# Battery Ingestion Triage and Treatment Guideline

## Suspect a battery ingestion in these situations

**"Coin" ingested.**
Carefully check AP x-ray for battery's double-rim or halo-effect and lateral view for step off. Use magnification.

**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

## Battery ingestion known or suspected

Give honey 10 mL every 10 mins if child ≥12 months, lithium coin cell possibly ingested, and ingestion within prior 12 hours. (See text guideline below for detail, #2.) Do not delay going to ER to give honey. Otherwise, NPO until esophageal position ruled out.[1]

Take up to 5 minutes to determine imprint code (or diameter) of companion or replacement battery.

Consult National Battery Ingestion Hotline at **800-498-8666** for assistance with battery identification and treatment.

**Patient ≤ 12 years** → **X-ray immediately** to locate battery.[2] Batteries lodged in esophagus must be removed within **2 hours** to avoid serious, delayed complications, including death. Batteries in the esophagus may be asymptomatic initially. **Do not wait for symptoms**.

**Patient > 12 years and battery > 12 mm** → **X-ray immediately** to locate battery.[2] Batteries lodged in esophagus must be removed within **2 hours** to avoid serious, delayed complications, including death. Batteries in the esophagus may be asymptomatic initially. **Do not wait for symptoms**.

**Patient > 12 years and battery ≤ 12 mm** → 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.

**NO** → **X-ray immediately** to locate battery.[2] Batteries lodged in esophagus must be removed within **2 hours** to avoid serious, delayed complications, including death. Batteries in the esophagus may be asymptomatic initially. **Do not wait for symptoms**.

**YES** → Manage patient at home. Regular diet. Encourage activity. Confirm battery passage by inspecting stools. Consider x-ray to confirm passage if passage not observed in 10-14 days.

**If symptoms develop later, promptly re-evaluate.**

Battery in Esophagus?

**YES** → **Immediately remove** batteries lodged in the esophagus.
- Consider sucralfate suspension or honey if ≤12 h post ingestion (see text guideline below for detail, #11).
- Do not delay removal if 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 damage. Note position of battery and direction negative pole faces.
- If no endoscopic evidence of perforation, irrigate injured areas of esophagus with 50-150 mL 0.25% sterile acetic acid to neutralize residual alkali (see text guideline below, #13a).

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 abscess, pneumothorax, spondylodiscitis, or exsanguination from perforation into a large vessel.

**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** → If battery in stomach, remove endoscopically from symptomatic patient, 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).

**NO** → ≥ 15 mm cell ingested by child < 6 years[3]

**YES** → X-ray 4 days post ingestion (or sooner if symptoms develop). If still in stomach, remove endoscopically (even if asymptomatic).

**NO** → Manage patient at home. Regular diet. Encourage activity. Confirm battery passage by inspecting stools. Consider x-ray to confirm passage if passage not observed in 10-14 days.

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 (98% diagnosed by 48 days after battery removal) and esophageal strictures delayed weeks to months.

**TIPS, PITFALLS & CAVEATS**

- 3 "N's" : **N**egative – **N**arrow – **N**ecrotic. 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 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 except for honey or sucralfate suspension.

[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 overestimates diameter).