

Barium Granulomatosis: A Rare Cause of Obstruction after Remote Bariatric Surgery and a Cautionary Tale of Contrast Selection with Surgical and Pathologic Correlation

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Received: May 03, 2022

Accepted: June 14, 2022

Published: June 16, 2022

Citation: Celii FG, Burris J, Hausner RJ, Wray CJ, Manisundaram N, et al. 2022. Barium Granulomatosis: A Rare Cause of Obstruction after Remote Bariatric Surgery and a Cautionary Tale of Contrast Selection with Surgical and Pathologic Correlation. *J Med Imaging Case Rep* 6(1): 24-26.

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Published by United Scientific Group

Abstract

Bariatric weight loss procedures have dramatically increased in recent years, but are not without significant complications, including post-procedural leakage. Upper gastrointestinal examination (UGI) studies or computed tomography (CT) abdomen with oral contrast, in conjunction with clinical suspicion, have excellent specificity for detection of leaks; however, attention to the contrast agent can be crucial to avoid worsening the patient's clinical outcome. We present a 64-year-old male with a previous adjustable gastric band (AGB) converted to a laparoscopic sleeve gastrectomy who was evaluated with barium UGI study in the post-operative period. Years later, the patient presented to the emergency room with acute small bowel obstruction (SBO), secondary to barium granulomatosis, and required extensive small bowel resection hemicolectomy and anastomosis. In addition to this novel complication, this case highlights the importance of appropriate contrast media selection and treatment options should this complication arise.

Keywords

Barium, Granulomatosis, Obstruction, Bariatric, Leak

Introduction

Bariatric weight loss procedures have dramatically increased in recent years, totaling approximately 256,000 bariatric surgeries per year, correlating with the rising prevalence of obesity, now affecting an estimated 42.4% of Americans, based on estimates by the CDC. Additionally, the majority of weight loss procedures have shifted from the prior standard Roux-en-Y Gastric Bypass (RYGB) and laparoscopic adjustable gastric banding to laparoscopic sleeve gastrectomy (LSG), which now represents approximately 59% of all bariatric procedures in the United States, per the American Society for Metabolic and Bariatric Surgery. Despite LSG not requiring a surgical anastomosis, they are actually more susceptible to leakage than RYGB, at 2.4% vs. 0.7%, which is thought to be secondary to a long staple line and high intraluminal pressure¹. To our knowledge, barium sulfate has never been described before as the cause of an extraluminal bowel obstruction after bariatric surgery.

Case Report

A 64-year-old male with hypertension, type 2 diabetes mellitus, hyperlipidemia, and morbid obesity, BMI of 46, presented to our emergency department with a 3-day history of nausea, non-bilious, non-bloody vomiting, and severe abdominal pain. Physical exam revealed pain in the right upper quadrant, a markedly distended abdomen, and hyperactive bowel sounds. During evaluation of the patient, it was elicited that the patient had multiple prior surgeries notable for a laparoscopic adjustable gastric band procedure that was later converted to a sleeve gastrectomy at an outside hospital. During the post-operative phase after the sleeve gastrectomy [1], the patient underwent routine fluoroscopic evaluation with UGI study using barium and a small leak was noted, which was managed conservatively. Now two years later, the abdominal CT revealed a small bowel obstruction with an adherent peritoneal soft tissue mass containing nodular and amorphous hyperattenuating foci abutting the transition point (Figure 1).

As an older male with obstruction and this appearance, a primary or metastatic peritoneal malignancy or aggressive fibromatosis was considered in the differential; however, given the history of prior gastric surgery with barium leak and the presence of hyperattenuating nodules in the soft tissue, a possibility of barium granulomatosis was raised and discussed pre-operatively with the surgical team.

A decision was made to take the patient to the OR. Intra-operatively, it was clear this large nodular lesion was the cause of the obstruction and tethered much of the small and adjacent large bowel (Figure 2a), causing adherence to the peritoneal lining of the abdominal wall. The patient required open resection of small bowel through the involved ascending and proximal transverse colon with primary small bowel to colon

anastomosis. Prior to closure, pathology was able to exclude malignancy, but noted a foreign material within the adherent, nodular, fibrous tissue. Further testing revealed the foreign material was in fact barium. Therefore, this clinched the clinical diagnosis of remote barium peritonitis causing a granulomatous reaction and fibrosis, which acted as a tethering point for small bowel obstruction 2 years removed from the inciting incident. Clinically the patient progressed well, recovered, and was discharged on post-operative day 4.

Discussion

Peritoneal contamination of barium from upper gastrointestinal perforation is exceedingly rare in the modern era especially with the availability of water-soluble contrast agents (estimated incidence of 0.008 – 0.04%) [2]. Acute peritoneal exposure to large area of peritoneum results in chemical peritonitis that may require early laparotomy with lavage, as well as aggressive fluid resuscitation and broad-spectrum antibiotics [2]. Chronic granulomatous peritonitis is a delayed manifestation whereby barium deposits incite the development of fibrous tissue that is firmly adherent to visceral and parietal layers of the peritoneum, which tether the adjacent bowel loops, leading to obstruction. Use of maximal intensity projection (MIP) images and thin slice volume rendered images (Figure 1) enhances visualization of the barium and surrounding fibrous tissue, additionally highlighting the extent of fibrous reaction and colonic involvement.

Our pathologists were able to then use a previously describe method of comparison to a known barium solution to confirm birefringence in both pathologic and control specimens (Figure 2c), confirming this was indeed barium along the serosal surface of the bowel (Figure 2b).

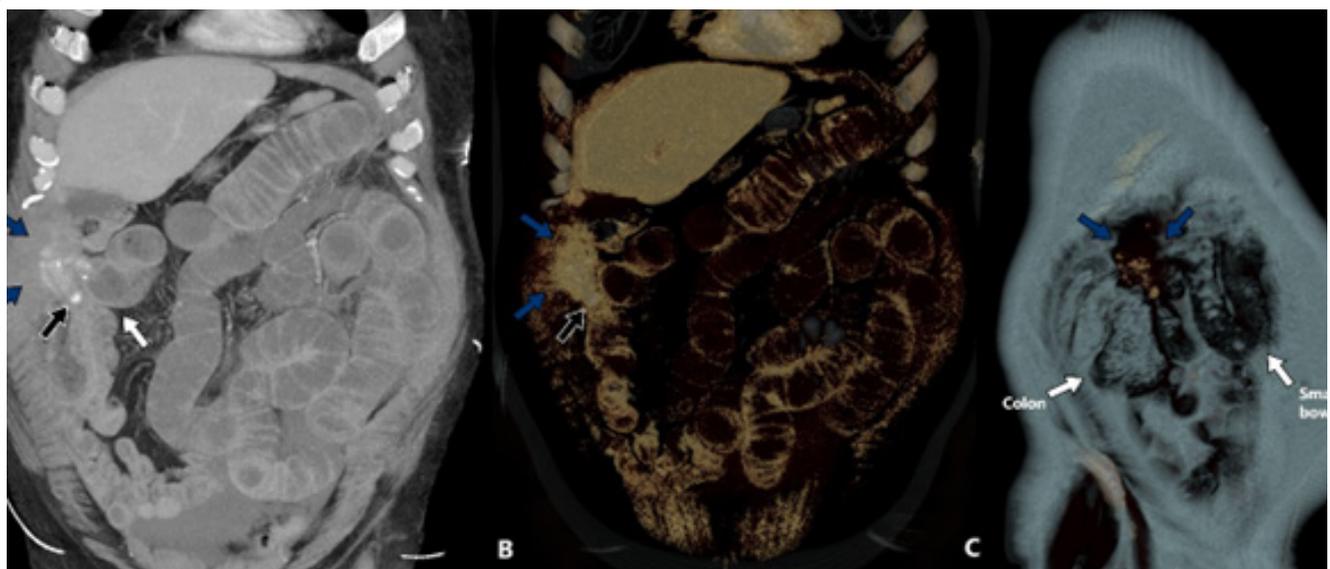


Figure 1: Coronal Maximal Intensity Projection (MIP) image (A) shows dilated fluid filled small bowel loops with a transition point (white arrow) abutting the barium (black arrow) with surrounding fibrous tissue along the serosal aspect (blue arrows). Volume rendered coronal image highlights the barium clump (black arrow) and improved visualization of surrounding fibrous tissue (blue arrows). Oblique volume rendered image (C) highlights the fibrous tissue (blue arrows) and barium clumps (gold foci) within the tethering mass, which is adherent to the afferent dilated small bowel loops as well as to the cecum and ascending colon.

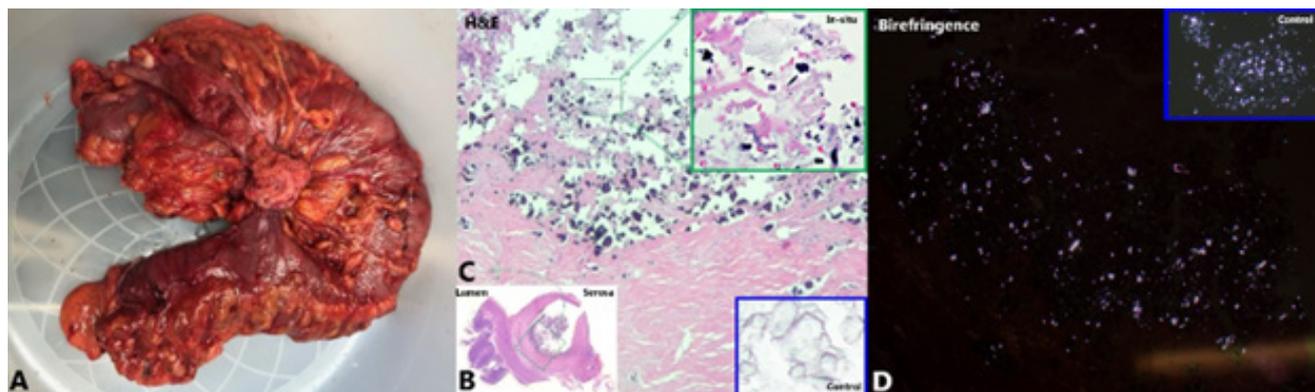


Figure 2: Gross surgical specimen (A) after resection of the matted and tethered loops of bowel around the peritoneal barium granuloma lead point. (B) Whole mount H&E section of the barium granuloma along the serosal aspect of the bowel with subsequent 20X magnification (C) and further 40X magnification (green box) identifying barium crystals in the granuloma and control barium (blue box), both with the typical appearance of light white-gray irregularly faceted rhomboid crystals. (D) Identification was further confirmed with demonstration of identical, robust birefringence of the barium crystals in both the H&E stained pathologic sections and control (blue box).

UGI or CT with oral contrast, in conjunction with clinical suspicion, can be used for detection of leaks; however, attention to the type of contrast agent can be crucial to avoid worsening the patient's clinical outcome. Despite its high sensitivity for leaks, barium has the major drawback of permanent retention at the location of leakage and causing inflammation, peritonitis, and even death. Some practices endorse using water-soluble contrast agents initially, and administer high-density barium for improved detection; however, this seems to be an unacceptable risk given the sensitivity and specificity of CT.

Multiple recent studies have demonstrated that CT is superior to UGI in the detection of leakage following bariatric surgery. CT was shown to be 95% sensitive and 100% specific, while UGI was shown to be 79.4% sensitive and 95% specific [3]. Additionally, CT has the added benefit of detecting other acute abdominal processes that may mimic clinical symptoms of a leak. UGI evaluation may be best suited for pre-operative planning when a leak has already been diagnosed. In this scenario, Omnipaque is the ideal water-soluble agent as Gastrografin is contraindicated in patients with risk for aspiration.

Due to the increasing popularity of LSG (primary leakage rate of 1-2.4% and drastically increased in cases of revisional gastric restrictive operations to approximately 14%) [4], it will be imperative that surgeons are familiar with the utility of radiologic studies, contrast agents, potential complications, and insist on the use of water-soluble contrast when leak is suspected.

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