CASE REPORT

Ingestion of cylindrical batteries and its management

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SUMMARY

In contrast to the ingestion of coin batteries, the ingestion of cylindrical batteries is an uncommon medical presentation. Owing to their larger size, cylindrical battery ingestion can lead to serious complications including intestinal haemorrhage, bowel obstruction, bowel perforation, peritonitis and even death. We discuss the case of a 17-year-old girl who presented after swallowing three cylindrical batteries. Her medical history included depression and previous battery ingestion that required surgical removal. During this presentation however, these ingested batteries were removed endoscopically at oesophagogastroduodenoscopy and ileocolonoscopy. The patient was subsequently discharged without complication. This paper discusses the complications and management of cylindrical battery ingestion.

BACKGROUND

Foreign body ingestion is a common presentation to the accident and emergency department.¹ The ingestion of a wide range of objects has been previously reported including coins and ashes.² Although the majority of foreign objects pass through the gastrointestinal tract and are egested without complication,¹ the ingestion of specific foreign bodies will confer variable risks and complications. Management therefore needs to be adjusted on a case-by-case basis according to the particular foreign body ingested and the patient characteristics. We describe the case of a patient who ingested three cylindrical batteries, her subsequent management and a literature review.

CASE PRESENTATION

A 17-year-old girl presented to the accident and emergency department with abdominal pain. The history revealed that she had ingested three cylindrical batteries 14 hours previously (2AA and 1AAA). She denied that the act was a deliberate attempt to self-harm; she stated that foreign object ingestion had become a habit of hers.

Her medical history included being registered as deaf since birth. She had a recent inpatient admission to a psychiatry unit with a long-standing history of depression. She was known to the Child and Adolescent Mental Health Services (CAMHS) and also under the care of an adolescent psychiatrist. Furthermore, she also recently presented with a mixed overdose of paracetamol and alcohol, which required treatment with N-acetyl cysteine. Within the past 1 year, she presented with another episode of battery ingestion. Following small bowel

ileus, the battery was removed surgically. Her current medications included citalopram 30 mg once daily and risperidone 1 mg two times per day. She had no known drug allergies.

Her baseline observations were as follows: heart rate 82/min, blood pressure 110/70 mm Hg, respiratory rate 16/min, oxygen saturations 98% on room air and temperature 37.2°C. On examination, there was a small transverse scar on her abdomen in the right iliac fossa. The abdomen was soft and non-tender with no masses, and bowel sounds were normal. Digital rectal examination was not remarkable.

INVESTIGATIONS

Routine blood tests revealed: haemoglobin 137g/L, white cell count $6.3 \times 10^9/L$ and platelets $257 \times 10^9/L$. Her urea and electrolytes, liver function tests and clotting were normal, and her C reactive protein was <4 mg/L. An erect chest radiograph did not show any evidence of free subdiaphragmatic air. An abdominal radiograph (figure 1) confirmed the presence of three radio-opaque structures (two in the epigastric area and one in the right iliac fossa) compatible with cylindrical batteries. There was no evidence of obstruction or perforation.

Figure 1 Abdominal radiograph at presentation. The radiograph shows three cylindrical batteries in the abdomen with two in the epigastric area and one in the right iliac fossa.

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TREATMENT

Given that her previous episode of battery ingestion required surgical removal, we proceeded to urgent oesophagogastrroduodenoscopy under general anaesthesia with the intent of removing the two batteries from the stomach. AA and AAA batteries were successfully removed from the stomach using a Roth retrieval net. Of note, both ends of the batteries had eroded

Figure 2 Batteries removed by oesophagogastrroduodenoscopy. Two cylindrical batteries (AA and AAA) were removed from the stomach. At the time of the procedure, they had already eroded with the contents leaked out into the stomach causing gastritis and ulceration.

Figure 3 Abdominal radiographs on proceeding days. Abdominal radiographs A and B show minimal progression of the remaining battery along the gastrointestinal tract.

Figure 4 Battery removed by ileocolonoscopy. The final battery was shown to be in the ascending colon at the time of removal by ileocolonoscopy using a Roth retrieval net.

(figure 2) and there was evidence of significant gastric ulceration and gastritis in the stomach due to caustic acid damage. The oesophagus and duodenum were normal. The remaining battery in the distal bowel was initially monitored conservatively with laxatives and daily abdominal radiographs.

After a further 2 days, the serial abdominal films confirmed that the remaining battery was in the right iliac fossa, suggesting impaction at the ileocaecal valve (figure 3). As the patient previously required surgical intervention to remove a battery from the small bowel, we proceeded to ileocolonoscopy removal (figure 4). At ileocolonoscopy, the final AA battery was actually found in the proximal right colon and was also successfully removed using a Roth retrieval net.

OUTCOME AND FOLLOW-UP

The patient remained stable post-ileocolonoscopy and was discharged later that day.

DISCUSSION

Ingestion of batteries is well documented in the medical literature with button batteries being the most common type of battery ingested.^{1 3} Although the incidence of battery ingestion is well documented, there appears to be a paucity of published data on the relative incidence of coin and cylindrical battery ingestion. Our literature review identified only one such publication. In this study, 8648 cases of battery ingestion were reported by the National Battery Ingestion Hotline (Washington, DC, USA) between 1 July 1990 and 30 September 2008. Of these 8648 cases, 8161 (94.4%) were button batteries and 487 (5.6%) were cylindrical batteries.⁴ While most cases follow a

benign course, serious complications can occur including perforation, strictures, fistulas, exsanguination and even death.⁴

Ingestion of AA or AAA batteries in adults is unusual and most commonly occurs in psychiatric patients or prison inmates.⁵ This may be an act of deliberate self-harm and cases of patients biting the ends of the battery to increase toxicity have also been reported.⁶ Our patient in this case report had a background of psychiatric illness which would fit with previous cases described. However, she denied removing or biting the ends of the batteries yet they had eroded in her stomach.

Guidelines produced by the American Society for Gastrointestinal Endoscopy have suggested that foreign body ingestion with signs of airway compromise and oesophageal obstruction should be removed emergently. Furthermore, these guidelines also suggest cylindrical batteries that remain in the stomach for over 48 hours after ingestion should be removed.⁷ However, our case highlights that within 24 hours of ingestion significant gastric ulceration can already occur; this may lead to visceral perforation. Certainly in the context of battery ingestion on a background of underlying peptic ulcer disease, we believe earlier oesophagogastroscopy should be considered due to increased risk of perforation.

Moreover, the contents of alkaline batteries include zinc, manganese, mercury and lithium. Although rare, these can cause poisoning with mercury toxicity being previously reported.³ If toxicity is suspected, the National Poisons Information Service should be consulted using TOXBASE (<https://www.toxbase.org/>).

Battery ingestion is being increasingly reported and as a result the management of this presentation is becoming more refined. Cylindrical batteries are often larger than button batteries thereby increasing the risk of complications. Owing to their larger size, cylindrical batteries will contain a greater volume of toxic contents thereby increasing the potential for mucosal chemical damage. Their larger size also confers an increased likelihood of subsequent intestinal obstruction. As a result, patients who have ingested cylindrical batteries are more likely to require therapeutic intervention than those who have ingested button batteries. Furthermore, extra caution should be taken with psychiatric patients who are at risk of biting them to increase the toxicity induced. This also demonstrates the importance of obtaining a detailed history, clinical examination and appropriate imaging.

The most feared complications following battery ingestion are gastrointestinal perforation and obstruction which normally occurs at the ileocaecal valve.⁸ Our case highlights that these

complications can be avoided by timely endoscopic intervention. It must be emphasised that formal airway protection is mandatory prior to the removal of foreign bodies from the upper gastrointestinal tract to avoid inadvertent migration into the respiratory tract.

Learning points

- ▶ Ingestion of cylindrical batteries may be a deliberate act of self-harm and most commonly presents in psychiatric patients or prison inmates.
- ▶ Although many cases follow a benign course, serious complications can occur including intestinal haemorrhage, bowel obstruction, perforation, peritonitis and even death.
- ▶ Complications of cylindrical battery ingestion may be avoided by timely endoscopic intervention, thereby avoiding the need for emergency surgery.

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