Evidence-Based Practice Recommendation: Foreign Bodies in Children

Clinical Considerations:

Children with Button Battery Ingestions

- In as little as 2 hours severe injury to the esophagus or other structures can occur. Emergency radiograph and referral is warranted in all suspected button battery ingestions.
- A two-view x-ray should always be ordered and special attention to look for a step-off or double ring on radiograph (Fig 1).
  - If they develop any symptoms, return to the ED earlier
- Batteries that are a single ingestion pass into the stomach and are ≤12 mm in size can be followed with stool checks and consideration of a follow-up x-ray. We strongly recommend consultation with specialist and err on the side of ED referral. Batteries should not remain in the body longer than 48 hours after ingestion.

What to do with Button Batteries in the Stomach

- Any patient that is symptomatic, has co-ingestion with a magnet, has more than one battery in the stomach needs a STAT GI referral and endoscopic removal
  - Even if abdominal symptoms are minor, they should be considered for removal
- If the patient is asymptomatic, battery is large (≥15 mm) and ingested by a young child (<6 years) – they should return to the ED within 2-4 days for a repeat radiograph
  - If they develop any symptoms, return to the ED earlier
- If the patient is asymptomatic, battery is small (≤12 mm), is a single ingestion, and the parent is reliable they can be managed at home with confirmation of battery passage by stool checks or a repeat radiograph in 10 days (with instructions to return earlier to ED if any symptoms develop)

Emergent Referral Indications

Table 1

<table>
<thead>
<tr>
<th>Emergent Referral Indications</th>
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<tr>
<td>High Powered Magnets (i.e. Buckyballs®)</td>
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<tr>
<td>Any disk or button battery</td>
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<td>Any signs of airway compromise (choking, stridor, unexplained wheezing)</td>
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<td>Any signs of GI irritation or obstruction (drooling, refusing to eat, chest pain, vomiting and fever)</td>
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<td>Sharp and long objects in the esophagus or stomach (i.e. sewing needle)</td>
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<td><strong>Urgent Referral</strong></td>
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<td>Asymptomatic and coin in esophagus not passing in 24 hours</td>
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<tr>
<td>Asymptomatic and single disc battery in stomach – should never stay in stomach past 48 hours.</td>
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Other Considerations

When can foreign body mimic other diseases?

- Typical viral croup has 1-4 days of prodrome of coryza followed by a barky cough and resolution of illness by 3-5 days. If hospitalized, the typical stay is 12-48 hours.
- Alternate diagnoses should be considered if:
  - The child is drooling, has difficulty swallowing, is refusing to drink or looks toxic
  - The child has only expiratory stridor
  - The child has repeated presentations for the same illness or an atypical length or onset of illness.
- Children with food bolus impaction often have underlying esophageal or anatomic pathology and should be referred to specialist.
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Imaging

- What image to order and how (all symptomatic patients warrant ED referral for urgent imaging):
  - GI foreign bodies
    - Order with ARA as: **AP from mouth to anus, Reason: foreign body**
    - If a foreign body is seen then a lateral may be added for localization
  - Airway foreign bodies – **many aspirated foreign bodies may be non-radiopaque and require bronchoscopy by history and exam alone**
    - CXR - AP and lateral with Inspiratory/expiratory films (Bilateral decubitus films in patients who are unable to do inspiratory/expiratory films)
    - AP and lateral neck films for upper airway foreign bodies (stridor, drooling)
  - **Never** order an esophagram prior to subspecialist consultation as it may make future endoscopy more challenging

**How do I get a STAT radiology read on a film?**

- Order the film stat
- Call ARA for stat read: 512-454-5641

**Radiation concern for plain films should not delay imaging:**

- Plain films – 0.04-0.1 mSv (10 times less than annual background exposure of living on Earth)
- Dose associated with risk of cancer – 50 mSv

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![Figure 1 – Button battery vs coin on radiograph](https://example.com/figure1.png)

- Button battery with double ring or halo sign
- Coin with a homogeneous appearance
Suspect a battery ingestion in these situations

- "Coin" ingested. Check AP x-ray for battery's double-rim or halo-effect and lateral view for step off.

Battery ingestion known or suspected

- NPO until esophageal position ruled out by x-ray.¹
- Take up to 5 minutes to determine imprint code (or diameter) of companion or replacement battery.
- Consult National Battery Ingestion Hotline at 202-625-3333 for assistance with battery identification and treatment.

Patient ≤ 12 years

- NPO until esophageal position ruled out by x-ray.¹
- Take up to 5 minutes to determine imprint code (or diameter) of companion or replacement battery.
- Consult National Battery Ingestion Hotline at 202-625-3333 for assistance with battery identification and treatment.

Patient > 12 years and battery > 12 mm

- X-ray immediately to locate battery.² Batteries lodged in esophagus may cause serious burns in 2 hours. Batteries in the esophagus may be asymptomatic initially. Do not wait for symptoms.
- Are all these conditions met?
  - Patient is entirely asymptomatic and has been so since ingestion.
  - Only one battery ingested.
  - Magnet not also ingested.
  - ≤ 12 mm diameter determination is certain.
  - No pre-existing esophageal disease.
  - Patient or caregiver is reliable, mentally competent, and agrees to promptly seek evaluation if symptoms develop.
- If symptoms develop later, promptly re-evaluate.
- If battery in stomach, remove endoscopically even if symptoms appear minor. If battery beyond reach of endoscope, surgical removal reserved for unusual patients with occult or visible bleeding, persistent or severe abdominal pain, vomiting, signs of acute abdomen and/or fever, or profoundly decreased appetite (unless symptoms unrelated to battery).
- Anticipate specific complications based on injury location, battery position and orientation (negative pole). Determine length of observation, duration of esophageal rest, need for serial imaging or endoscopy/bronchoscopy based on severity and location of injury. Monitor patients at risk of perforation into vessels as inpatients with serial imaging and stool guaiacs. Intervene early to prevent fatality. Monitor for respiratory symptoms, especially those associated with swallowing, to diagnose TE fistulas early. Expect perforations and fistulas to be delayed up to 28 days after battery removal and esophageal strictures delayed weeks to months.

Battery in Esophagus?

- NO (battery in stomach or beyond)
  - Was a magnet co-ingested?
    - YES
      - Do not wait for symptoms. Remove endoscopically if possible; surgically if not.
    - NO
      - Are related signs or symptoms present?
        - YES
          - ≥ 15 mm cell ingested by child < 6 years³
          - X-ray 4 days post ingestion (or sooner if symptoms develop). If still in stomach, remove endoscopically (even if asymptomatic).
        - NO
          - X-ray immediately to locate battery.² Batteries lodged in esophagus may cause serious burns in 2 hours. Batteries in the esophagus may be asymptomatic initially. Do not wait for symptoms.

Patient > 12 years and battery ≤ 12 mm

- Symptomatic patient, no ingestion history. Consider battery ingestion if:
  - Airway obstruction or wheezing
  - Drooling
  - Vomiting
  - Chest discomfort
  - Difficulty swallowing, decreased appetite, refusal to eat
  - Coughing, choking or gagging with eating or drinking

Immediately remove batteries lodged in the esophagus. Serious burns can occur in 2 hours. Do not delay because patient has eaten. Prefer endoscopic removal (instead of retrieval by balloon catheter or magnet affixed to tube) for direct visualization of tissue injury. Inspect mucosa for extent, depth and location of tissue damage. Note position of battery and direction negative pole faces.

After removal, if mucosal injury was present, observe for and anticipate delayed complications: tracheoesophageal fistula, esophageal perforation, mediastinitis, vocal cord paralysis, tracheal stenosis or tracheomalacia, aspiration pneumonia, empyema, lung abscesses, pneumonia, spondylodiscitis, or exanguination from perforation into a large vessel.

TIPS, PITFALLS & CAVEATS

- 3 “N’s”: Negative – Narrow – Necrotic. The negative battery pole, identified as the narrowest side on lateral x-ray, causes the most severe, necrotic injury. The negative battery pole is the side opposite the “+” and without the imprint.
- 20 mm lithium coin cell is most frequently involved in esophageal injuries; smaller cells lodge less frequently but may also cause serious injury or death.
- Definitive determination of the battery diameter prior to passage is unlikely in at least 40% of ingestions.
- Assume hearing aid batteries are < 12 mm.
- Manage ingestion of a hearing aid containing a battery as an ingestion of a small (< 12 mm) battery.
- Do not induce vomiting or give cathartics. Both are ineffective.
- Assays of blood or urine for mercury or other battery ingredients are unnecessary.

NOTES:

¹ NPO. Anesthesia may be required for removal.
² X-ray abdomen, esophagus and neck. Batteries above the range of the x-ray have been missed. If battery in esophagus, obtain AP and lateral to determine orientation of negative pole. If ingestion suspected and no battery visualized on x-rays, check ears and nose.
³ If battery diameter is unknown, estimate it from the x-ray, factoring out magnification (which tends to overestimate diameter).
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References