

Two Cases with Perforation of the Large Intestine after Upper Gastrointestinal Series with Barium

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Abstract

Upper gastrointestinal series (UGIS) with barium is a routine investigation, and the incidence of serious complications associated with this procedure is very rare. We report 2 cases of perforation of the large intestine after UGIS with barium, and review relevant literature.

Case 1: A 72-year-old woman presented with nausea and vomiting that had started on the 4th day after UGIS with barium. She was brought to our hospital by ambulance. The abdomen was rigid with muscle guarding. Computed tomography (CT) of the abdomen revealed retention of barium in the sigmoid colon, with free air at its periphery. Upon diagnosis of pan peritonitis related to perforation of the digestive tract, emergency partial sigmoidectomy and colostomy were performed on the same day. The patient recovered uneventfully and was discharged on postoperative day 15. Colostomy closure was performed 6 months after the first surgery.

Case 2: A 66-year-old woman presented with abdominal pain on the day after UGIS with barium. She was brought to our hospital by ambulance. The abdomen was rigid with muscle guarding. Abdominal CT revealed barium outflow into the abdominal cavity, and free air at its periphery. Upon diagnosis of pan peritonitis related to perforation of the digestive tract, emergency partial sigmoidectomy and colostomy were performed on the same day. Postoperatively, the patient received antimicrobial therapy for protracted fever, and was discharged on postoperative day 24.

Keywords: Barium; Upper gastrointestinal series; Perforation of the large intestine

List of Abbreviations: CT: Computed Tomography; UGIS: Upper Gastrointestinal Series; WBC: White Blood Cell ; CRP: C-Reactive Protein

Background

Upper gastrointestinal series (UGIS) with barium represents a routine investigation, and the incidences of serious complications associated with this procedure are very rare. Since perforation of the large intestine caused by barium ingestion can progress to severe peritonitis, prompt diagnosis and treatment are needed. We report 2 cases of large intestinal perforation after UGIS with barium, and provide a review of the relevant literature.

Case Presentation

Case 1

The patient was a 73-year-old woman.

Chief complaint: Abdominal pain, nausea, vomiting.

Past history: Appendectomy for appendicitis at the age of 18 years.

Current history: The patient underwent UGIS with barium at a health checkup. Four days later, she presented with abdominal pain, nausea, and vomiting, and was emergently transported to our center.

Observations at admission: The following were noted: height, 155.0 cm; weight, 54.5 kg; body temperature, 36.0°C; blood pressure, 152/87 mmHg; and pulse rate, 60 beats/min. The patient appeared to have extreme pain, and her abdomen was rigid.

Blood test findings at admission: The white blood cell (WBC) count was 13390/ μ L and the levels of C-reactive protein (CRP) were 25 ng/mL, indicating increased inflammation.

Contrast-enhanced computed tomography (CT) findings: CT showed a 3-cm barium stool in the sigmoid colon, barium leakage, and free air surrounding the stool (Figure 1). Emergency surgery was performed on the same day, under the diagnosis of barium peritonitis caused by perforation of the sigmoid colon.

Surgical findings: Laparotomy showed ascetic fluid clouded by barium and stools. Intra peritoneal examination revealed hard stool in the sigmoid colon, with a perforation at the same site. No ischemic change or tumor was noted in the surrounding area. After barium that adhered to the colonic wall was carefully removed, partial sigmoidectomy, colostomy, and intra peritoneal irrigation drainage were performed.

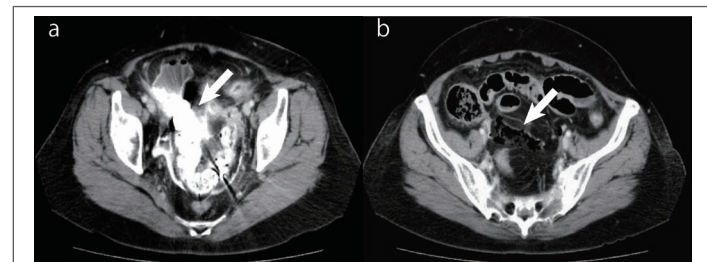


Figure 1: Abdominal computed tomography at admission for a 72-year-old woman with perforation of the large intestine after upper gastrointestinal series with barium: a) A 3-cm barium stool (arrow) is noted in the sigmoid colon, with barium leakage and free air surrounding the stool; b) Free air is observed in the pelvis (arrow).

Histopathological findings: In the resected specimen, the barium stool was retained within the sigmoid colon (Figure 2). Upon removal, a perforation with a diameter of 15 mm was observed, with fibrosis and inflammation of the surrounding area. Since no findings indicative of diverticulum, malignant tumor, or ischemia were noted, a condition caused by the barium stool was suspected.

Postoperative course: The patient had an uneventful course; she resumed food intake on postoperative day 6 and was discharged on postoperative day 15. Colostomy closure was performed 6 months after the first surgery.

Case 2

The patient was a 66-year-old woman.

Chief complaint: Pain in the lower abdomen, vomiting.

Past history: The patient received medication for chronic renal failure, hypertension, and gout.

Current history: The patient underwent UGIS with barium as part of a health checkup. The next day, she presented with abdominal pain and vomiting, and was emergently transported to our center.

Symptoms at admission: The following were noted: height, 147.0 cm; weight, 58.0 kg; body temperature, 37.1°C; blood pressure, 122/75 mmHg; and pulse rate, 60 beats/min. Abdominal examination revealed tenderness in the medial lower abdomen, with rigidity and guarding.

Blood test findings at admission: The WBC count was 4920/ μ L, and CRP levels were 0.02 ng/mL.

Plain abdominal CT scan findings: Barium stool retention, barium leakage in the mesentery, and intramesenteric emphysema were observed (Figure 3). The patient underwent emergency surgery under the diagnosis of barium peritonitis caused by perforation of the sigmoid colon.

Surgical findings: Laparotomy revealed a large amount of cloudy ascetic fluid. Intra peritoneal examination showed inflammatory thickening of the sigmoid colon to the rectosigmoid mesentery, which indicated perforation at the same site. Dissection of the mesentery at the same site revealed a large amount of barium stool. There was a relatively large perforation of 20 mm in diameter, and a vascular necrosis caused by barium stool retention was suspected. After barium that adhered to the site was carefully removed, the patient underwent partial sigmoidectomy, colostomy, and peritoneal lavage and drainage.

Histopathological findings: A 20 \times 18-mm perforation was noted in the resected specimen of sigmoid colon (Figure 4). The area surrounding the perforation showed inflammation in all layers; however, no diverticulum or malignancy was noted.

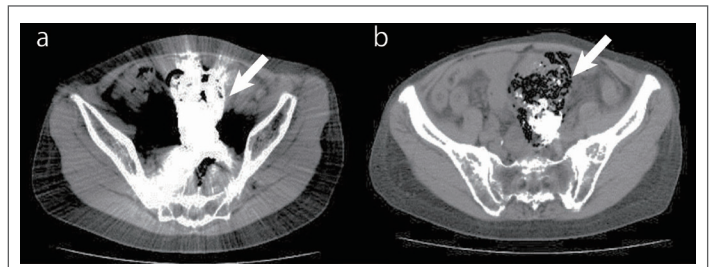


Figure 3: Abdominal computed tomography at admission for 66-year-old woman with perforation of the large intestine after upper gastrointestinal series with barium: a) Barium stool is retained in the sigmoid colon (arrow); b) Barium leakage in the mesentery of the sigmoid colon and intramesenteric emphysema are observed (arrow).

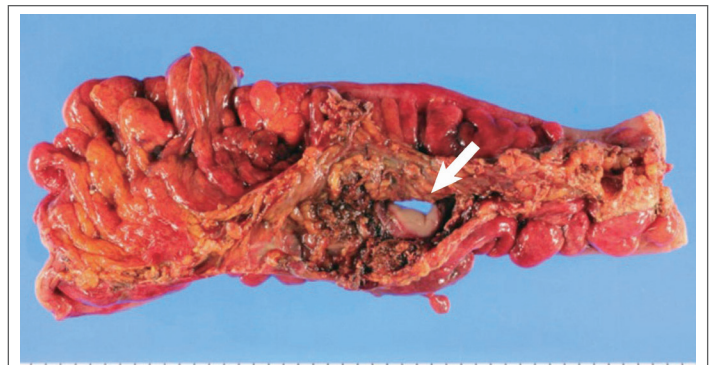


Figure 4: Resected specimen from a 66-year-old woman with perforation of the large intestine after upper gastrointestinal series with barium: A perforation of 20 \times 18 mm is noted, with inflammation in all layers of the surrounding area. No diverticulum or malignant finding is noted (arrow).

Postoperative course: Postoperatively, the patient was treated with antimicrobial therapy for protracted fever. Her condition gradually improved, and she was discharged on postoperative day 24.

Discussion

UGIS with barium is a procedure commonly performed for upper gastrointestinal examination at health checkups in Japan. UGIS with barium is not used for gastric cancer screening in Europe and America. Administration of barium can cause adverse reactions such as constipation, transient diarrhea, abdominal pain, intestinal obstruction, gastrointestinal perforation, and peritonitis. Nonetheless, the incidence of gastrointestinal perforation and concurrent peritonitis is very low. Colonic perforation after UGIS is very rare, occurring in 3 out of 1.01 million people. Therefore, UGIS is considered relatively safe [1]. We further examine relevant literature regarding such complications of UGIS with barium.

Because UGIS with barium is conducted more often in Japan, we primarily examined Japanese reports. We searched the database of the Japan Medical Abstracts Society for original articles published between 1983 and 2014. The following 3 keywords (in Japanese) were used in the search: “barium,” “perforation of the large intestine,” and “upper gastrointestinal series.” Thirty-four reports of concurrent perforation of the gastrointestinal tract after UGIS with barium were found [2-31]. A summary of all cases of perforation of the gastrointestinal tract after UGIS with barium in Japan is given in table 1. The median age of the patients was 65 years (range, 40–90 years); 10 patients were younger than 60 years, and 26 patients were aged 60 years or older, indicating that the complication occurs more commonly in these elderly individuals. Of the

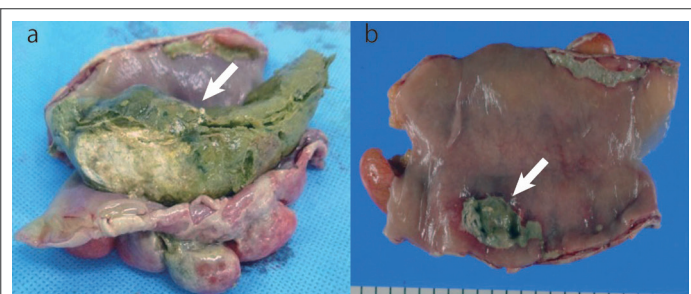


Figure 2: Resected specimen from a 72-year-old woman with perforation of the large intestine after upper gastrointestinal series with barium: a) Barium stool is retained in the sigmoid colon (arrow); b) Perforation of the sigmoid colon, 15 mm in diameter, is noted after removal of the barium stool, with fibrosis and inflammation of the surrounding area (arrow).

36 patients, including the 2 patients we report on here, 4 were male, and 32 were female, indicating that the complication occurs predominantly in women. Moreover, the most common site of perforation was the sigmoid colon. Both our patients were elderly women, and the perforation site was indeed the sigmoid colon.

With respect to timing, perforation of the gastrointestinal tract occurred within 4 days of UGIS in 30 of 36 patients, suggesting that the condition progresses rapidly. Indeed, in our patients, the complication occurred 1 and 4 days after UGIS with barium. This aspect highlights the importance of checking for barium retention by plain abdominal radiography when symptoms such as abdominal distension, abdominal pain, and vomiting are present despite administration of laxatives after UGIS. If barium retention is confirmed, medication-induced bowel movement is required.

The severity of barium peritonitis can increase rapidly because intra peritoneal barium leak causes severe inflammation, resulting in edema, as cites retention, and dehydration. Furthermore, the prognosis may worsen significantly due to concurrent severe infection caused by stool leakage.

For the cases reported in Japan, the mortality rate was 13.8% (5 out of 36 patients). Our patients survived most likely due to prompt investigation and intervention upon the occurrence of the symptoms.

Our patients exhibited perforation in the sigmoid colon, and therefore underwent partial sigmoidectomy and adequate peritoneal lavage with removal of intra peritoneal barium and warm saline infusion, followed by colostomy. Based on previous reports, most patients underwent colostomy rather than anastomosis in a single-stage surgery. Colostomy is considered to be a safe procedure, with a focus on preserving life by removing the risk of an anastomotic leak by intra peritoneal infection.

In such cases, McPhendran attributes the cause of lower gastrointestinal tract perforation to mechanical laceration by barium stool [32]; whereas Brearley attributes it to the compression of the colonic wall by barium stool mass, resulting in a vascular necrosis [33]. In our patients, the intestinal wall exhibited no organic lesions such as a diverticulum or a tumor, but a relatively large ulcer localized only at the site in close contact with the barium stool; therefore, we consider that the perforation was caused by the latter.

Case	Age/Sex	Perforated site	Duration after UGIS	Surgical procedure	Outcome
1	40/M	Sigmoid	8	Simple closure	Alive
2	60/M	Sigmoid	4	Simple closure	Dead
3	75/F	Sigmoid	3	Stoma	Alive
4	71/F	Sigmoid	2	None	Dead
5	65/F	Descending	3	Stoma	Dead
6	59/F	Sigmoid	9	Simple closure	Alive
7	60/F	Transverse	7	Stoma	Dead
8	66/F	Sigmoid	0	Unknown	Alive
9	78/F	Sigmoid	3	Hartmann operation	Alive
10	76/F	Sigmoid	4	Simple closure	Alive
11	62/F	Descending	1	Stoma	Alive
12	61/F	Descending	1	Stoma	Dead
13	68/F	Sigmoid	4	Hartmann operation	Alive
14	45/F	Sigmoid	270	Hartmann operation	Alive
15	64/F	Sigmoid	1	Stoma	Alive
16	72/F	Rectum	1	Hartmann operation	Alive
17	66/F	Rectum	3	Hartmann operation	Alive
18	79/M	Sigmoid	2	Hartmann operation	Alive
19	71/M	Rectum	2	Hartmann operation	Alive
20	70/F	Sigmoid	2	Hartmann operation	Alive
21	73/F	Sigmoid	3	Hartmann operation	Alive
22	80/F	Descending	2	Stoma	Alive
23	90/F	Descending	10	Hartmann operation	Alive
24	40/F	Sigmoid	4	Simple closure +Stoma	Alive
25	40/F	Sigmoid	2	Hartmann operation	Alive
26	47/F	Sigmoid	4	Stoma	Alive
27	46/F	Descending	2	Hartmann operation	Alive
28	74/F	Sigmoid	3	Trans-anal decompression tube	Alive
29	68/F	Sigmoid	1	Hartmann operation	Alive
30	49/F	Sigmoid	2	Hartmann operation	Alive
31	48/F	Sigmoid	1	Hartmann operation	Alive
32	74/F	Sigmoid	1	Hartmann operation	Alive
33	44/F	Sigmoid	3	Hartmann operation	Alive
Our case	60/F	Sigmoid	5	Hartmann operation	Alive
Our case	73/F	Sigmoid	4	Hartmann operation	Alive
36	64/F	Sigmoid	1	Hartmann operation	Alive

Table 1: Overview of reported cases of perforation of the large intestine after upper gastrointestinal series (UGIS) with barium, without organic disease Age given in years. Duration after UGIS given in days

Conclusions

We described 2 cases of perforation of the large intestine after UGIS with barium. As the proportion of elderly individuals is expected to increase in Japan, so will the number of procedures such as UGIS, performed as part of screening or diagnosis for problems of the gastrointestinal tract. To minimize the risk of gastrointestinal tract perforation caused by barium stool, laxatives should be administered after UGIS, and patients with abdominal pain following the procedure (even several days after UGIS) should receive prompt investigations and treatment.

Consent

Written informed consent was obtained from the patients for publication of this Case Report and any accompanying images.

Competing Interests

The authors declare that they have no competing interests related to the work presented in this manuscript.

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