CASE REPORT

Ingested cylindrical batteries in an incarcerated male: a caustic tale!

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Accepted 9 September 2015

SUMMARY

A 37-year-old incarcerated man presented to the accident and emergency department following the deliberate ingestion of eight cylindrical batteries. He also admitted to inserting a razor blade wrapped in cling-film into his rectum; in addition, he sustained a self-inflicted laceration to his left antecubital fossa, using the metal casing from a battery. His medical history included a borderline and emotionally unstable personality disorder. He had ingested several batteries 12 months previously and required an emergency laparotomy to retrieve them. On the present admission, as there was no clinical evidence of small bowel obstruction, he was treated conservatively with serial radiographs. Following conservative management, the batteries failed to progress through the gastrointestinal tract, hence a laparotomy was performed and all the batteries were extricated. This paper discusses the management and associated sequelae of patients presenting following the intentional ingestion of a battery.

BACKGROUND

Accidental ingestion of foreign bodies is a common problem in the paediatric population, with the literature reporting children inadvertently swallowing small button batteries. However, in adults, deliberate ingestion of large batteries is common in the psychiatric population, with a history of personality disorders, self harm, schizophrenia and depression frequently reported. In addition, deliberate ingestion is common in prison inmates, and accidental ingestion has been reported in patients with learning disabilities and those experiencing alcohol intoxication. It has the potential for serious complications including toxicity, haemorrhage, gastric erosions and death. This report discusses an incarcerated man who presented following the deliberate ingestion of eight cylindrical batteries, and examines the management and potential sequelae of battery ingestion.

CASE PRESENTATION

A 37-year-old incarcerated man presented to the accident and emergency department, with generalised mild abdominal pain and a self inflicted laceration to his left antecubital fossa. In addition, he admitted to swallowing eight batteries 7 h previously and causing the laceration with the metal case surrounding one of the batteries. Furthermore, he informed medical staff that he had inserted a razor blade wrapped in plastic in his rectum.

His medical history included a dissocial, paranoid, borderline and emotionally unstable personality disorder. He had multiple accident and emergency attendances, with episodes of self-harm. Furthermore, he underwent an emergency laparotomy 12 months previously, following the ingestion of several cylindrical AA batteries. His current medications included pregabalin 450 mg once daily, fluoxetine 60 mg once daily and clonazepam 2 mg twice daily. He was allergic to chlorpromazine, amitriptyline and diclofenac.

On examination, his baseline observations were stable: temperature 36.7, blood pressure 120/80 mm Hg, heart rate (HR) 62, SpO₂ 100% on air and RR 15. Clinical examination confirmed soft tissue damage to the anterolateral aspect of his left elbow with an estimated blood loss of 750 mL. On this presentation, he did not have any clinical signs of small bowel obstruction or perforation. He was passing flatus and reported no nausea or vomiting. His abdomen was soft and non-tender on palpation, with audible bowel sounds on auscultation. A PR examination was performed but it was not possible to retrieve the razor blade.

INVESTIGATIONS

Serological investigations revealed the following: white cell count $13.7 \times 10^9/L$, haemoglobin (Hb) 113 g/L and C reactive protein, <2 mg/L. The patient's urea and electrolytes and liver function tests were normal. An anteroposterior erect chest radiograph (figure 1) was unremarkable. However, the patient's abdominal radiograph (figure 2) demonstrated eight radiopaque shadows below the left hemidiaphragm, suggesting that the batteries were within the stomach. A further two radiopaque foreign bodies were projected over the pelvis. There was no evidence of obstruction. In addition, the razor blade was evident in his rectum. A radiograph of his left elbow revealed no evidence of a foreign body.

TREATMENT

The patient was started on intravenous antibiotics, fluids and analgesia. Following clinical evaluation by the gastroenterology team, retrieval by endoscopic means was deemed futile. After initial conservative management, the batteries failed to progress through the gastrointestinal tract, leading to small bowel obstruction. A nasogastric tube and catheter were inserted and strict fluid balance monitoring was undertaken. The patient subsequently admitted to removing the ends from the batteries

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To cite: Dunphy L, Maatouk M, Raja M, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-208922

Figure 1 No free air was evident beneath the diaphragm.

prior to ingestion, having previously denied doing so. Following review, a decision was made to perform an urgent laparotomy.

Under general anaesthesia, the patient's left antecubital fossa wound was explored and closed primarily. No foreign body was identified. The blade wrapped in cling film was removed from his rectum as per the history. A midline laparotomy incision was made via the previous incision and multiple adhesions were evident throughout the abdomen. Unfortunately, it was not possible to palpate the batteries and fluoroscopy was required to locate them ([figure 3](#)). The stomach was mobilised and a gastrotomy made in the body of the stomach. Six AA and two AAA batteries were retrieved ([figure 4](#)). The ends had indeed been removed from all the batteries and were successfully retrieved. An active leak of contents from two batteries was observed. Superficial mucosal necrosis was clinically evident but, on inspection, the wall of the stomach appeared viable. The

Figure 2 Radiopaque shadowing beneath the left hemi-diaphragm suggesting that batteries are within the stomach. The razor blade is also evident in the patient's rectum.

Figure 3 Using fluoroscopy, the batteries were identified in the fundus of the stomach.

stomach was irrigated with 2 L of normal saline. The gastrotomy was closed in two layers with 2/0 polydioxanone suture (PDS). Haemostasis was achieved. Mass closure was performed with 1 PDS loop and skin clips.

OUTCOME AND FOLLOW-UP

Postoperatively, the patient's nasogastric tube was left on free drainage and he continued to take intravenous pantoprazole 40 mg and coamoxiclav 1.2 g three times a day. He remained nil by mouth overnight. His Hb dropped to 71 g/L and 2 units of packed blood cells were transfused. As he remained tachycardic, with a HR of 120, a CT of the abdomen and pelvis with contrast was performed to determine the presence of a collection. Tiny pockets of free air and small volumes of free fluid most

Figure 4 Six AA and two AAA batteries were retrieved.

likely due to recent surgery were present. No focal collection was seen and the bowel was of normal calibre. A repeat Hb count was 8.8 and the patient self-discharged.

DISCUSSION

Ingestion of batteries has been a well documented toxicological entity in the medical literature and in poison control centres for decades.¹ It commonly occurs in the paediatric population with the incidence of button battery ingestion increasing. The associated clinical consequences include corrosive oesophageal ulceration, tracheo-oesophageal fistula, tracheal stenosis, oesophageal stricture, perforation, mediastinitis and gastrointestinal haemorrhage.¹

Emergency endoscopy is generally regarded as a safe procedure to avoid the aforementioned complications.

Accidental ingestion of a foreign body in adults includes those with special needs or a history of alcohol intoxication. Inmates are especially known to ingest foreign bodies to manipulate the prison system, with frequent episodes and underlying psychiatric illness often reported.² Gitlin *et al*³ reports that the deliberate ingestion of large batteries in the adult cohort may occur as a result of a personality disorder leading to deliberate self-harm, as frequently reported in prison inmates. Indeed, swallowing multiple objects or repeating the episode of deliberate self-harm is a frequent occurrence.⁴ A recent evaluation of battery ingestion by Gurler *et al*⁵ reports that swallowing batteries accounts for 2% of all foreign body cases. As well as this, the literature contains several case reports of psychiatric patients biting the battery case prior to ingestion, with a subsequent increased risk of heavy metal toxicity or gastrointestinal ulceration.⁶ Owing to the contents of alkaline batteries (metals including zinc, manganese, mercury and an alkaline electrolyte solution, potassium hydroxide), leakage can cause liquefaction necrosis, erosions, ulceration and perforation. Metal toxicity and hypersensitivity are other possible adverse effects, with transmission of an electrical current rarely reported.

Ingestion of foreign bodies is generally managed conservatively with serial radiographs, provided the foreign body has traversed the oesophagus.⁷ The American Society for Gastro-intestinal Endoscopy has recommended an emergency endoscopy when there is an airway compromise, oesophageal obstruction, perforation or damage to the battery casing.

In addition, the National Poisons Service should be consulted for advice, using their online facility, TOXBASE (<http://www.toxbase.org/>). Most reports describe spontaneous expulsion of these batteries after a few days in the gastrointestinal tract.⁸ According to Ambe *et al*⁹, in approximately 80% of cases, the foreign body passes uneventfully through the gastro-intestinal tract; endoscopy is performed in 20% of cases, with surgery being performed in <1%. Gullbrand *et al*⁷ recommends laparoscopic retrieval of foreign bodies causing small bowel obstruction as, under the right conditions, it may offer a safer alternative to laparotomy. Williams and McHenry⁸ has estimated that foreign bodies wider than 2.5 cm or longer than 6 cm in adults are more likely to be retained in the stomach. Foreign body impaction may occur at the ileocaecal valve, with that being the most commonly reported site for perforation, followed by the lower oesophagus.¹⁰

Emergency staff and prison personnel should be educated on the management of suspected foreign body ingestion and maintain a high index of suspicion to prevent significant mortality and morbidity.

Learning points

- ▶ Ingestion of batteries has been a well-documented toxicological entity in the paediatric, surgical and psychiatric literature for decades. However, it still poses a diagnostic and management dilemma for the physicians in the emergency department as well as for their surgical colleagues. This manuscript provides a succinct overview of the diagnosis and management of ingested cylindrical batteries.
- ▶ This manuscript aptly describes the patient cohort, with a high proportion of patients presenting with an underlying psychiatric condition, including personality disorders and self-harm. Indeed, this has been demonstrated in our case report, with our patient diagnosed with an emotionally unstable (borderline) personality disorder.
- ▶ Ingestion of cylindrical batteries poses a risk of significant morbidity and mortality. Several reports in the literature have described oesophageal erosion, perforation and gastrointestinal haemorrhage. In addition, leakage of battery contents can result in metal toxicity and hypersensitivity as well as liquefaction necrosis.
- ▶ This paper also describes the management algorithm of ingested cylindrical batteries. Provided the foreign body has traversed the oesophagus, management is conservative, with serial radiographs. As already mentioned, spontaneous expulsion is common.
- ▶ According to the American Society for Gastro-Intestinal Endoscopy, an emergency endoscopy is indicated when there is airway compromise, perforation or damage to the battery casing. Furthermore, the National Poisons Service should be consulted for advice, using their online facility, TOXBASE. It is imperative that emergency staff and prison personnel are educated on the management of suspected foreign body ingestion.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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