


## Case Report

# A case of intestinal obstruction due to inflammatory changes in the small intestine from alkaline ingestion

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**Case:** Alkaline ingestion frequently causes corrosive esophagitis but rarely causes lower digestive tract injury. In this case, a 79-year-old man accidentally drank kitchen detergent. After 3 h, lower abdominal pain occurred and gradually worsened. He was taking a proton pump inhibitor after proximal gastrectomy for gastric cancer. He had local tenderness in the left lower abdomen. Abdominal computed tomography showed expansion of the small intestine, thickening of the intestinal wall, and inflammatory changes. Upper gastrointestinal endoscopy showed no obvious injury to the esophagus or stomach.

**Outcome:** Conservative treatment with an ileus tube was undertaken for intestinal obstruction caused by alkaline ingestion. There were no complications, such as gastrointestinal perforation, and he was discharged on day 17.

**Conclusion:** Alkaline ingestion may cause injuries not only to the upper but also to the lower digestive tract in patients who are taking proton pump inhibitors or have had gastrectomy.

**Key words:** Alkaline ingestion, esophagitis, ileus, intestinal obstruction, upper gastrointestinal tract

## BACKGROUND

ALKALINE SUBSTANCES ARE used in many household products, such as mold removers and bleaches. Many of them are tasteless and odorless. Accidental ingestion by children accounts for 80% of cases, whereas in adults most ingestions are intentional, resulting from suicide attempts.<sup>1</sup> Alkaline ingestion causes corrosive pharyngitis and esophagitis, with sclerotic stenosis as a late complication.<sup>2</sup> Lower gastrointestinal tract injuries rarely occur, because alkali is neutralized in the stomach.<sup>3</sup> We report an unusual case in which alkaline ingestion caused inflammatory changes in the small intestine and localized stenosis, leading to intestinal obstruction, although the upper gastrointestinal tract showed no injuries.

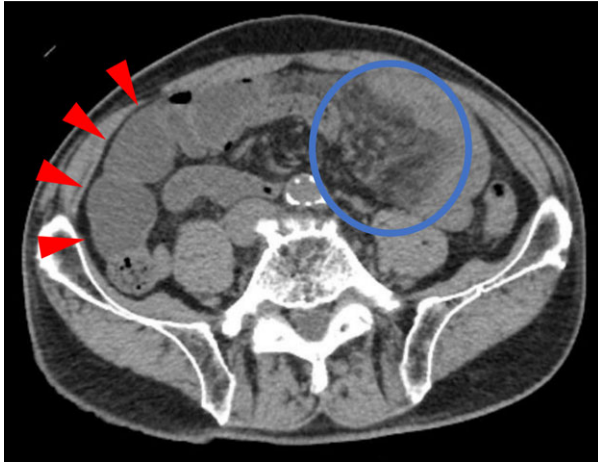
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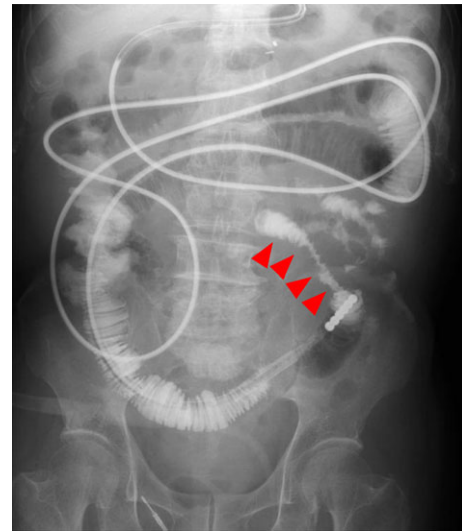
## CASE

A 79-YEAR-OLD man accidentally drank a kitchen detergent, which was strongly alkaline with a pH of 13 (Kitchen Hitter; Kao Corporation, Tokyo, Japan), diluted with water in a glass. Three hours later, lower abdominal pain developed and gradually worsened. He was urgently transported to our hospital. He had a medical history of gastric cancer and had undergone proximal gastrectomy and esophagogastrostomy reconstruction 4 years previously. He was taking 20 mg esomeprazole, a proton pump inhibitor (PPI), after surgery. He had taken it 10 h before drinking the kitchen detergent. At arrival, his consciousness was clear and vital signs were as follows: respiratory rate, 18 breaths/min; oxygen saturation, 100% on room air; blood pressure, 212/74 mmHg; and pulse, 58 b.p.m. He had no nausea or sore throat. Tenderness localized to the left lower abdomen was observed, with no symptoms of peritonitis. The first abdominal computed tomography (CT) scan showed small intestinal wall thickening, bowel dilatation, and inflammatory changes, such as increased mesenteric fat concentration localized on the left side (Fig. 1). As initial treatment, the patient was given milk to drink for protecting the esophageal mucosa. Repeated nausea and vomiting, abdominal pain exacerbation, and abdominal distension developed on day 2; CT was repeated. Massive ascites appeared (Fig. 2A), and



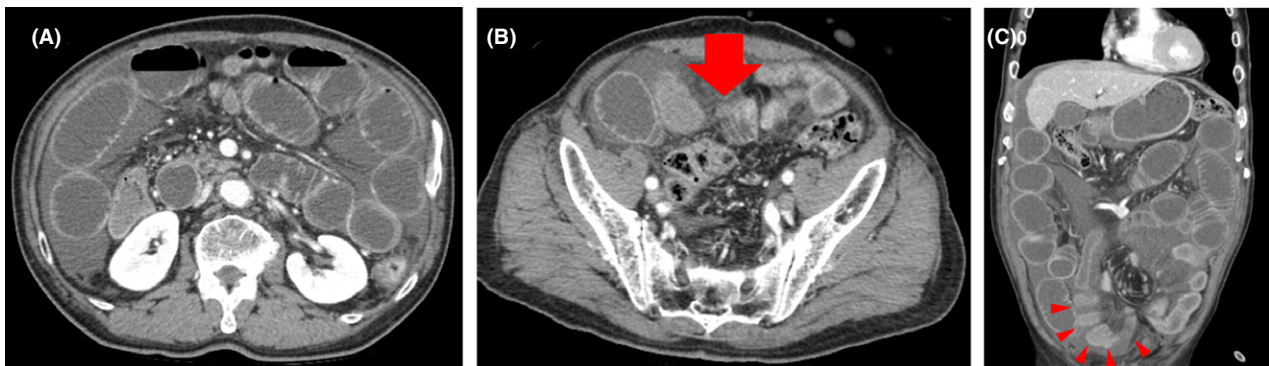
**Fig. 1.** Abdominal computed tomography images, taken at hospital arrival, of a 79-year-old man who accidentally ingested kitchen detergent. We observed an increase in mesenteric fat tissue concentration localized on the left side (circled). There was intestinal dilatation (arrowheads). Intestinal obstruction was observed, but at this point the mechanism of occlusion was not clear and paralytic ileus was suspected.

there was a sharp stenosis in the ileum (Fig. 2B). The small intestine on the oral side of stenosis was dilated, and an intestinal obstruction was found. The CT values of the intestinal fluids were high, and intramural bleeding due to mucosal injury was suspected (Fig. 2C). There were no findings suggestive of strangulation, such as closed loop obstruction accompanying internal hernia, and no obvious signs of intestinal ischemia, such as poor contrast in the intestinal wall. We concluded that alkaline ingestion caused mucosal injury and inflammatory changes in the small intestine, resulting in intestinal obstruction.



**Fig. 3.** Small bowel radiography from the ileus tube of a 79-year-old man who accidentally ingested kitchen detergent. The intestinal wall was edematous, and intestinal peristalsis was weak. Stenosis was present in the ileum, and the contrast agent barely flowed to the distal side (arrowheads).

Conservative treatment with an ileus tube was carried out. Small bowel radiography from the ileus tube showed intestinal wall edema and stenosis in the ileum (Fig. 3). The ileus tube was inserted under the upper gastrointestinal endoscope, but there was almost no injury to the upper gastrointestinal tract, including the oral cavity and anastomotic part. There were no further complications, such as esophagus stenosis or gastrointestinal tract perforation, and the ileus tube was removed on day 11. The patient was discharged on day 17 without recurrence of intestinal obstruction.



**Fig. 2.** Abdominal contrast computed tomography images, taken hospital day 2, of a 79-year-old man who accidentally ingested kitchen detergent. A, B, Axial views. C, Coronal view. Massive ascites and extensive small intestinal dilatation appeared (A). There was a sudden narrowing site in the ileum (B, arrow). The small intestine on the anal side was collapsed. The contents of the dilated intestinal tract showed high absorption in part, and intramural hemorrhage due to mucosal injury was suspected (C, arrowheads).

## DISCUSSION

**A**LKALINE SUBSTANCES USED in household products mainly comprise sodium hydroxide and are classified as weak alkalis with pH of approximately 10–11. Some industrial products contain strong alkalis of pH  $\geq$  12. In general, alkaline products pass through the oral cavity and esophagus slowly because of their high viscosity. Furthermore, they cause liquefactive necrosis accompanied by saponification,<sup>3</sup> and sclerotic esophagus stenosis occurs later. This complication may differ from stenosis because of inflammatory changes in the intestinal mucosa similar to that in the present case. Corrosive changes in the bronchi and acute respiratory distress syndrome due to aspiration, and acute renal failure by alkaline ingestion have been reported.<sup>4,5</sup> As mentioned above, alkaline ingestion causes injuries to various organs in addition to the pharynx and esophagus. However, there have been few reports on lower digestive tract injuries from alkaline ingestion. Taguchi *et al.*<sup>6</sup> reported a case of ingestion of a large amount of a strong alkaline development solution comprising mainly potassium carbonate. Gastric perforation and necrosis of all gastrointestinal layers progressed over time, leading to total intestinal necrosis and death. In another case of ingestion of a corrosion inhibitor comprising mainly potassium hydroxide, autopsy revealed that melting necrosis of the small intestinal mucosa was the cause of death.<sup>7</sup> The authors considered that lower digestive tract injury occurred in these cases because large quantities were taken of a strongly alkaline product compared with household products. In our case, there are several reasons why lower gastrointestinal injury occurred from ingestion of a small amount of alkaline product. First, the passage time through the gastrointestinal tract was shortened because of proximal gastrectomy. A comparison of esophagogastrectomy with jejunal pouch interposition (the reconstructive methods after proximal gastrectomy) showed that food residue after eating was significantly less in esophagogastrectomy.<sup>8</sup> Previous studies that evaluated the postoperative quality of life after proximal gastrectomy showed the smaller the residual stomach, the more frequently diarrhea occurred,<sup>9</sup> indicating that when the residual stomach is small, the passage time of food is accelerated.

A second reason why lower gastrointestinal injury occurred in our case might have been that the patient was taking a PPI. Proton pump inhibitors are used to treat peptic ulcers and reflux esophagitis by suppressing gastric acid secretion. Maintaining a pH  $>$ 4 in the stomach is important for treating these diseases. Esomeprazole, which was taken in this case, maintains the pH  $>$ 4 significantly longer than other PPIs and has a large gastric acid-suppressing effect.<sup>10</sup>

Thus, the alkaline preparation could flow into the small intestine without neutralization, causing mucosal injury.

In cases of injury of the lower gastrointestinal tract, abdominal pain is present and CT images show edematous changes in the intestinal tract and paralytic ileus. It may be better to insert ileus tubes and consider continuous intestinal cleansing in a patient with these findings because of the serious risk of lower digestive tract perforation. Furthermore, repeated examination of abdominal symptoms and follow-up abdominal CT images may be needed. If intestinal perforation or necrosis is found, a surgical strategy that takes into account gradually worsening intestinal necrosis should be considered.

## CONCLUSION

**A**LKALINE INGESTION CAN cause injuries to not only the upper but also the lower digestive tract in patients who are taking PPIs before alkaline ingestion or have had gastrectomy. In these cases, additional treatment may need to be considered.

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## DISCLOSURE

Approval of the research protocol: N/A.

Informed consent: Informed consent was obtained from the patient for the publication of this report.

Registry and registration no. of the study/trial: N/A.

Animal studies (if applicable): N/A.

Conflict of interest: None declared.

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