Barium peritonitis: a rare complication of upper gastrointestinal contrast investigation

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Summary

Contrast examination of the gastrointestinal tract is rarely complicated by perforation. The colon and rectum are most commonly affected, with many perforations limited to the retroperitoneum. Generalised peritonitis is therefore rare, but is life-threatening and difficult to treat. We present two analogous cases in which extravasation of barium sulphate complicated contrast meal investigation. These cases illustrate important aspects in the management of this unusual occurrence.

Keywords: barium, peritonitis, management, ulcer, perforation

Barium peritonitis is a rare but life-threatening complication of contrast examination of the gastrointestinal tract. The incidence of peritonitis following barium enema is in the order of 2–8 per 10 000 investigations.^{1,2} Generalised peritonitis in such circumstances is rare, since most perforations are limited to the retroperitoneum.¹ The incidence of barium peritonitis following barium meal investigation is much lower, with only 30 cases including our own, being reported in the English literature.^{3,4} The chemical peritonitis due to barium contamination is characteristically severe and difficult to treat.^{2–8} The following cases provide illustration of the difficulties which may be encountered, and facilitate discussion of the principles of management.

Case reports

Case 1

A 32-year-old woman underwent a barium meal examination for suspected peptic ulcer disease. A penetrating ulcer of the lesser curve was seen to perforate during radiographic 'screening' (figure). This instantaneous diagnosis enabled prompt transfer to the operating theatre and laparotomy within 30 minutes, at which point barium contamination was largely limited to the surface of the lesser curvature of the stomach. Vigorous peritoneal toilet with copious volumes of warm saline readily removed most of the barium. In view of the age and general condition of the patient definitive treatment of the ulcer was undertaken by Billroth II gastrectomy rather than simple patch repair and medical therapy. The patient's

convalescence was uncomplicated but for a superficial wound infection, and she was discharged on the 12th postoperative day, remaining free from symptoms 10 years later.

Case 2

A 63-year-old man developed progressively severe abdominal pain shortly after completion of a barium meal investigation for suspected peptic ulcer disease. On re-presentation to our unit six hours later generalised peritonitis was evident, and plain abdominal radiographs confirmed the presence of extraluminal barium. At emergency laparotomy a perforated posterior pyloric ulcer was noted, along with barium contamination throughout the peritoneal cavity. An inflammatory membrane, with multiple adherent clumps of barium, covered most visceral and parietal surfaces. After extensive peritoneal toilet with warm saline and removal of as much barium as possible, the ulcer was closed with an omental patch. Complete removal of all contamination was felt to be hazardous and impractical and significant quantities of barium were undoubtedly left behind. Postoperatively the patient required ventilatory support for three days, but his recovery was otherwise uneventful until

Learning/summary points

- generalised peritonitis following contrast examination is rare, but life-threatening.
- modern barium, because of its mucosal coating properties, adheres to the peritoneum and is therefore more difficult to remove.
- management of barium peritonitis includes vigorous fluid resuscitation, broad-spectrum antibiotics, and early surgical intervention to remove barium and deal with perforation
- postoperative nutritional support may be needed

Figure Perforation of an ulcer of the lesser curvature of the stomach during barium meal study

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signs of peritonitis developed on the 11th day. A further laparotomy confirmed reperforation of the pyloric ulcer, with multiple erosions around the ulcer edge. Partial closure of the disruption with tube duodenostomy, truncal vagotomy, gastrojejunostomy and feeding jejunostomy was performed. The patient required a prolonged period of enteral support, but his recovery was otherwise uncomplicated. He was discharged on the 31st postoperative day, and remains well three years later.

Discussion

Although barium studies of the gastrointestinal tract are a safe and accurate diagnostic modality, complications such as gastrointestinal perforation, impaction and obstruction, and aspiration of barium have all been reported.¹ The faecal contamination which follows large bowel perforation leads to a more severe peritonitis than that which follows gastric perforation.

The role of contrast studies in the investigation of the upper gastrointestinal tract has diminished with the increasing availability of endoscopy, and the single contrast meal, as illustrated in the figure is now undertaken infrequently. The relative risks of single and double contrast examination are not known. In theory, however, newer double contrast meals may carry an increased risk of perforation because of the greater gastric distension which they produce. However, the use of intravenous gastric relaxants should protect the stomach against undue increases in pressure.

Following perforation, rapid spread of barium throughout the peritoneal cavity can be documented radiographically.⁸ Such peritoneal contamination produces a marked chemical peritonitis which can lead to the exudation of large volumes of extracellular fluid and albumin, with resulting hypovolemia.^{3,8} Aggressive fluid resuscitation in combination with broad-spectrum antibiotics must therefore be commenced immediately.^{3,4,7,8}

Barium within the peritoneal cavity quickly begins to accumulate in small fibrin-covered

clumps which adhere firmly to parietal and visceral surfaces and are not easily removed.^{4,8} Indeed, modern barium contains additives designed to maintain suspension and coat the mucosal surface, and is thus more adherent than older barium which was designed to fill rather than coat the bowel lumen.^{6,7} Nevertheless, considerable barium remains in suspension within the peritoneal cavity,⁸ and this eventually undergoes a process of successive aggregation, partial or complete phagocytosis, and fibroblastic encapsulation with subsequent adhesion formation.⁵ Repeated episodes of small bowel obstruction have been reported in up to 30% of patients surviving barium peritonitis,⁵ and in animal studies dense adhesions are the inevitable consequence of barium peritonitis.⁸

Early laparotomy with removal of barium and gastrointestinal contents by vigorous peritoneal toilet, has been shown to diminish the intensity of peritonitis and reduce morbidity and mortality.^{3,4,6-8} Copious normal saline lavage should be performed. Although concentrated urokinase (72 000 IU in 500 ml of normal saline)⁴ provides an alternative which may be particularly efficacious in this scenario. In addition, some authors have recommended omentectomy if that structure is saturated with a substantial volume of barium, with the aim of reducing the likelihood of adhesion formation.^{3,8}

Postoperatively, in addition to close attention to fluid balance and administration of broad-spectrum antibiotics, the patient may require nutritional support. A number of authors have drawn attention to this requirement, since such patients are often septic and debilitated by coexisting pathology.³

The prognosis of barium peritonitis has long been held to be poor, with the mortality in early series being as high as 53%.⁵ However, more recent reviews have documented mortality rates in the region of 20%.⁶ Such improvements can be ascribed to better understanding of the pathophysiology of this condition, as well as the increased availability of broad-spectrum antibiotics and nutritional support.

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