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Ongoing Computed Tomography Appraisal of Intestinal Perforation Due to an Ingested Foreign Body

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Funds Collection G

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Patient: Female, 73
Final Diagnosis: Ileal perforation due to the ingestion of a foreign body
Symptoms: Abdominal discomfort • nausea • vomiting
Medication: —
Clinical Procedure: CT-scan
Specialty: Radiology

Objective: Unusual clinical course

Background: Diagnosis and management of accidental or intentional ingestion of foreign bodies is a common problem at in emergency departments. This condition is generally observed in patients with limited consciousness or attention, such as children, elders, or psychiatric patients. Here, we report a case of intestinal perforation caused by ingestion of a foreign body that occurred during the performance of a contrast-enhanced CT scan.

Case Report: A 73-year-old diabetic woman was admitted to the emergency room of our hospital with postprandial abdominal discomfort, nausea, and vomiting. Under the suspicion of bowel ischemia, the patient underwent a contrast-enhanced CT scan. A thickened ileal loop with an endoluminal bone-density foreign body was detected. The following contrast-enhanced acquisitions additionally showed air bubbles adjacent to the loop, as the sign of an intestinal perforation that occurred between the basal and the contrast-enhanced acquisitions.

Conclusions: Caution should be always exercised in patients with suspected gastrointestinal perforation, especially if caused by ingested foreign bodies. A high degree of suspicion and a CT scan may prevent delays in the diagnosis and clinical management of these patients.

MeSH Keywords: Eating • Foreign Bodies • Intestinal Perforation • Tomography Scanners, X-Ray Computed

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Background

Intentional or unintentional ingestion of a foreign body (FB) is a relatively common clinical problem, especially in children and the elderly.

The FBs ingested, particularly if small and blunt, are usually expelled from the gastrointestinal tract without any complaint. However, they may occasionally lead to serious complications, including intestinal perforation (1% of cases), which requires a prompt diagnosis [1].

Although plain abdominal radiography can demonstrate the presence of radiopaque FBs and pneumoperitoneum, multidetector computed tomography (MDCT) is the most reliable imaging modality for accurate localization of FBs and detection of a small amount of free air within the abdominal cavity [2].

To the best of our knowledge, we report the first case of an ongoing bowel perforation caused by an FB with a real-time leakage of intestinal gas occurring during the performance of a contrast-enhanced CT scan.

Case Report

A 73-year-old diabetic woman was admitted to the Emergency Department of our hospital with a clinical picture of abdominal discomfort, nausea, and vomiting, which began during the late postprandial phase (3–4 hours after eating). At physical examination, mild distension of the abdomen with mild central tenderness were found. Blood tests showed a mild relative neutrophilia and a mild rise of transaminases and lactate dehydrogenase. Since the physical examination and the post-prandial onset of symptoms were suspicious for intestinal ischemia, we decided to directly perform an intravenous contrast-enhanced CT scan of the abdomen.

Immediately after the acquisition of the unenhanced phase, the patient experienced a sudden worsening of the pain, with tachycardia, tachypnea, and hypotension. The examination was suspended and prompt assistance was provided by the nursing staff, but no medications or resuscitation were necessary because her clinical condition quickly improved. As soon as she was stable (approximately 4–5 minutes later), the CT scan was completed with the injection of intravenous contrast medium. Oral contrast medium was not necessary and thus was not administered.

During evaluation of the unenhanced phase, a thickened ileal loop with a parietal pneumatosis and a stranding of the

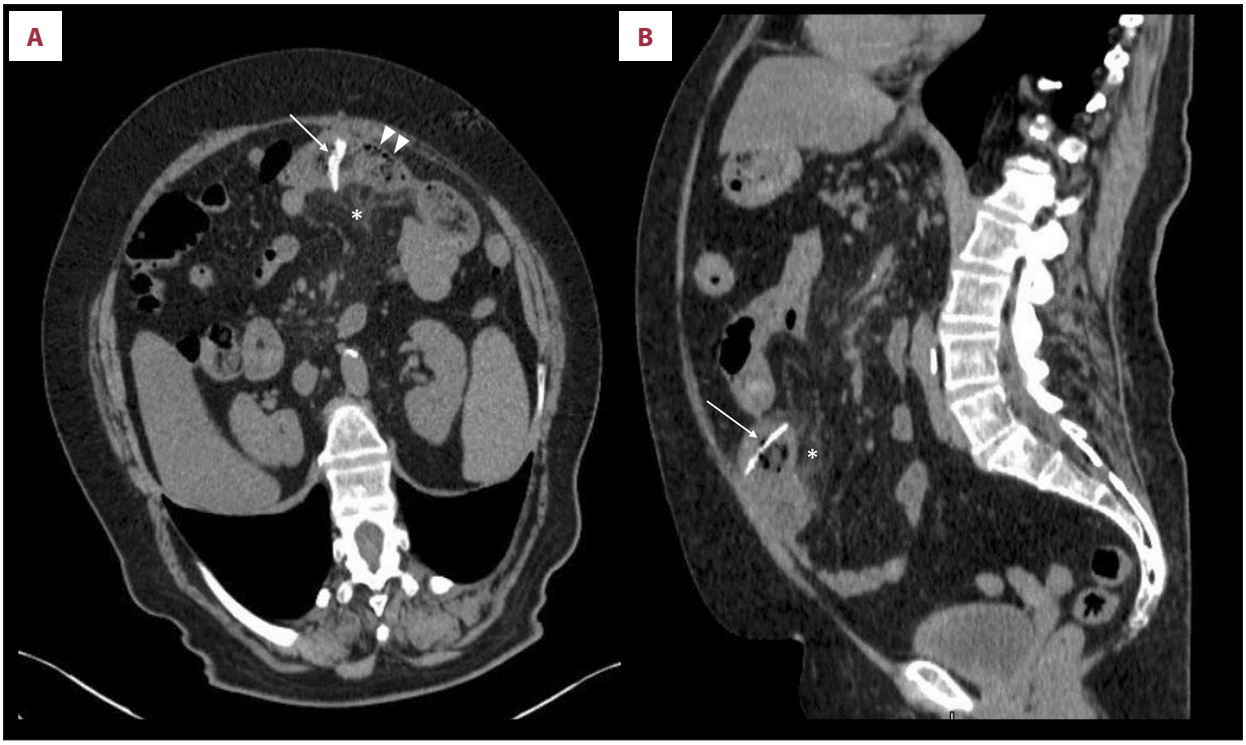

Figure 1. Unenhanced CT scan performed on axial-oblique (**A**) and sagittal (**B**) planes showing the FB (*arrow*), the parietal pneumatosis (*arrowheads*) of the thickened bowel loop, and the stranding of the surrounding fat tissue (*asterisk*). No free air was detectable.

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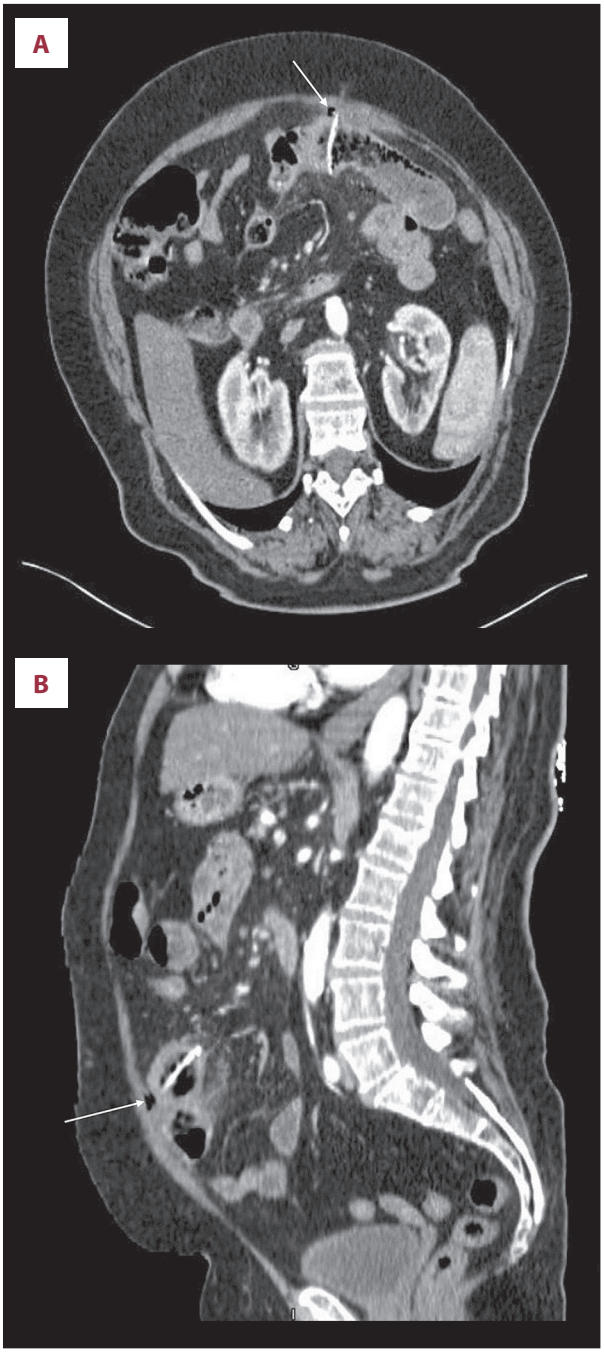

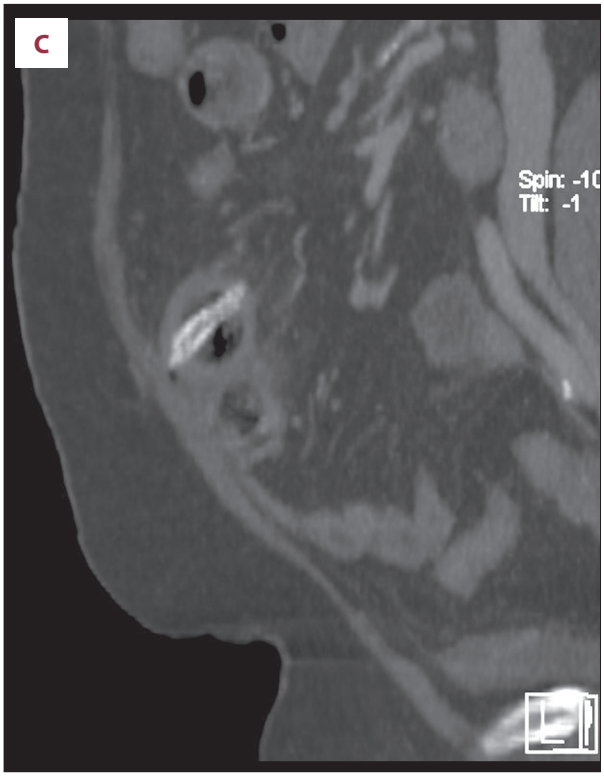

Figure 2. Axial-oblique (**A**) and sagittal (**B**) contrast-enhanced CT scan with soft-tissue windowing demonstrating a small amount of free air (*arrow*) adjacent to the thickened loop, as the sign of intestinal perforation. Detail of sagittal contrast-enhanced CT scan with bone windowing (**C**), better demonstrating the structure of the goat ossicle.

surrounding mesenteric fat tissue were noted. On the endoluminal side of the thickened loop, an oblong-shaped bone-density element was also detected (Figure 1).

However, no air-fluid levels within the intestinal loops nor free air in the abdominal cavity were detected.

Backwards, the evaluation of the contrast-enhanced acquisitions showed the presence of some gas bubbles strictly adjacent to the thickened ileal loop (Figure 2).

The patient underwent laparotomy with resection of the necrotic loop (approximately 13 cm) and removal of the foreign body consistent with a goat ossicle, unknowingly swallowed by the patient during her last meal (Figure 3). A 3-mm perforation of the ileum was found, surrounded by a small amount of small-bowel content.

The operation was followed by 6-day hospitalization for recovery. Afterwards, the patient was discharged from the hospital after a few days without early or delayed complications. Therefore, no follow-up examinations were needed or performed.

Discussion

Ingestion of FBs is a frequent cause of admission to the Emergency Department.

FBs may vary in shape and composition (e.g., coins, batteries, fish and animal bones, pins, and needles) and their ingestion is

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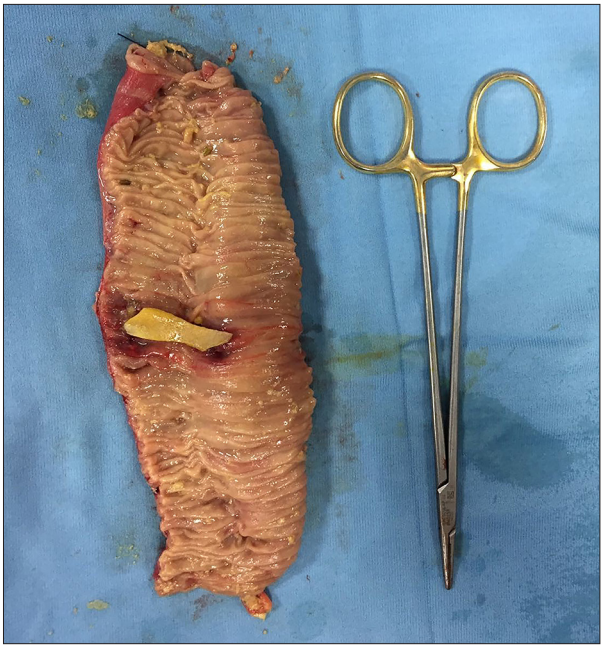

Figure 3. Surgical specimen of the ileal loop resected with the goat ossicle.

more frequent in people with limited consciousness (e.g., children or old people, psychiatric patients, alcohol abusers) [1,3,4].

Generally, most FBs ingested pass harmlessly through the entire digestive tube, but some of them cause discomfort and lead to complications such as intestinal perforation [5].

This latter condition can occur anywhere within the gut, but the tracts with a physiologic acute angulation or shrinkage of the lumen (e.g., ileocecal valve, colic flexures) are the most affected. Nevertheless, some pathological conditions, (e.g., stenosis, thickening of the bowel walls in patients with Crohn's disease) can further increase the risk [6].

Radiological imaging plays a pivotal role in achieving the correct diagnosis since the symptoms are often non-specific and a clinical history of FBs ingestion is seldom available, especially considering the patients generally affected [7].

Usually, plain abdominal radiography is the initial imaging examination performed in the diagnostic workup for acute abdominal pain with a suspicion of intestinal perforation [8]. However, its sensitivity in detecting abdominal free air is not very high (50–70%, or even lower at early stages with small amounts of gas) and the site of the perforation is rarely recognizable [9].

Nevertheless, the detection of the FBs can be very challenging because of their dimensions (often very small) and density (radiolucent or insufficiently radiopaque) or due to the overlap of bones or intestinal gas [10].

On the other hand, CT scan is the imaging modality of choice for the evaluation of acute abdomen conditions, with a high sensitivity in recognizing the site of an eventual perforation [11]. The most important CT signs of perforation are thickening of the perforated intestinal wall and stranding of the surrounding mesenteric fat tissue, caused by the infiltration of fluid and inflammatory cells, where air bubbles also can be found.

The presence of intestinal ischemia, demonstrated in our case by intramural pneumatosis, is very rare in cases of ingested foreign bodies, but has been described in literature and is related to traumatic mucosal damage [12].

Even the detection of a FB within the bowel lumen is not always easy, depending on its size, density, and orientation. In this sense, the post-processing reconstructions and the window setting adjustments can significantly improve the confidence of the radiologist.

The uniqueness of our case is the ongoing intestinal perforation appreciable during the different acquisitions of a contrast-enhanced CT scan. In fact, no evidence of localized or diffuse pneumoperitoneum was detectable on the basal phase, showing that the serosa was still containing the progression of the perforation.

This "sealing" process ceased right after the ending of the precontrast phase, with consequent abdominal pain consistent with the perforation and CT-proven by the air bubbles found near the thickened bowel wall.

Conclusions

The ingestion of FBs can be unconscious and therefore should always be included in the differential diagnosis of acute abdominal pain, particularly in children and the elderly. We described the first case in which the onset of intestinal perforation was appreciable during the performance of a multiphase CT scan. This case report demonstrates not only the importance of multidetector CT scan and the usefulness of multiplanar reconstructions, but also the high degree of attention necessary in the management of these particular clinical conditions for both clinical physicians and emergency radiologists.

Conflict of interest

None.

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