

Medical Misadventure: Barium Extravasation in Colorectal Cancer

Dear Editor,

Double contrast barium enema (DCBE) is a safe and accurate diagnostic procedure for colorectal cancer. It is often the next diagnostic test after incomplete colonoscopy,¹ with an additional diagnostic yield of 3.2% for neoplastic lesions larger than 1 cm in the non-visualised portion of the colon.² However, severe complications of colorectal perforation can occur rarely in 0.02% to 0.04% of patients.³ High morbidity and mortality of 50% in patients with colorectal perforation during barium examination have been reported.⁴ This complication is a relatively common cause of medical malpractice litigation involving radiologists.

At present, colonoscopy is the investigation of choice in diagnosing colorectal cancer. Once the diagnosis has been made, contrast-enhanced computed tomography (CT) scan of the abdomen is commonly used for staging purposes.

In this article, we retrospectively reviewed 2 patients who developed barium peritonitis followed by DCBE. This complication could have been prevented had the signs of colonic perforation been picked up from the CT scan performed after the colonoscopy.

Case 1

A 66-year-old woman complained of bloody stool for 8 days, associated with cold sweats and fever 6 days before admission. She was also noted to have had a change of bowel habit over 3 months. Physical examination revealed mild tenderness over her lower abdomen. Colonoscopy revealed a mass in the sigmoid colon. Biopsy of the tumour confirmed that it is a carcinoma. DCBE was done 4 days after incomplete colonoscopy. We used a soft-tip enema tube with a balloon and inflated it with 80 cc of air. The

Case 1

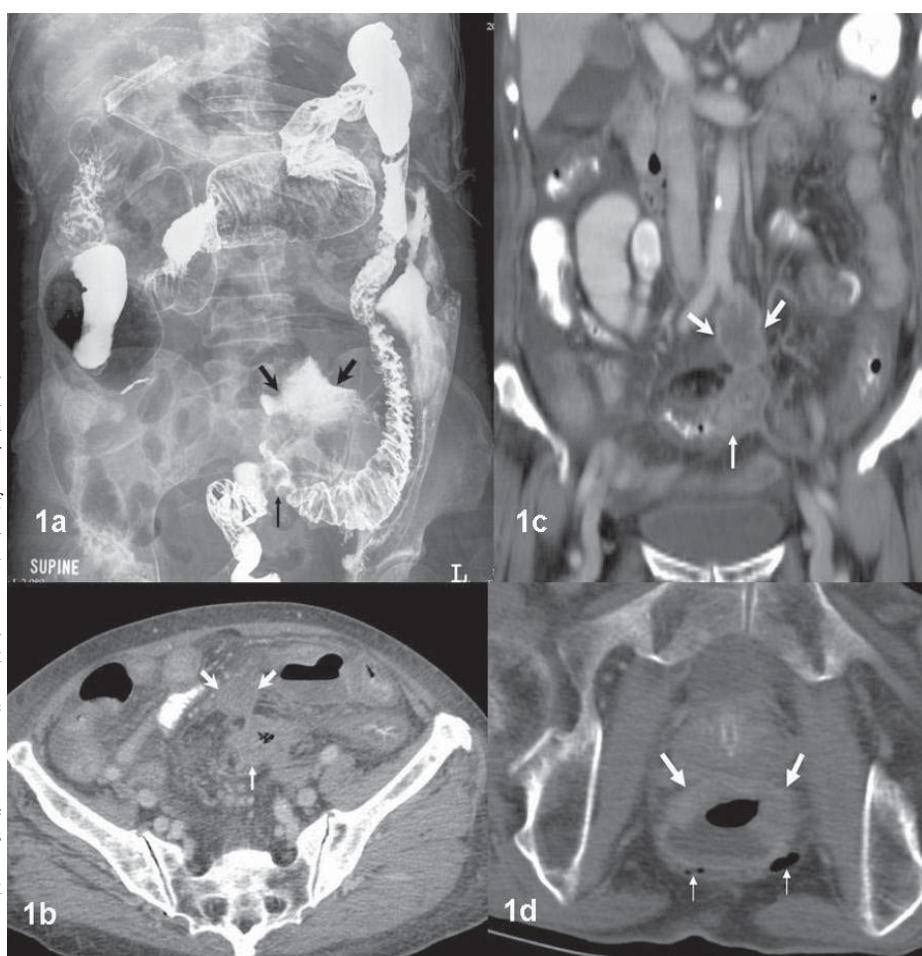
Fig. 1a. Double contrast barium enema shows barium spillage (thick arrows) into the peritoneum from the annular lesion (thin arrow) in the sigmoid colon, compatible with sigmoid colon cancer with perforation.

Fig. 1b. Contrast-enhanced CT scan image of the abdomen shows focal abnormal loculated fluid accumulation (thick arrows) and luminal narrowing (thin arrow) of the sigmoid colon, compatible with colon cancer with perforation.

Fig. 1c. Coronal reformatted CT image shows focal abnormal loculated fluid accumulation (thick arrows) adjacent to the sigmoid mass (thin arrow), suggesting colonic perforation with pericolic abscess formation.

Case 2

Fig. 1d. Contrast-enhanced CT scan image at a lower rectal level shows abnormal gas accumulation (arrows) in the perirectal space. Thickening of the anterior rectal wall (thick arrows) is seen.



colon was inflated smoothly with 1800 cc of air. During the procedure, barium leaked from the sigmoid lumen into the peritoneal cavity was noted. The procedure was stopped immediately. The patient's vital signs changed quickly, with tachycardia (131/min) and low blood pressure (80/50 mmHg) in the second hour after barium extravasation. Antibiotics, intravenous fluid, and oxygen were given. Emergency laparoscopy followed by Hartmann's procedure with peritoneal lavage was done 6 hours after the incident. At surgery, a perforation, approximately 2- to 3-mm, and a 3-cm mass in the sigmoid colon were noted. The cancer was staged T4N1M0. Culture of ascites revealed *Escherichia coli* and *Klebsiella pneumoniae*. After operation, the patient's condition deteriorated and she developed intractable septic shock. She died 6 weeks later due to sepsis and multiple organ failures.

Review of the abdominal CT scan performed one day after colonoscopy showed localised fluid accumulation adjacent to the sigmoid mass (Figs. 1a, b and c).

Case 2

A 72-year-old man complained of bloody stool and change of bowel habit for a month. He was also noted to have tarry stool and weight loss (2 to 3 kg) over a period of one year. Digital examination showed a hard and fixed mass in the rectum. Colonoscopy performed on the patient revealed a 5-cm rectal mass. Biopsy of the tumor proved it to be a rectal carcinoma. Abdominal CT scan was performed 4 days after the biopsy. Due to incomplete colonoscopy, a DCBE examination was scheduled 6 days later. The patient tolerated the DCBE procedure well until the last step of the procedure, when the patient was turned to the true lateral position, fluoroscopic display showed loculated barium extravasation into the retroperitoneal and presacral spaces. At that moment, the patient did not feel any discomfort, and no change in vital signs was noted. Emergency operation with anterior resection was performed 9 hours after the barium leakage. At surgery, an ulcerated rectal cancer was noted. A 5-mm perforation was detected adjacent to the rectal mass. The tumor stage was T3N0M0. The patient recovered well after surgery and was discharged 2 weeks later. He did not receive adjuvant chemotherapy or radiotherapy. He died one year later due to liver metastasis and hepatic failure. No subsequent complications attributed to barium extravasation occurred during that year.

In retrospect, abdominal CT images showed extraluminal gas adjacent to the rectal tumour (Fig. 1d).

Discussion

The most common cause of rectal perforation during barium examination is an injury to the rectal wall.⁴ It is

relatively safe to inflate the balloon with 100 to 150 cc of air.⁵ In our cases, we used a soft-tip enema tube with barium and safety amount of air during the procedure.

Another common mechanism of colorectal perforation is related to weakness of the colorectal wall, especially in patients with colon cancer or after biopsy. Previous studies have showed that barium enema has to be postponed 4 to 6 days after biopsy.⁴ Both of our patients had advanced stage of colorectal cancer, and biopsies were done 4 and 6 days respectively before the DCBE examination.

Other causes of a weak colon wall include long-term steroid use, previous radiotherapy, diverticulitis, inflammatory bowel disease, ischaemia, or bowel obstruction causing distension of the colon.^{3,4} However, no such history was noted in our patients.

Pain felt during or after the barium enema is a clinical sign of colonic perforation.⁴ Tachycardia and fever may develop a few hours after perforation, followed by rapid, progressive sepsis.⁴ In our cases, there were no clinical signs during the DCBE procedure initially, except for fluoroscopic detection of barium leakage into the pelvic cavity.

After gross extravasation of barium, immediate aggressive surgical treatment is indicated.⁴ The barium sulfate can cause an intense inflammatory reaction and septic peritonitis resulting in mortality of 50%.⁴ Gross intraperitoneal barium extravasation in a poorly prepared colon (faecal spill) can result in severe peritonitis.^{4,5} On the other hand, retroperitoneal perforation is usually less catastrophic, and has a favourable prognosis.²

Our first patient had a massive intraperitoneal barium spill, and even though immediate surgery and adequate treatment were applied, septic shock progressed. Ascites revealed *E coli* and *K pneumoniae*, suggesting complication of the faecal spill. The second patient suffered from barium extravasation into the retroperitoneum, and he recovered well.

Perforated colonic cancer presenting as intra-abdominal abscess or unusual abscesses associated with colon cancer has been reported.⁵ In our cases, CT scan had shown air and fluid accumulation in the pericolic space suggesting colonic perforation.

In the first case, the patient was actually presented with altered bowel habits, cold sweats, fever and abdominal tenderness. This was an indication that the patient could have developed a tumour perforation. Performing a DCBE was perhaps an error. Awareness of clinical signs and careful interpretation of the CT scan before barium examination can help to obviate such fatal complication.

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