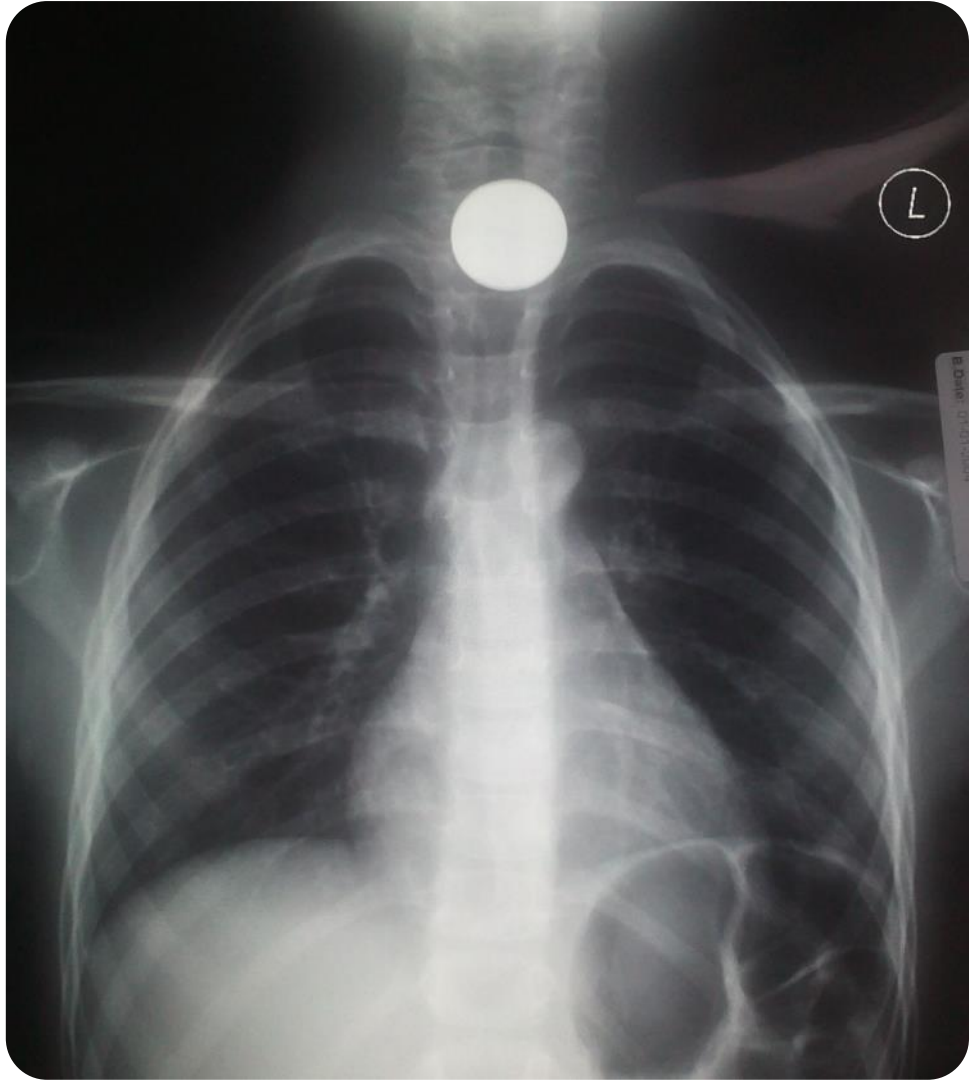
Coins

- Majority (of proximal) will remain entrapped and require retrieval.
- Options for retrieval:
 - Nonemergent endoscopy (rigid or flexible)
 - Foley balloon extraction with fluoroscopy (80% success rate)

Esophageal Foreign Bodies

Coins

- FBs impacted in the lower esophagus:
 - often spontaneously pass into the stomach
 - can be observed
 - can be advanced into the stomach (with NGT in ER without anesthesia)





Rigid esophagoscopy → optical grasper used → coin extraction
(safety and success rate approaches 100% with minimal complications)



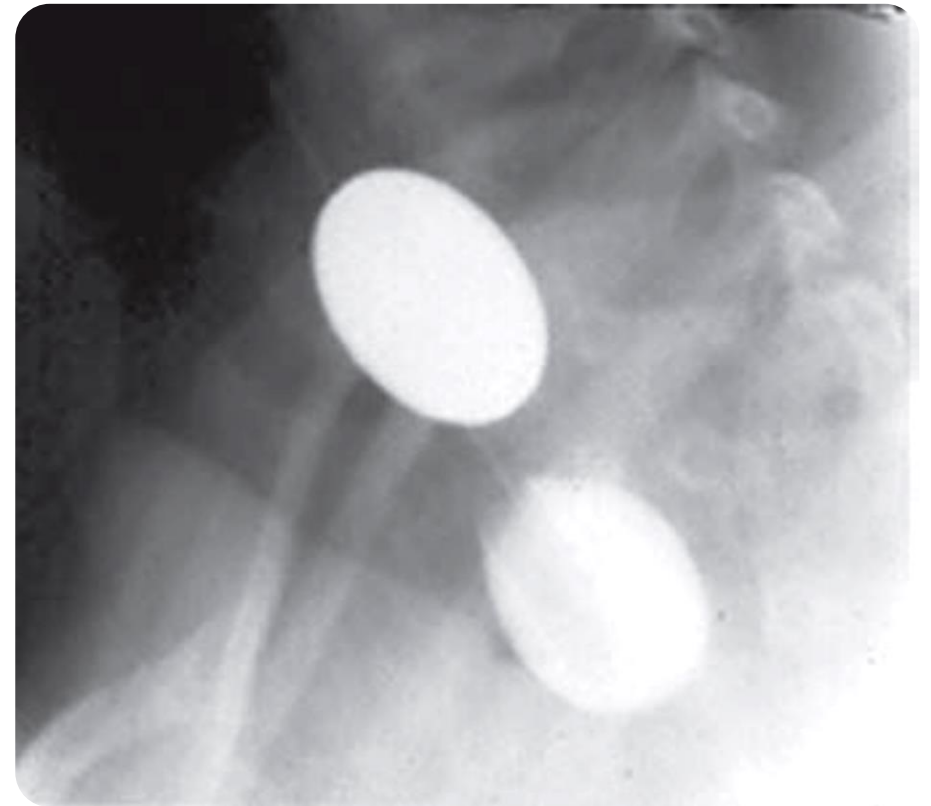




Esophageal Foreign Bodies

Foley catheter technique

- The balloon is filled with contrast
- Under fluoroscopy
- Care to avoid aspiration
- Very cost-efficient



Gastrointestinal Foreign Bodies



Gastrointestinal Foreign Bodies

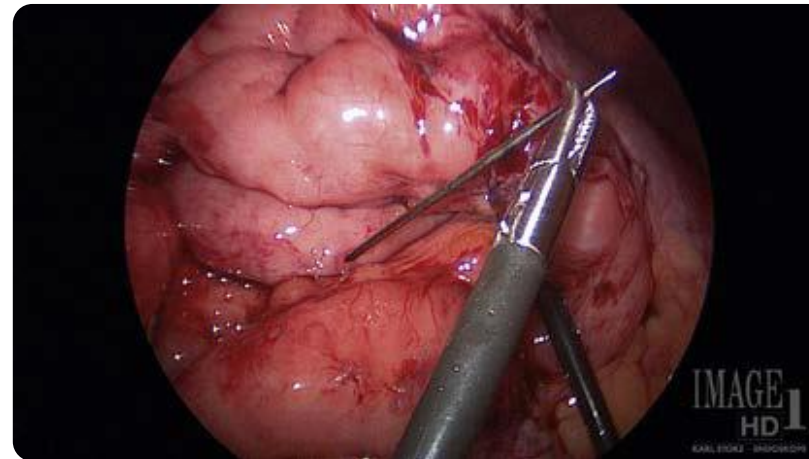
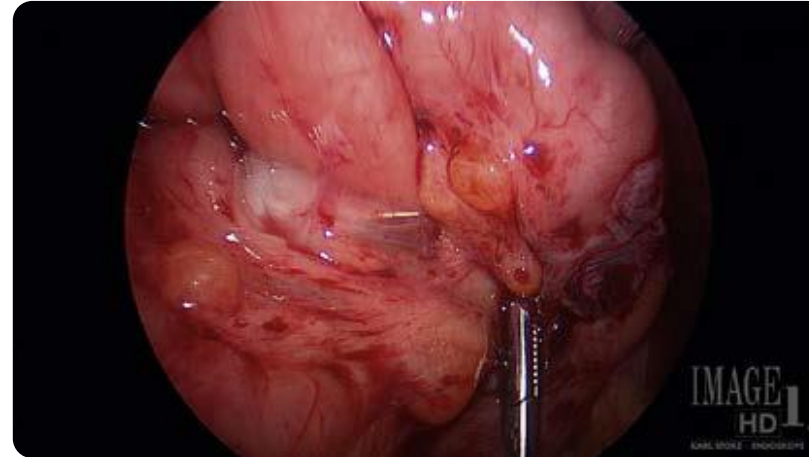
- FB ingestions distal to the esophagus are usually **asymptomatic**
- Signs and symptoms:
 - Abdominal pain
 - Nausea/vomiting
 - Fevers
 - Abdominal distention
 - Peritonitis

Gastrointestinal Foreign Bodies

- The majority of FBs that pass into the stomach will usually pass through the remainder of the gastrointestinal (GI) tract uneventfully.

Gastrointestinal Foreign Bodies

- Can be managed as an outpatient.
- Prokinetic agents and cathartics have not been found to improve gut transit time and passage of the FB.
- If did not pass → endoscopy is usually deferred for 4-6 weeks.
- Sometimes laparoscopy is needed.



sewing needle was ingested → diagnostic laparoscopy → penetrated the proximal jejunum → extracted

Special Topic Ingestions



BATTERIES

- Button batteries are more common than cylindrical.
- Symptoms occur in fewer than 10% of cases.
- On radiographs:
 - Appear as a round, smooth object (often misdiagnosed as coins)
 - Can demonstrate a double contour rim



double contour rim (button battery)

BATTERIES

- Esophageal batteries:
 - associated with increased morbidity
 - tissue injury through:
 - pressure necrosis
 - release of a low-voltage electric current
 - leakage of an alkali solution (liquefaction necrosis)
 - mucosal injury may occur in 1 hour of contact time and may continue even after removal
 - immediate removal is warranted

BATTERIES

- Early and late complications:
 - esophageal perforation
 - tracheoesophageal fistula
 - stricture and stenosis
 - mortality



Lithium battery was removed

→ 1 week later, respiratory distress → bronchoscopy: tracheoesophageal fistula

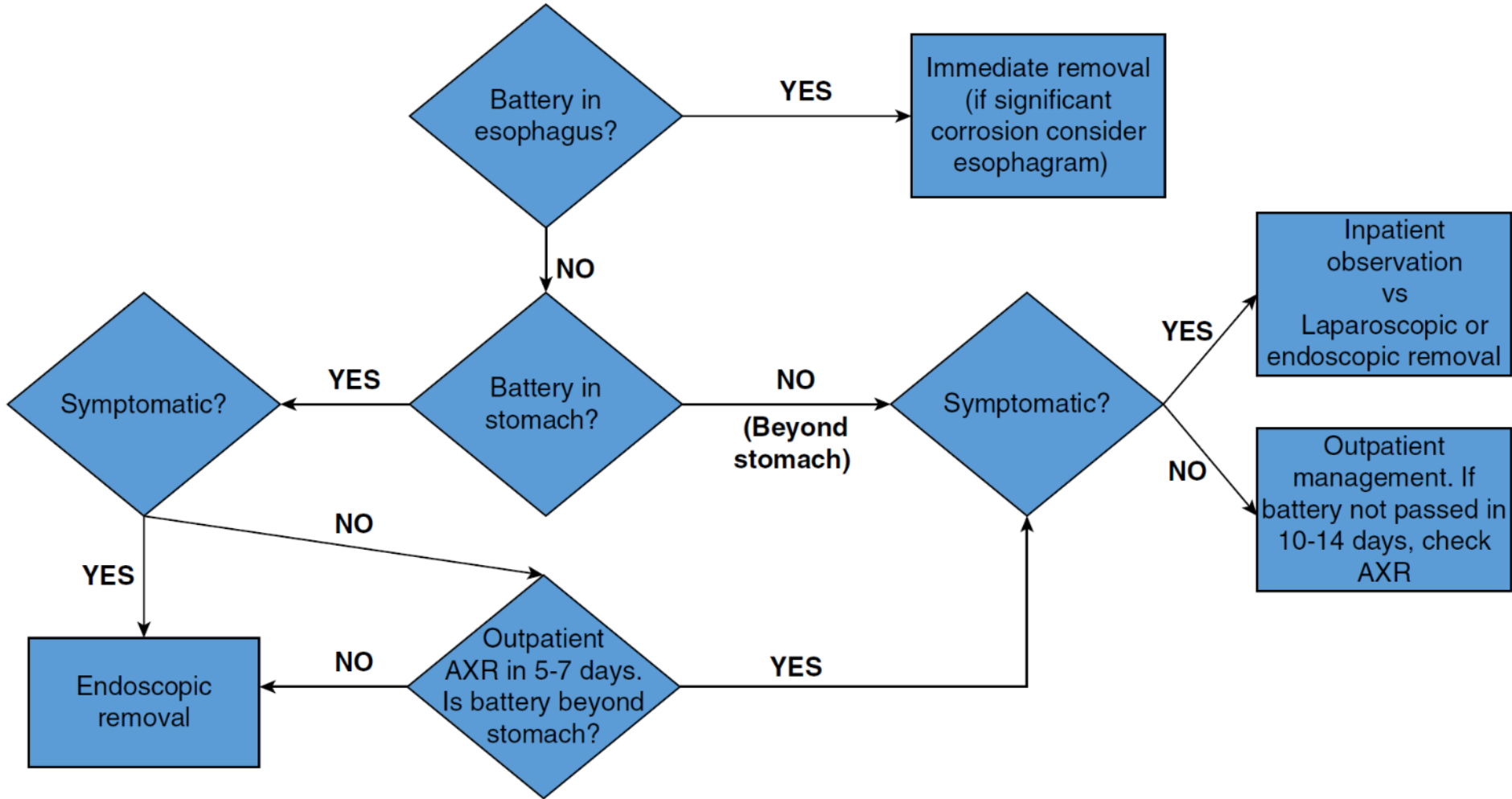
BATTERIES

If the battery is confirmed to be distal to the esophagus

+ the patient is asymptomatic

→ it can be observed (>80% will pass uneventfully within 48 hours)

Battery Ingestion Treatment Algorithm

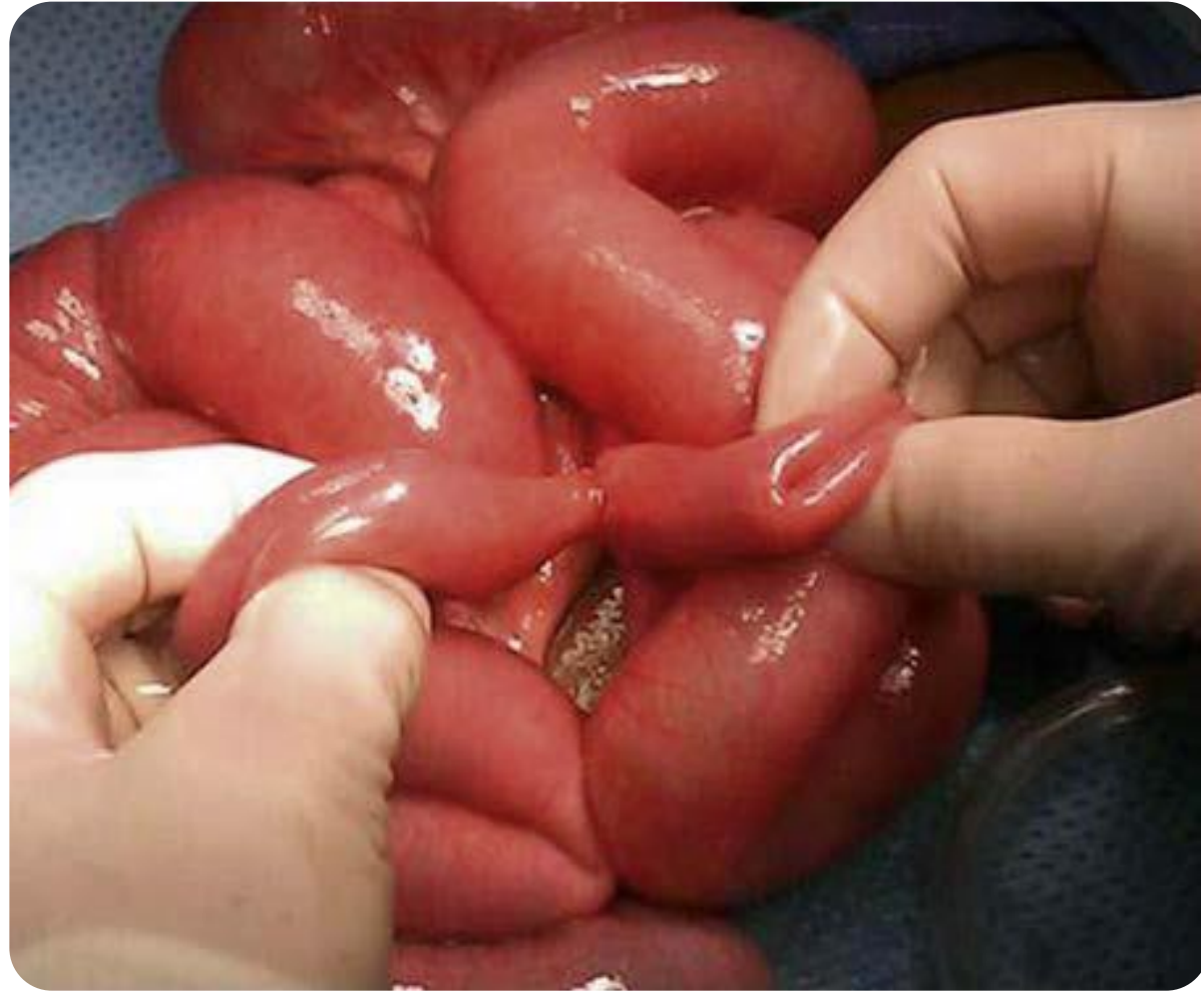


MAGNETS

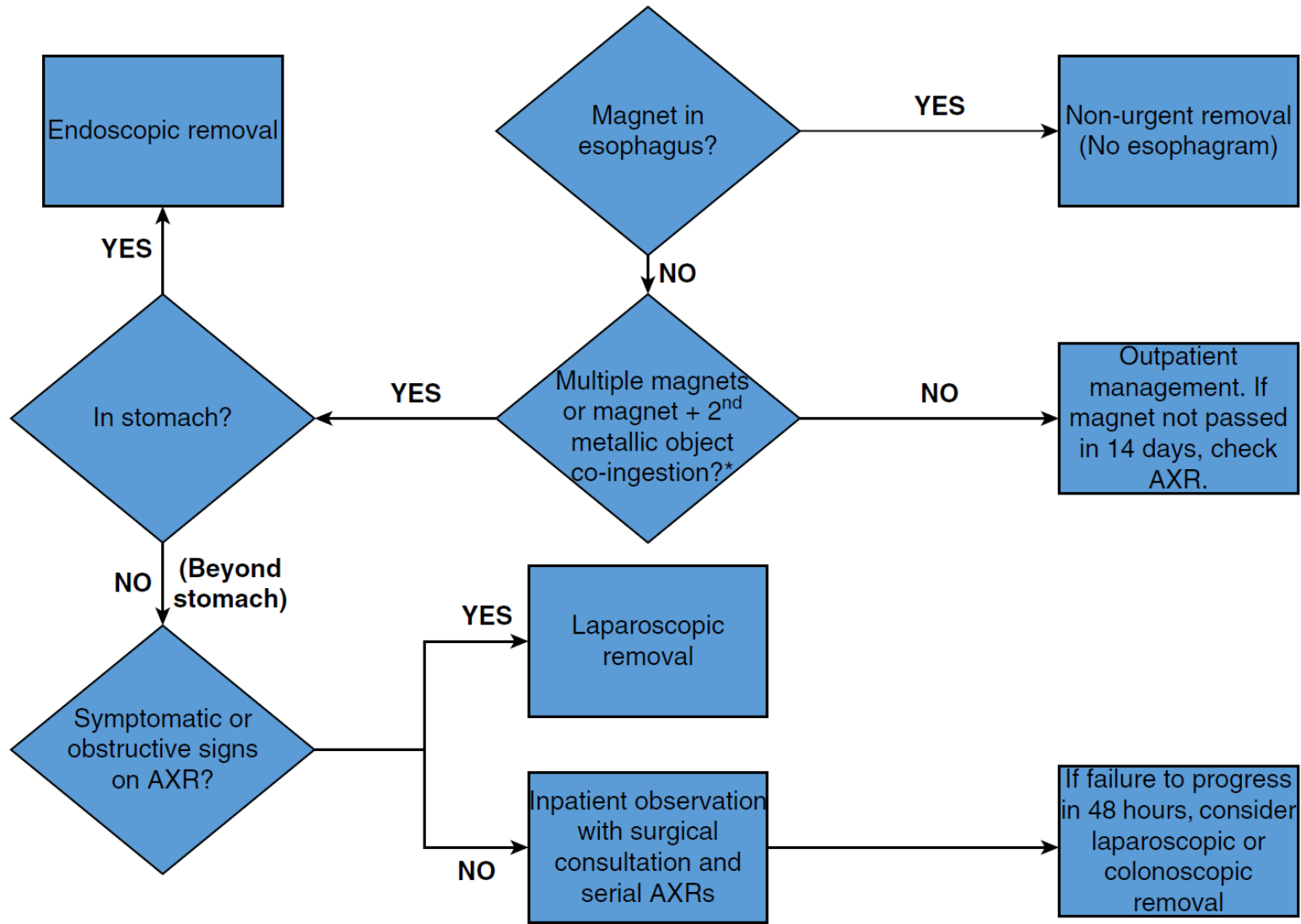
- Significant morbidity when:
 - multiple magnets
 - or a single magnet + second metallic FB
- <40% symptomatic (most common symptom is abdominal pain)
- Plain radiographs (most commonly used to confirm diagnosis)
[but.. be careful!!]

MAGNETS

- Mx:
 - Close inpatient observation (if 2 magnets or 1 + metallic FB or if in doubt)
 - Outpatient observation (if 1 magnet)
 - +/- endoscopy (to prevent complications)
 - +/- laparoscopy or laparotomy (to treat complications)
- They may attach to each other and lead to: obstruction, volvulus, perforation, or fistula through pressure necrosis.



two small magnets → exploratory laparotomy → in two separate bowel lumens causing the bowel obstruction and fistulization

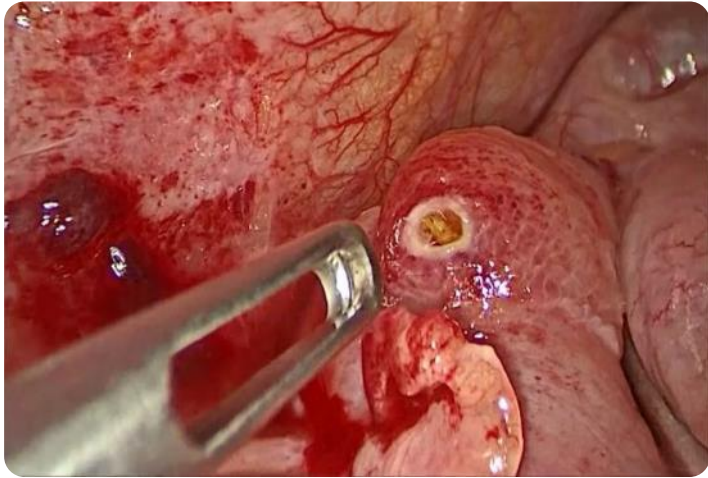
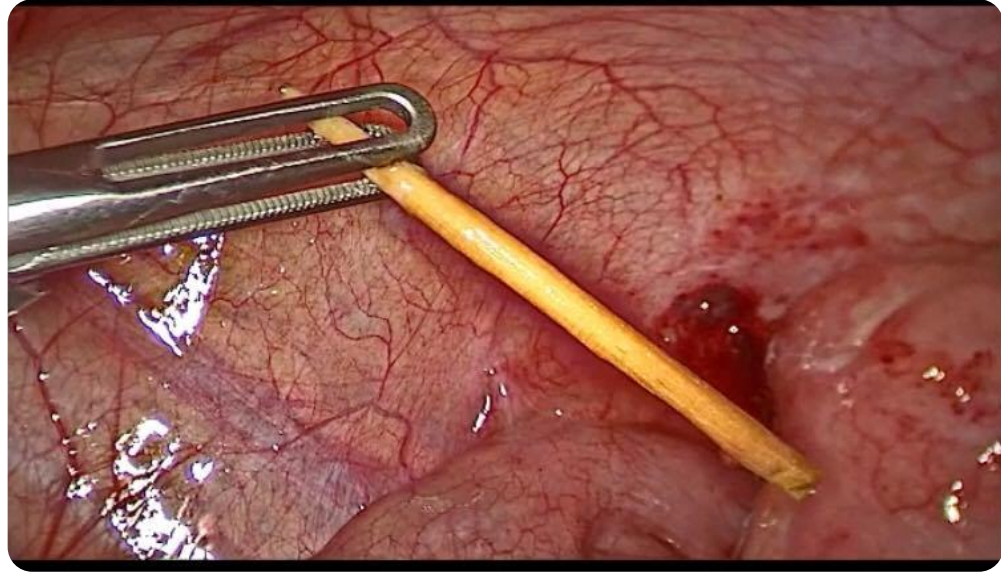
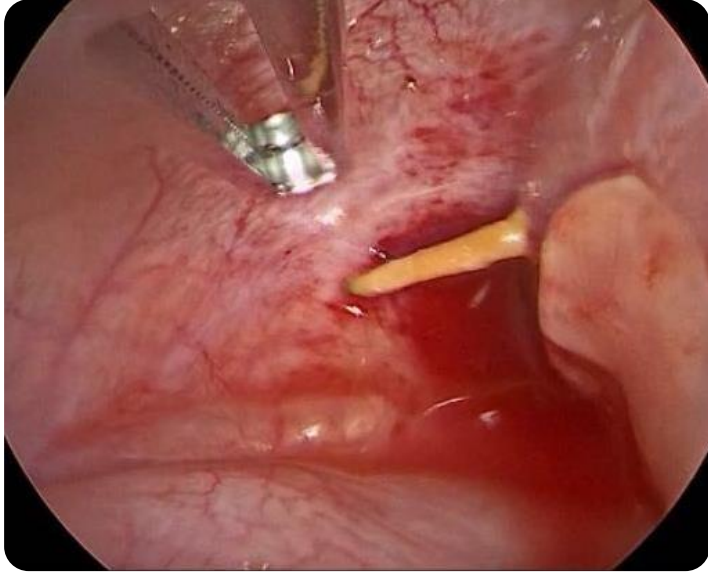


*If a single magnet vs. multiple magnet ingestion cannot be definitively differentiated by history and radiographic findings, then the patient should be treated as an inpatient for suspicion of ingestion of multiple magnets.

Management algorithm for ingested magnets

SHARP FOREIGN BODIES

- Significant morbidity
- 15-35% risk of perforation
- Perforation is most likely in narrowed portions or areas of curvature (as ileocecal valve).
- Mx:
 - Conservative: smaller objects and straight pins (lower rates of perforation)
 - Endoscopic retrieval
 - Close inpatient observation (for potential development of complications)



BEZOARS

- A bezoar is a tight collection of undigested material.
- Include:
 - lactobezoars (milk)
 - phytobezoars (plant)
 - trichobezoars (hair)

BEZOARS

- **Presenting symptoms:** nausea, vomiting, weight loss, and abdominal distention.
- **Diagnostic imaging:** plain radiographs, upper GI contrast studies, or endoscopy.
- **Mx:**
 - Operation is necessary
 - Often medical management and endoscopic removal are unsuccessful

BEZOARS

- **Phytobezoars:**

- are composed of vegetable matter.
- usually causes obstruction at the ileo-cecal valve level.

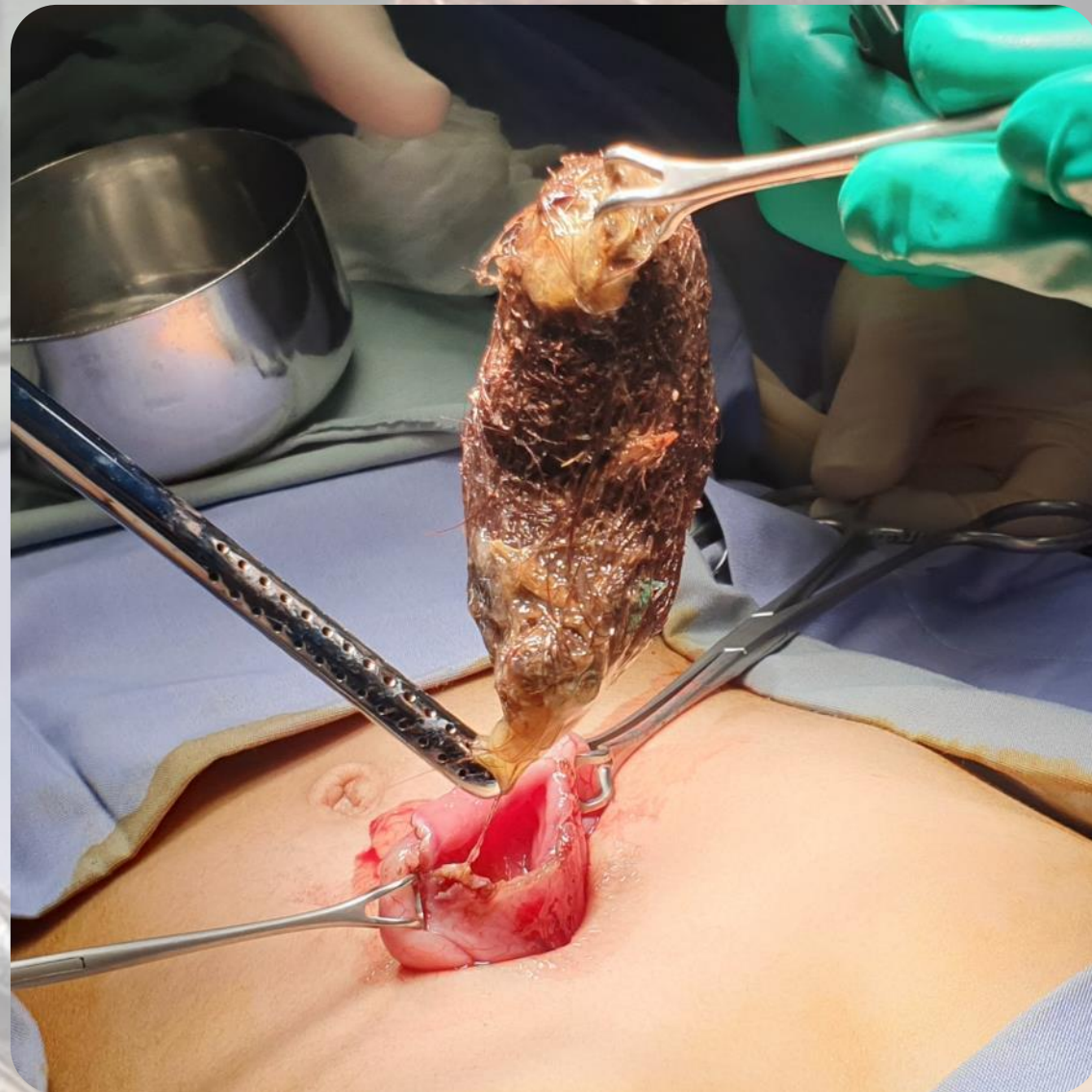
BEZOARS

- **Trichobezoars:**

- formed by hair that is swallowed
- referred to as the Rapunzel syndrome (when involves stomach + small bowel)
- associated with trichotillomania (irresistible urges to pull out hair and chewing or eating it)
- hair usually fills the stomach and can extend into the duodenum
- typically removed through a gastrotomy at laparotomy/laparoscopy



Gastric bezoar with extension into the proximal duodenum



Airway Foreign Bodies



Airway Foreign Bodies

- Most episodes occur while eating or playing.
- Curious children (who are in the oral exploration phase of development) where everything tends to go into the mouth.
- Children often will cry or run with objects in their mouth.

Airway Foreign Bodies

- Young patients tend to have:
 - immature coordination of swallowing
 - less developed airway protection

Airway Foreign Bodies

A high index of suspicion is required

Airway Foreign Bodies

- **Boys** are affected twice as often as girls (2:1).
- **Death** caused by suffocation following a FB aspiration is the leading cause of mortality from unintentional injury in children younger than 1 year.
- Victims of **child abuse** represent another community that is at **higher risk**.

Airway Foreign Bodies

- Geographical differences:
 - Sunflower seeds (m.c. in USA)
 - Watermelon seeds (m.c. internationally)
 - Nuts (m.c. in children from non-English-speaking backgrounds)

Airway Foreign Bodies

- Anatomical differences in the airway of young children compared with older children:
 - They have a shorter airway, smaller in calibre.
 - Their larynx is anteriorly positioned (increases difficulty with oral intubation).
 - Subglottic region is the narrowest part.

Airway Foreign Bodies

- The tendency for FBs to find the right main stem bronchus is well known:
 - Larger in diameter
 - Airflow is generally greater
 - Smaller angle of divergence from the trachea

Airway Foreign Bodies

- Common presenting symptoms:
 - Respiratory distress
 - Stridor
 - Wheezing
 - +/- Dysphonia
- Many children will be asymptomatic.
- Laryngeal pathology → manifest as inspiratory stridor
- Tracheal FBs → expiratory stridor

Airway Foreign Bodies

- Many aspiration events go **unwitnessed**.
- Albeit rare, FBs may completely obstruct the larynx or trachea producing **sudden death**.
- **Chronic FBs**: respiratory illnesses with persistent cough and atelectasis, recurrent pneumonia, or hoarseness.
- **Other late findings**: development of granulation tissue, strictures, perforation, and bronchiectasis.

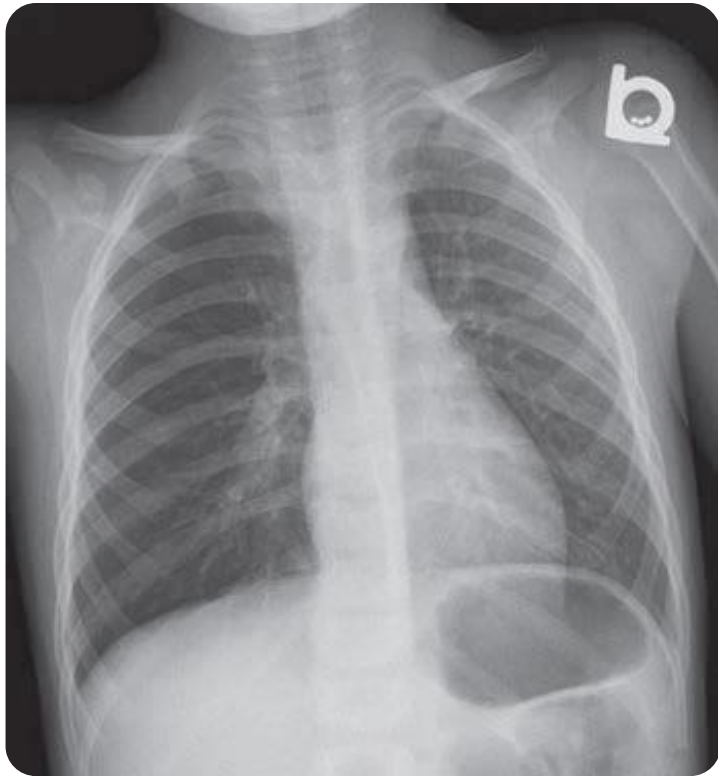
Airway Foreign Bodies

AP and lateral films of the neck and chest (inspiratory and expiratory)

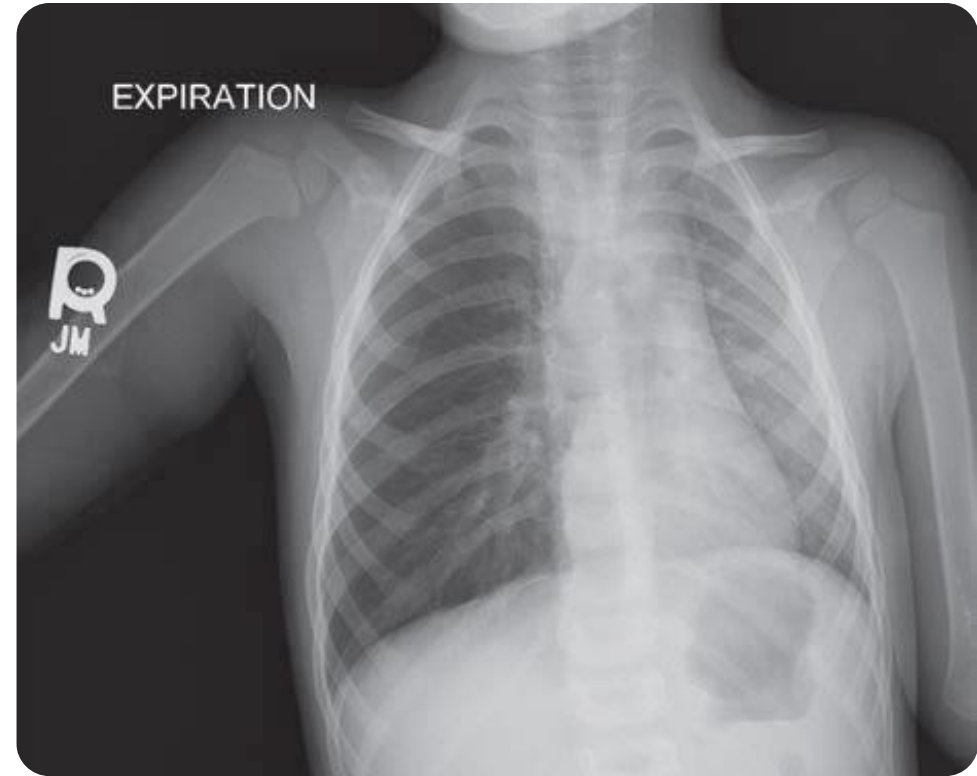
→ can reveal hyperinflation or “air trapping”

- up to 60% of children
- FB acts as a one-way valve

→ +/- mediastinal shift



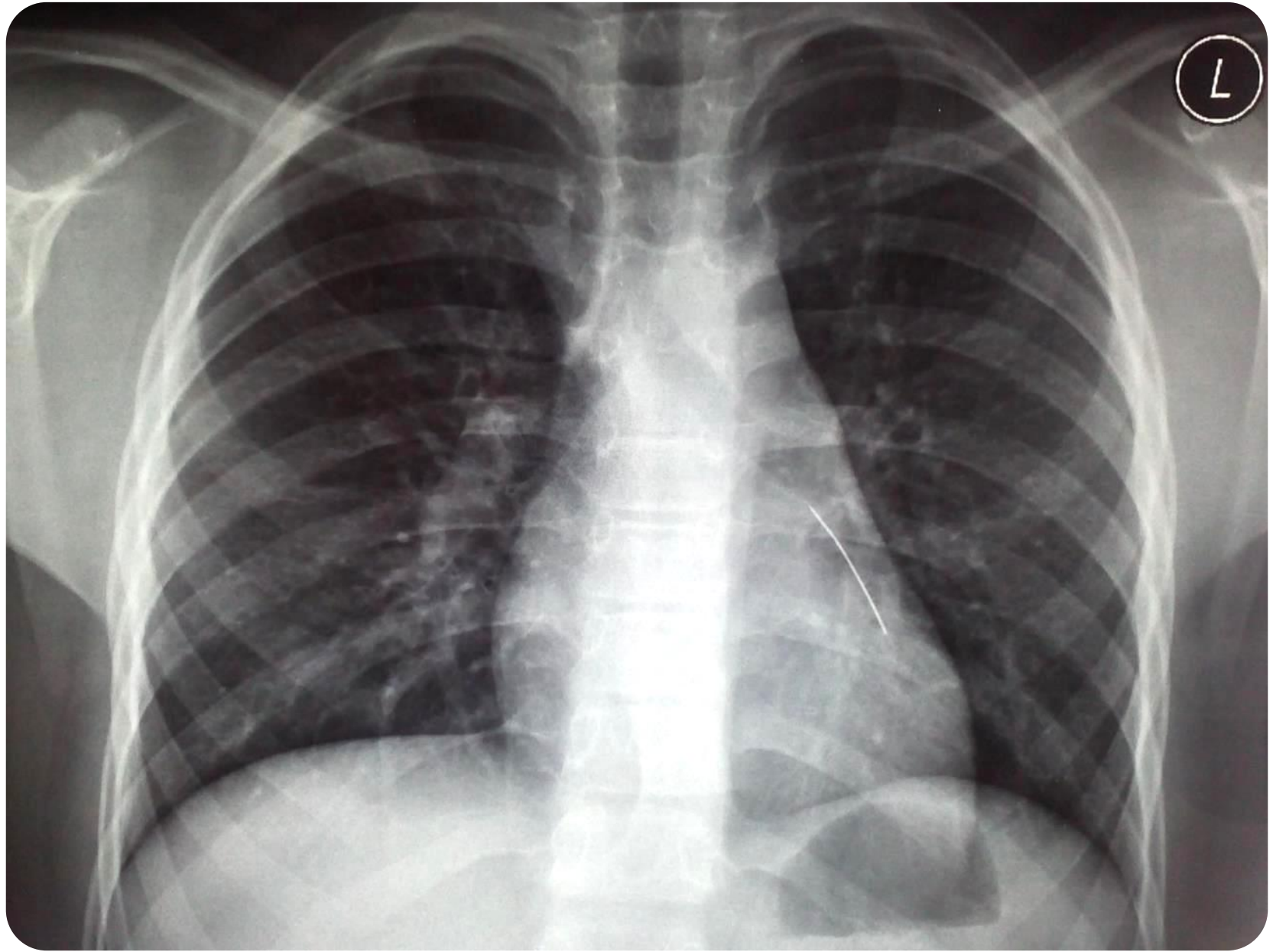
slight hyperexpansion of the right lung



expiratory film, with hyperlucency of the right lung due to air trapping

Airway Foreign Bodies

- 56% of patients had a **normal chest film** within 24 hours of aspiration.
- **Radiopaque FBs** are easily identified.
- **Radiolucent FBs** have indirect radiographic clues such as hyperexpansion.



Airway Foreign Bodies

- Radiographic imaging remains helpful in children with a history of **choking**
- Definitive diagnosis requires **bronchoscopy**

Airway Foreign Bodies

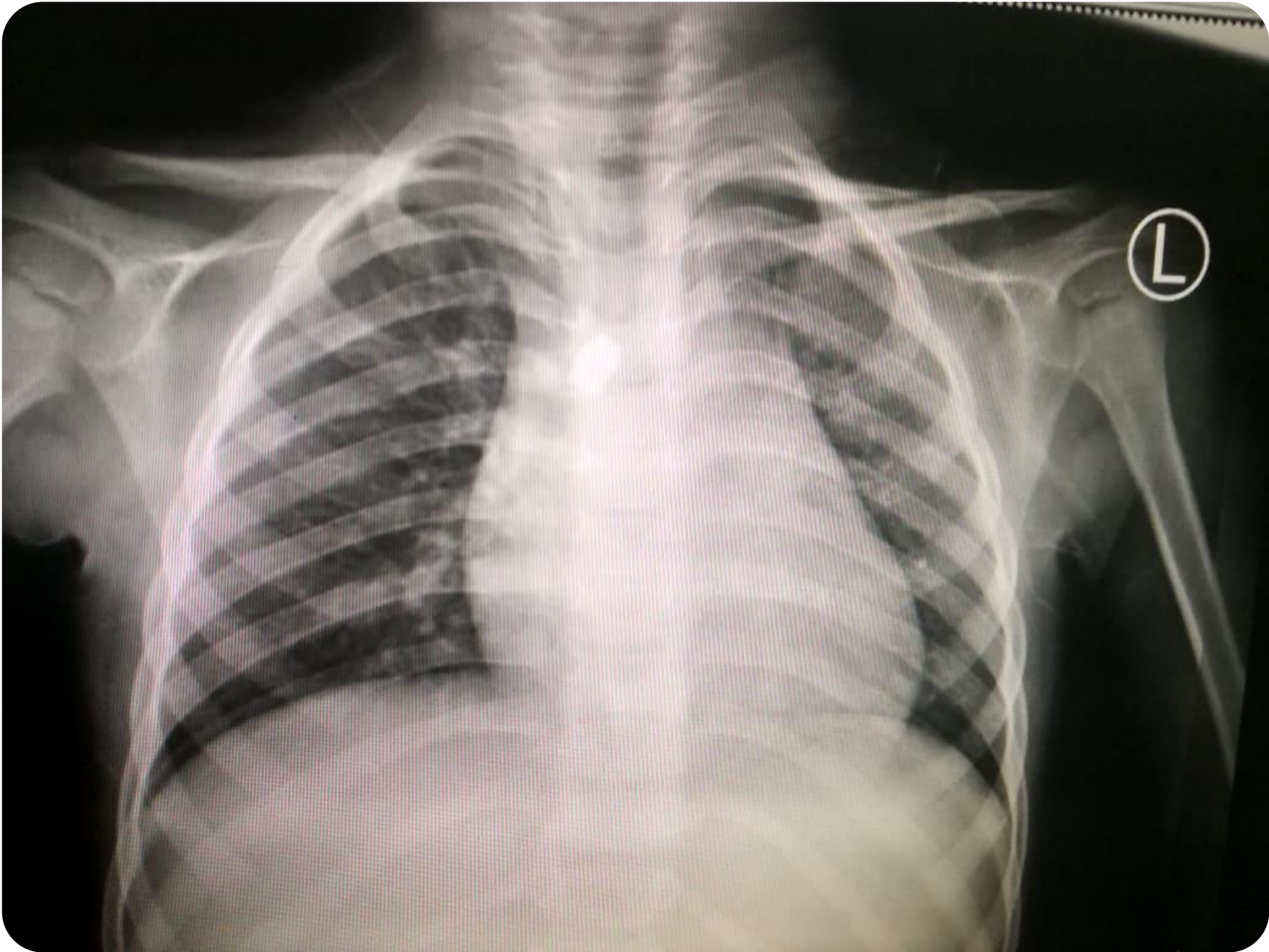
- Common practice:
 - The use of **flexible** bronchoscope (mainly to diagnose a FB)
 - **Rigid** bronchoscopy for removal of FBs (diagnostic & therapeutic)

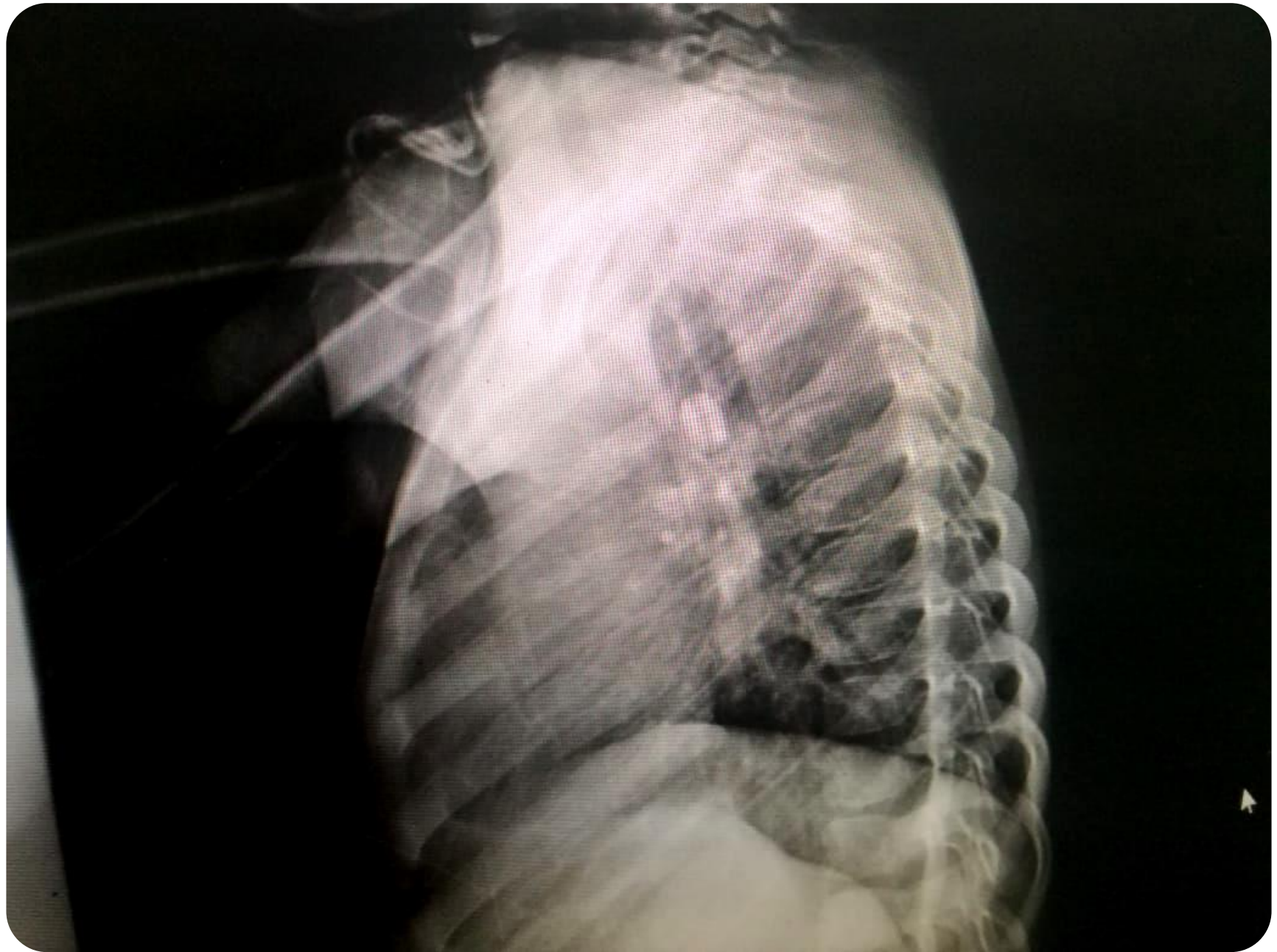


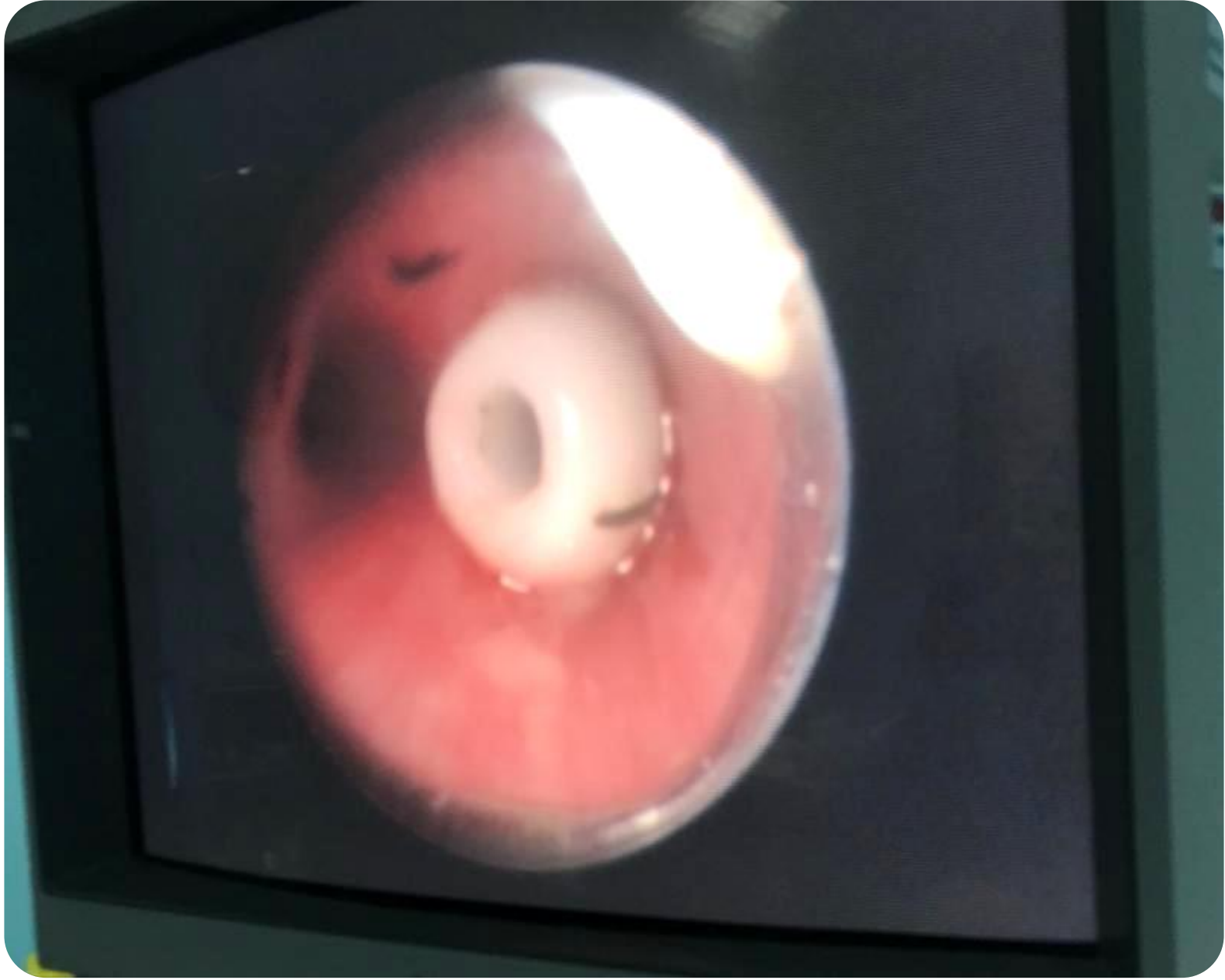


BRONCHOSCOPY

- In difficult cases, with FBs lodged distal to the main bronchus, a **Fogarty catheter** may be helpful.











BRONCHOSCOPY

- Overall **complications** of rigid or flexible bronchoscopy:
 - Bleeding from local inflammation
 - Laryngospasm
 - Pneumothorax
 - Hypoxia

BRONCHOSCOPY

- Rarely a thoracotomy with bronchotomy or lobectomy is required.

Reference

- Holcomb, G. W., Murphy, J. P., & Peter, S. D. S. (2019).
Holcomb and Ashcraft's Pediatric Surgery.