

## Button battery ingestion in children: What the emergency radiologist should know

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**Section:** Paediatric radiology

**Area of Interest:** Emergency

**Procedure:** Diagnostic procedure

**Imaging Technique:** CT

**Imaging Technique:** CT-Angiography

**Special Focus:** Foreign bodies Acute Case Type:

Clinical Cases

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**Patient:** 4 years, female

### Clinical History:

A 4-year-old previously healthy girl presented to the emergency room with chest pain, coughing and vomiting. A chest radiograph 3.5 hours after presentation showed a round radiopaque 22mm foreign body in the mid-oesophagus.

### Imaging Findings:

A chest radiograph 3 hours after presentation showed a round radiopaque foreign body in the mid-oesophagus (Fig. 1). It measured 22mm in diameter and 6mm in thickness.

On computed tomography angiography (CTA) (with low-dose paediatric protocol), performed before endoscopy, a button battery (> 2000 HU) is clearly visualised, with a preserved fat plane with respect to the aorta (Fig. 2, 3 and 4). Despite the metallic artefact, there was no evidence of tracheo-oesophageal or aorto-oesophageal fistulae. With these findings, endoscopy was rapidly performed for removal of the foreign body lodged in the oesophagus. Oesophago-gastroscopy described the following findings:

In the upper part of the middle third of the oesophagus there is a button battery, stuck in the mucosa. The oesophageal mucosa, which surrounds the foreign body, demonstrates fibrin, oedema, and some necrotic areas, which bled with rubbing of the endoscope. Extraction was achieved without bleeding.

### Discussion:

Injuries related to button batteries in children have been a problem for several decades; however, a dramatic rise in severe or fatal outcomes has occurred. Button batteries are increasingly used in devices such as hearing aids, electronic games, watches, digital planners, and new-electronic gadgets. Their smooth and shiny appearance makes them quite attractive and interesting to children.

Imaging plays an important role in the workup and treatment of paediatric patients with suspected foreign-body aspiration or ingestion, and a familiarity with the appropriate imaging approach as well as the imaging appearances for common and dangerous foreign bodies is essential for the practicing radiologist [1].

The first imaging step in suspected foreign-body ingestion is generally radiography [1].

Disk (or button) batteries in particular carry a high risk for corrosive injury to the gastrointestinal tract, including

oesophageal burns, fistula formation, and perforation. High-efficiency disk batteries produce currents that cause liquefaction necrosis and thermal injury to the oesophagus [1, 3, 5].

Even “dead” batteries retain enough voltage to generate an external current and need to be removed promptly. Oesophageal damage can occur in as little as 1–2 hours.

If a foreign body suspected to be a disk battery is noted in the oesophagus, emergency endoscopic removal is indicated (as in our case). In guidelines such as NASPGHAN (2015), a CTA is indicated if there is suspicion of oesophageal complications due to ingestion of a button battery [2]. With CTA, in addition to oesophageal anomalies, we also want to confirm vascular integrity, especially of the aorta, since there are cases described in which the aorta is affected. Perforation can result in as soon as 6 hours after ingestion, almost always in the oesophagus. In addition to perforation, major complications include tracheoesophageal or oesophageal-aortic fistula and oesophageal scarring [1, 2, 3, 4].

Disk batteries left in the stomach for more than 4 days may corrode and fragment, releasing toxic substances. Radiographic follow-up is therefore needed for batteries seen in the stomach at initial examination. Removal of a disk battery present in the stomach is indicated if the patient develops signs of peritonitis or if the battery remains in the stomach for more than 4 days and is greater than 15 mm in diameter [4, 5].

Consider the 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 [2, 5].

**Differential Diagnosis List:** Impaction of a button battery in the oesophagus, without associated perforation or fistula., Magnets, Lead-containing foreign bodies

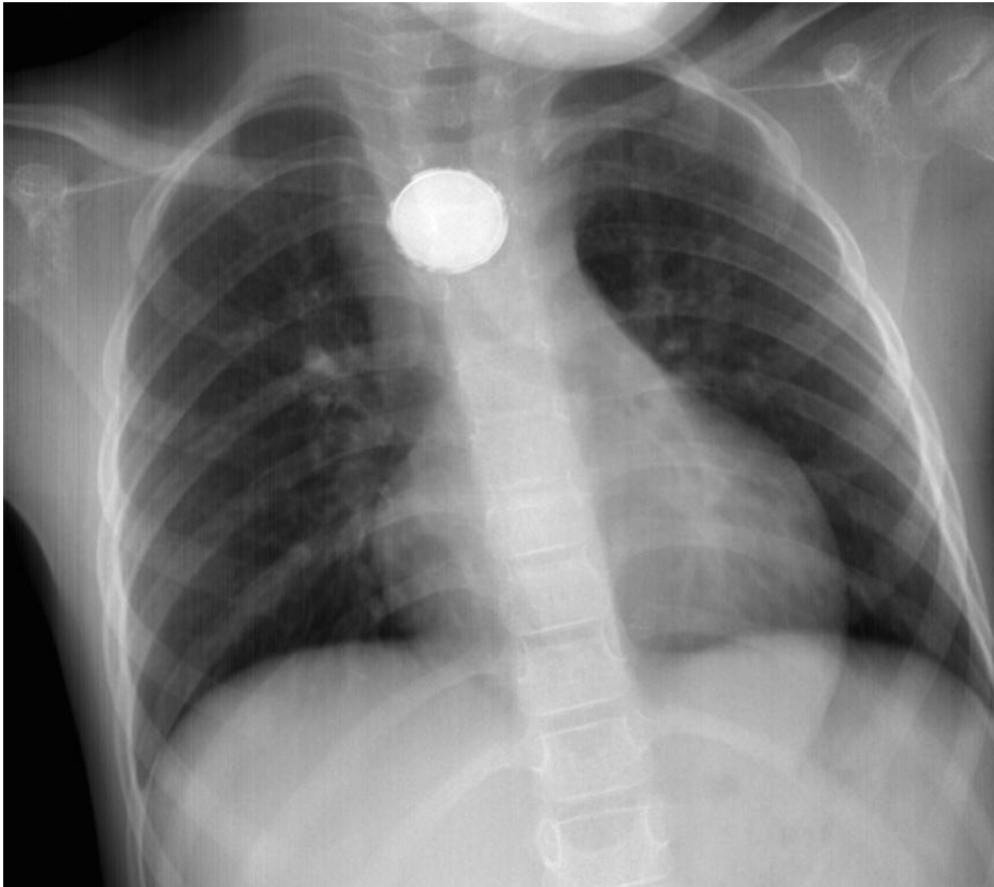
**Final Diagnosis:** Impaction of a button battery in the oesophagus, without associated perforation or fistula.

## References:

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**Figure 1**

**a**



**Description:** PA chest X-ray with a foreign body in the oesophagus. **Origin:** Department of Radiology, Hospital Clínico Virgen de la Arrixaca. Murcia (Spain).

**Figure 2**

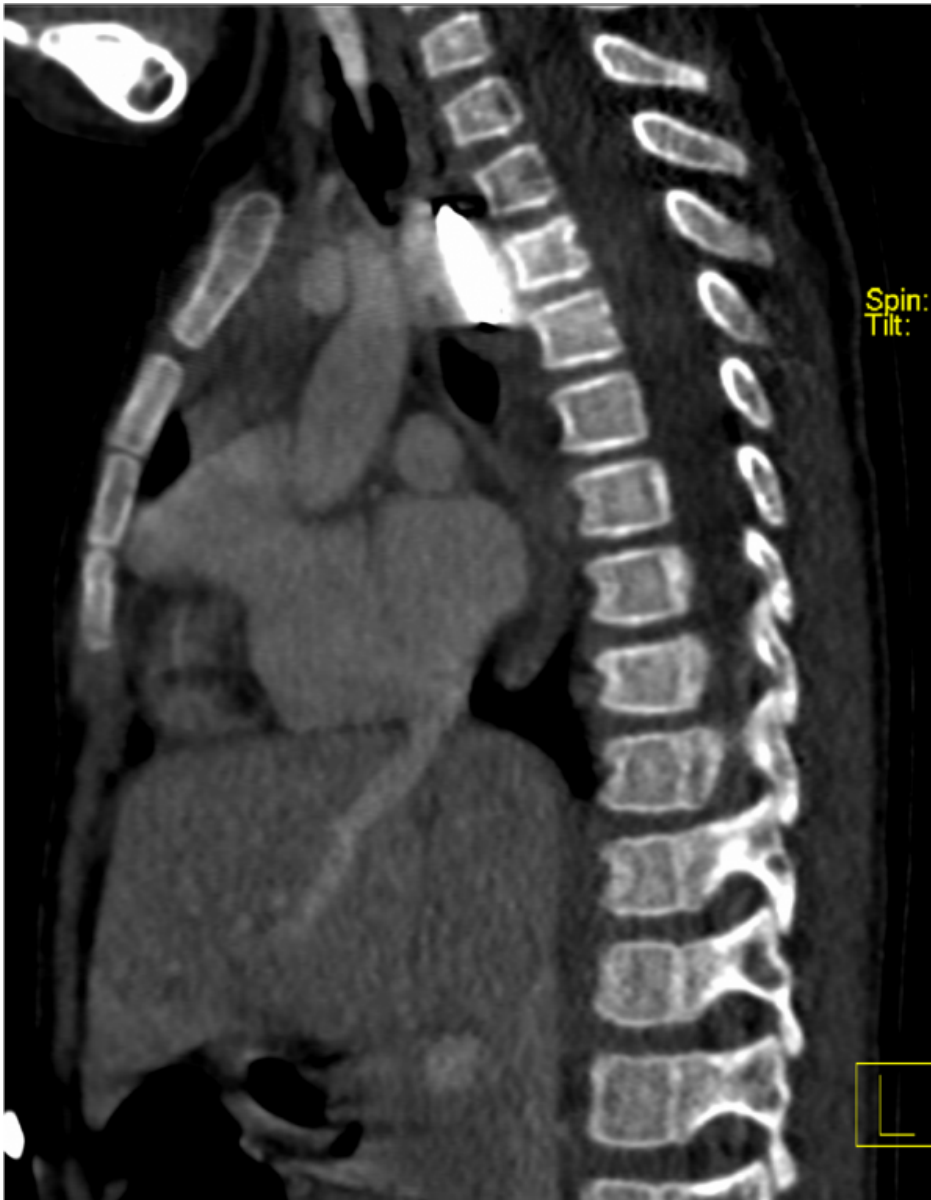
**a**



**Description:** Despite the metallic artefact, there is no evidence of tracheo-oesophageal or aorto-oesophageal fistulae. **Origin:** Department of Radiology, Hospital Clínico Virgen de la Arrixaca. Murcia (Spain).

**Figure 3**

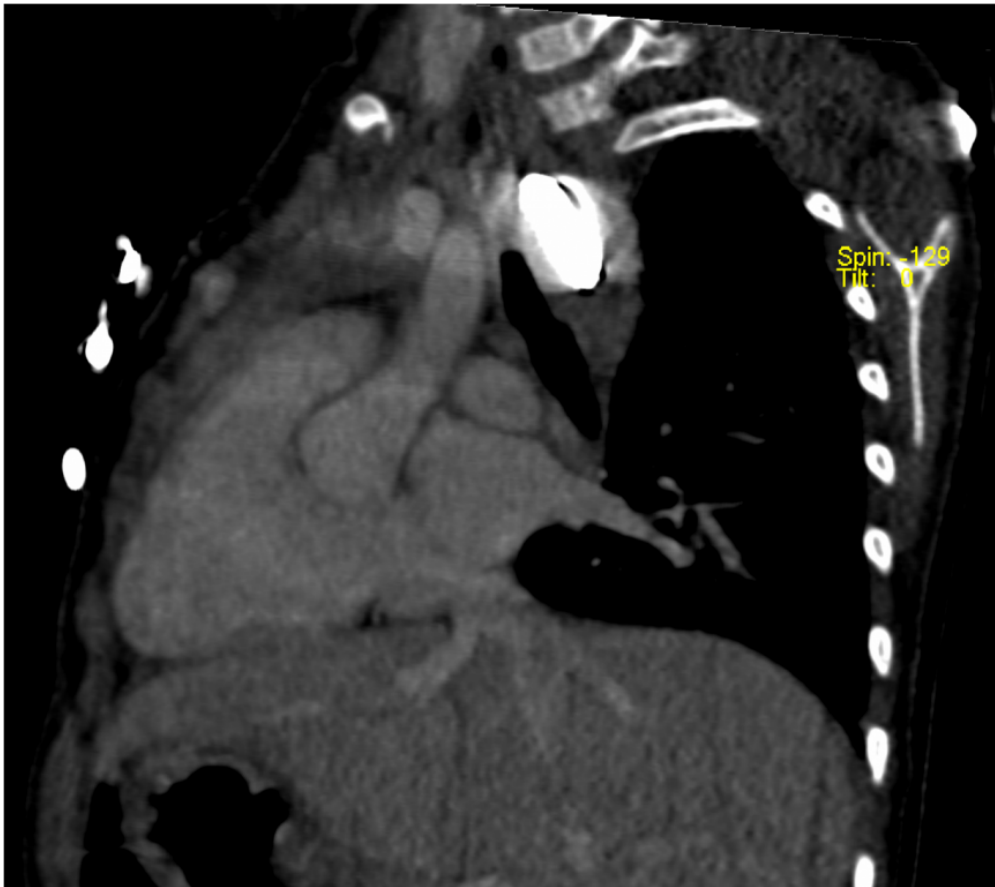
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**Description:** Despite the metallic artefact, there is no evidence of tracheo-oesophageal or aorto-oesophageal fistulae. **Origin:** Department of Radiology, Hospital Clínico Virgen de la Arrixaca. Murcia (Spain).

**Figure 4**

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**Description:** No evidence of fistulae.

Hyperdensity around the foreign body is due to artefact, not to blood or other complications. **Origin:** Department of Radiology, Hospital Clínico Virgen de la Arrixaca. Murcia (Spain).

## Figure 5

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**Description:** Detail of the foreign body using CT. There is no communication (at the time of study) between the airway and the digestive tract. **Origin:** Department of Radiology, Hospital Clínico Virgen de la Arrixaca. Murcia (Spain).