

Barium Venous Intravasation in a Patient with Colovenous Fistula

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Barium radiography is generally regarded as safe diagnostic procedure. Rarely, however, the procedure may be followed by serious complications such as barium intravasation. This article describes a case of barium venous intravasation into the inferior mesenteric vein that occurred in a patient with a history of ischemic colitis who underwent a barium enema. The incidence, causes, and radiographic appearance of barium intravasation are reviewed. Measures for preventing and treating barium intravasation are discussed.

CASE PRESENTATION

Initial Presentation

A 62-year-old man with an end-ileostomy was admitted to the hospital with a history of passing a brown-green secretion from his rectal stump. Although the secretion had been present for more than a year, it had recently become copious. The preadmission test for occult blood was positive.

Surgical History

Four years previously, the patient had been admitted to the hospital with acute ischemic colitis, ileus, and gangrene of the colon. He had peripheral vascular disease and severe vascular dementia. He underwent laparotomy, subtotal colectomy, colostomy of sigmoid colon, end-ileostomy, and tracheostomy and drainage of a right flank collection. Postoperatively, his condition worsened and included septic shock, severe metabolic acidosis, evisceration, and pneumonia. Following appropriate treatment in the intensive care unit, his condition improved. After 48 days, he was discharged from the hospital with ileostomy but in relatively good general condition. Histology showed chronic inflammation and ischemia of the colon but no evidence of ulcerative colitis or tuberculosis.

Physical Examination and Diagnostic Evaluation

On physical examination, the anus and perianal area

were red and edematous. Sigmoidoscopic investigation was impossible owing to severe pain. A barium enema was performed under fluoroscopy. The sigmoid colon was spastic, and a barium-filled structure was noted in the left paramidline region (**Figure 1**). Barium administration was promptly halted. A computed tomographic (CT) scan was immediately obtained and better demonstrated barium within the liver (in the portal radicle) (**Figure 2**). Additionally, a fistula communicating with the inferior mesenteric vein was found in the recto-sigmoid stump. The remainder of the examination, including liver ultrasound of the portal vein, was normal.

Clinical Course

Approximately 20 minutes after barium administration was halted, the patient developed rigors that lasted approximately 5 minutes and a fever of 38°C (100.4°F). The rigors ceased spontaneously and he developed no further symptoms or signs. The patient was administered antibiotics and corticosteroid prophylactically. He was discharged some days later with a recommendation to return in 3 weeks for a short colonoscopy.

DISCUSSION

Incidence and Outcomes of Barium Intravasation

Venous intravasation of barium sulfate is an unusual but potentially lethal complication of barium enema. Most patients with barium intravasation are women with a mean age of 67 years.¹ In 29 previously reported cases of barium intravasation, the mortality rate was as high as 65% to 67%, with half of patients dying immediately and others dying shortly after the barium study. In women with vaginal perforation, the mortality rate was significantly higher.² Massive barium pulmonary embolism appears to be one of the causes of death.¹⁻³

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Figure 1. Abdominal radiograph of the case patient during barium administration reveals a fistula from recto-sigmoid colon stump to a tubular barium collection in the left paramidline region of the abdomen.



Figure 2. A noncontrast abdominal computed tomography scan of the patient following cessation of barium administration shows barium entering the portal venous confluence. Portal vein radicle of the right hepatic lobe are visible and contain barium.

Nevertheless, full recovery is possible.^{1,2} Indeed, cases with relatively minor degrees of intravasation might even be overlooked.¹

Prognosis and survival in barium intravasation depend on patients' general health and amount of barium intravasated.^{4,5} Patient age also is important, with a better prognosis in younger patients.² Outcomes are better when barium enters the portal rather than the systemic circulation. Survival depends on the promptness of resuscitative measures, but death can be immediate.^{4,5}

The clinical consequences of barium intravasation can be dramatic and may include hypotension, sepsis, disseminated intravascular coagulation, liver microabscesses, and deterioration of liver functions on laboratory examination.^{1-3,6,7} Interestingly, high endotoxin levels may be found in the contrast material.⁷

Radiographic Appearance

Barium can enter the inferior mesenteric vein, vena cava, cardiac chambers, spleen, and liver via the hemorrhoidal plexus or upper bowel segments. Barium intravasation may be apparent on plain radiographs, CT scans, or at necropsy.^{1,2} In reported cases of vaginal instillation of barium, intravasation was seen in and beyond the paravaginal plexus.^{1,8} On radiographic study, venous intravasation of barium in the inferior mesenteric vein during enema can resemble a colo-

ureteral fistula¹ and thus cause diagnostic difficulties. In addition to barium emboli, air is sometimes seen in the portal and splenic veins, liver, and spleen.¹⁻⁶ Radiographic densities may be seen bilaterally within the parenchyma of the liver, spleen, lower lungs, skeleton (especially the spine), and even in the perivascular space and around the portal vein. Branching tubular radiolucencies denote the vascular system within these organs.^{1-3,6} Elevated levels of barium have been demonstrated in cerebrospinal fluid as well.⁹ In the liver, reticuloendothelial cells are thought to load and clear up small barium particles.^{1,2,6} At necropsy, portal vein thrombosis with barium deposition within the clot may be found.⁵

Causes

Causes of barium intravasation are not entirely clear. Sometimes the predisposing factors remain undetected on examination.⁴ The causes may be mechanical or related to diseased bowel conditions. Mechanical causes include perforation of colon^{1,7} or vagina² resulting from misplacement of the catheter tip.⁴ Previous colon surgery can distort the vascular anatomy and allow barium intravasation to occur.⁴ High filling pressure carries a risk of intravasation in patients with intestinal obstruction.¹ Excess intraluminal pressure from using a balloon catheter may cause barium intravasation⁴; however, barium intravasation also may occur without excess pressure.⁵ When barium is administered orally in patients

with intestinal obstruction, intravasation may occur as the result of stasis of contrast material.^{5,9,10}

Barium intravasation almost always occurs in a setting of altered mucosal integrity such as diverticulitis, mucosal inflammation, ulcerative colitis, Crohn's disease, or thrombophlebitis.³ The small size of barium particles facilitates their intravasation.² In the patient presented here, altered mucosal integrity apparently was caused by ischemic colitis. The patient's preexisting fistula (as evidenced by the green-brown discharge) provided a breach for the barium to flow through. Ischemia increases intestinal permeability and the production of cytokine-like tumor necrosis factor and interleukin-6, which, in turn, increase ischemic/reperfusion injury.¹¹ Friable and atrophied rectal or vaginal tissues in the elderly predispose to barium intravasation.^{1,3-6,9} Atrophy of perineal tissues can predispose patients to vaginal perforation as a result of catheter misplacement.⁸ Barium intravasation also has been described in patients with severe chronic illness (eg, end-stage renal disease, cancer).^{4,6}

In the case described, barium intravasation occurred in a patient with ischemic colitis. To our knowledge, ischemic colon as a cause of intravasation is mentioned in only 1 report.⁶ An unusual feature of the present case is that it took more than a year before excessive brown-green secretions from the anus became copious and the patient came to the hospital. There is no certain method of determining whether the patient suffered from colovenous fistula during this time. It is possible, however, that a fistula did indeed exist but was not detected because the pressure in the stump of the colon was low.

Preventing Barium Intravasation

Predisposing factors must be identified to aid in the prevention of barium intravasation in patients scheduled for barium enema.^{1,3} Every attempt must be made to avoid mucosal injury from a catheter tip or from balloon hyperinflation. Barium injection should not be performed forcefully or at high pressure.^{3,5} Recommendations that can reduce risks associated with the use of balloon catheters have been suggested; for example, a digital rectal examination to define the perineal anatomy and the use of a gloved finger to guide the catheter into the rectum.⁸

If barium intravasation is noted during the radiographic study, the procedure should be terminated immediately.^{1,7} The patient must be placed in a reverse Trendelenburg position with the right side down in order to prevent the flow of barium into the heart and pulmonary circulation.¹ Antibiotic prophylaxis against

gram-negative bacteria carried by the contrast material may be life saving and should be administered immediately. Blood cultures may help in the choice of the proper antibiotic.⁷ If a colovenous fistula with barium intravasation is suspected, urgent hematology consultation is warranted because emergent treatment of coagulopathy may be required.⁶

CONCLUSION

Barium enema is not a fully safe diagnostic procedure, especially in debilitated patients and those with altered mucosal integrity. Clinicians should be aware of the risk factors for barium intravasation. Prompt recognition and rapid resuscitation are critical to the survival of patients with contrast intravasation. **HP**

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