

Colonic Obstruction and Perforation Due to Gallstone Ileus

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Background	A 51-year-old female presented to the emergency department with one week of progressively worsening abdominal pain, nausea, and vomiting.
Summary	Upon arrival, the patient was hypotensive and tachycardic and exhibited significant abdominal distention and diffuse peritonitis on exam. CT abdomen/pelvis revealed colonic gallstone ileus with a radiopaque mass at the distal sigmoid colon, inflammation within the hepatic flexure, and air within the gallbladder. The patient was expeditiously taken to the operating room and underwent an exploratory laparotomy which revealed feculent peritonitis and diffuse diverticula with multiple segments of adhesions and strictures along the entire descending colon. In addition, there were perforations at the splenic flexure and sigmoid colon, resulting in gross spillage of stool. The gallstone was palpated within the upper rectum and fixed within a segment of colonic stricture. As a result, an incision was made directly over the gallstone, and it was removed piecemeal. Due to the extensive intraabdominal contamination and the patient's hemodynamic instability, the decision was made to leave the cholecystocolonic fistula in place and perform a left hemicolectomy with end colostomy. The patient was subsequently taken to the intensive care unit in critical condition. The remainder of the patient's hospital course was uncomplicated, and she recovered quite well.
Conclusion	Gallstone ileus is a rare complication of cholelithiasis, and the colon is the most infrequent site of obstruction. Furthermore, this case demonstrates the significant impact of diverticular disease on the pathogenesis and management of colonic gallstone ileus.
Key Words	large bowel obstruction; obstruction; acute abdomen; adhesions; colorectal; hepatobiliary

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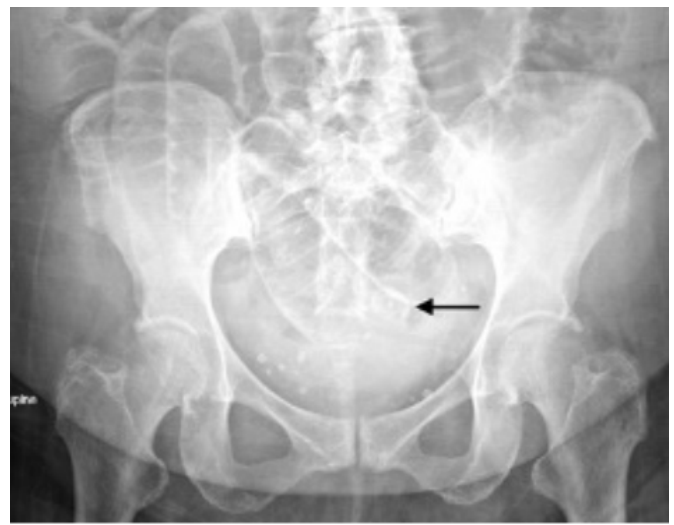
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Case Description

Gallstone ileus is a rare complication of cholelithiasis, occurring in 0.3% of patients with gallstones and comprises 3-4% of benign small bowel obstructions requiring operative intervention.⁸ Women and the elderly are most often affected, with reports as high as 25% in patients over the age of 65 presenting with non-strangulated obstruction.⁸ The pathogenesis of gallstone ileus stems from chronic or recurrent cholecystitis. Pericholecystic inflammation promotes adhesions between the biliary and enteric systems. Pressure necrosis of the gallstone against the biliary wall leads to erosion and fistula formation in the bowel. A majority of gallstones that enter the gastrointestinal tract become impacted within the ileum (0-89.5%), with less found in the jejunum (0-50%), stomach (0-20%), and the colon (0-8.1%).⁵ Our case is a rare subset of an already uncommon disease process.

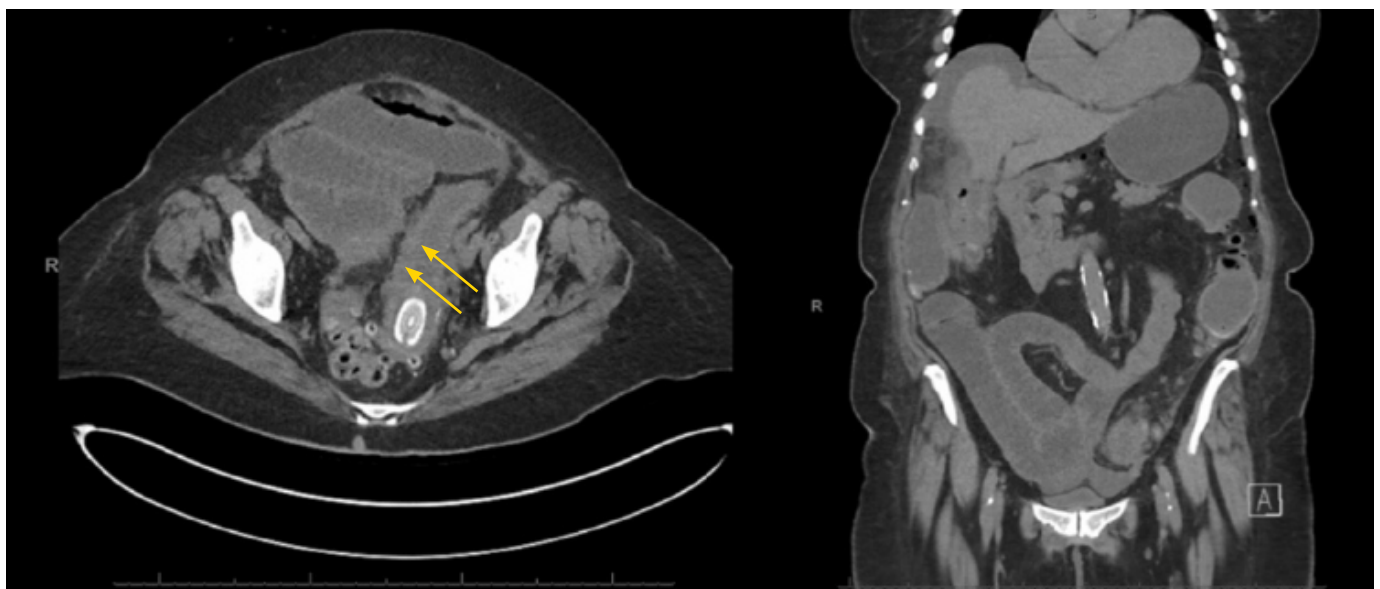
The patient is a 51-year-old female with a history of hypertension and atrial fibrillation (on Xarelto) who presented to the emergency department with a one-week history of progressively worsening bilateral lower quadrant abdominal pain. She endorsed nausea, vomiting, abdominal distention, and constipation since the onset of her symptoms. She had no significant past surgical history. Upon arrival, she was tachycardic at 120-130 beats per minute (BMP), and her blood pressure was in the 90s systolic. Other vital signs were within normal limits, and she appeared in no acute distress. However, her abdomen was distended on physical exam and firm with rebound tenderness in the left lower quadrant. Labs were notable for lactic acidosis at

Figure 1. Dilated Loops of Bowel and Radiopaque Mass Within Distal Colon. Published with Permission



2.1. An abdominal X-ray revealed distended loops of bowel concerning for a high-grade small bowel obstruction and pneumoperitoneum. A radiopaque mass was evident within the distal colon (Figure 1). CT abdomen/pelvis with IV contrast was subsequently ordered and re-demonstrated the radiopaque mass, which appeared to be a 3.5 cm gallstone within the distal sigmoid colon as well as inflammation at the hepatic flexure and pneumoperitoneum (Figure 2). Diverticulosis was also evident throughout the entire descending colon. Given the concern for colonic gallstone ileus and bowel perforation, the patient was taken urgently to the operating room.

Figure 2. Gallstone Within Distal Sigmoid Colon, Inflammation at Hepatic Flexure, and Pneumoperitoneum. Published with Permission



Feculent peritonitis and dilated bowel were encountered upon entry into the abdominal cavity. The entire small bowel was inspected and appeared healthy with no evidence of perforation. The colon was examined, which was notable for diverticulosis throughout the descending and sigmoid colon. Inflammation was noted at the hepatic flexure with the colon, obscuring any visualization of the gallbladder. A perforation was discovered at the splenic flexure (pinhole defect) and sigmoid colon with gross spillage of stool. The gallstone was palpated within the upper rectum. At this point, the decision was made to proceed with a left hemicolectomy with end colostomy due to the extensive intraabdominal contamination. First, the left colon was mobilized medially by dissecting along the white line of Toldt. The splenic flexure attachments and the omentum along the transverse colon were divided. The gallstone extraction proved quite challenging. As previously mentioned, the patient had diffuse diverticular disease within the descending colon. It was suspected that she likely suffered from recurrent episodes of diverticulitis, which resulted in multiple segments of adhesions and strictures. The gallstone was unable to be milked proximally from the upper rectum as it appeared to be lodged within a segment of colonic stricture. As a result, an incision was made directly over the gallstone, which appeared more tubular than depicted on imaging. The proximal half of the gallstone was removed whole (Figure 3). The remaining half was morselized and extracted piecemeal. The left hemicolectomy was then completed by dividing the colon proximal to the perforation at the splenic flexure and distal to colotomy at the upper rectum. The abdomen was irrigated with 4L of warm saline, and an end colostomy was created. The fascia was closed, and the skin was loosely approximated at the umbilicus. The subcutaneous space was packed with kerlix both above and below the umbilicus. The patient's blood pressure was maintained with intravenous fluids and vasopressor agents throughout the entirety of the case. She remained intubated and was taken to the intensive care unit in critical condition.

Fortunately, she recovered well, and the remainder of her hospital course was uncomplicated. On postoperative day 2, she was weaned from the vasopressors and extubated. Her diet was gradually advanced, and she was discharged to a skilled nursing facility for continued physical therapy on postoperative day eleven. Three months later, she returned for cholecystectomy with a takedown of the cholecystocolonic fistula and Hartmann's reversal with diverting loop ileostomy. A loop ileostomy was created due to the low rectal anastomosis. She finally underwent loop ileostomy takedown four months later and was doing quite well during her most recent follow-up visit.

Figure 3. Gallstone Extracted From Upper Rectum. Published with Permission



Discussion

The passage of gallstones through a cholecystoenteric fistula was first described in 1694.⁷ Although medicine and surgery have significantly advanced since this disease process was first identified over 200 years ago, mortality has remained relatively high. From the 1800s to the mid-twentieth century, mortality rates were as high as 44%.⁶ Considerable reductions in mortality were reported in the 1990s at 15-18%, mainly due to improved diagnostic capabilities and early surgical intervention.⁶

A plain abdominal radiograph may be used to establish a diagnosis and is a useful initial study. Rigler's triad consists of the classic radiographic features that are pathognomonic for gallstone ileus: (1) partial or complete obstruction; (2) pneumobilia; (3) and aberrant gallstone.⁶ However, these findings are not always evident, and Rigler's triad occurs in less than 50% of cases on abdominal plain film.¹ CT scan remains the diagnostic modality of choice, with sensitivity as high as 93%.⁶ Moreover, studies have shown that the features mentioned above are more frequently detected on a CT scan versus an abdominal radiograph.⁶

The mainstay of treatment for gallstone ileus is an expeditious surgical intervention to remove the stone and thereby relieve the obstruction. Laparotomy with longitudinal enterotomy proximal to the point of impaction has been well described in the literature.⁶ There is a long-standing

debate about whether biliary surgery should be performed at the index operation, in a delayed fashion, or even at all. The current surgical options are (1) enterolithotomy, (2) enterolithotomy, cholecystectomy, and fistula takedown (one-stage procedure), and (3) enterolithotomy with interval cholecystectomy and fistula takedown (two-stage procedure).⁶ Enterolithotomy alone is most frequently performed in the emergency setting as patients often present with fluid or electrolyte derangements that preclude a more aggressive operative approach.¹ The one-stage procedure is associated with more surgical trauma, prolonged operative time, and increased length of hospital stay.¹ Reisner and Cohen conducted a retrospective review of 1,001 patients with gallstone ileus. They found a higher mortality rate with the one-stage procedure than with the two-stage procedure (16.9% vs. 11.7%, respectively).⁹

Proponents of the two-stage procedure argue that leaving the biliary fistula in place increases the risk of recurrent gallstone ileus, cholecystitis, ascending cholangitis, and gallbladder cancer.⁴ Natural fistula closure has been found to occur in 61.5% of cases.⁴ However, if the adjacent gallbladder mucosa remains viable or the cystic duct is permanently occluded, the fistula will likely persist.⁶ The recurrence rate after simple cholecystectomy has been reported to be up to 8%, with some studies documenting a 17-33% recurrence rate.⁶ Furthermore, acute cholangitis has been reported in 11% of patients with cholecystoduodenal fistula and 60% with cholecystocolonic fistula.⁶ This is likely due to the lower natural closure rate of 10% for cholecystocolonic fistulas and retrograde flow of fecal fluid.⁴ To further complicate this debate, more recent case reports of colonic gallstone ileus incorporate endoscopic methods for stone extraction.⁶

Several reports describe failed attempts at endoscopic retrieval of gallstones due to extensive adhesions and strictures from diverticular disease.^{3,7,10} Although the patients in these reports were hemodynamically normal initially and preoperative imaging did not reveal evidence of bowel ischemia or perforation, extensive diverticular disease was clearly evident on an abdominal CT scan.^{3,7,10} Patients with colonic gallstone ileus often have a history of diverticulitis, which predisposes them to stone impaction within areas of colonic stricture.⁵ This explains the variable success rate of utilizing endoscopy for stone extraction. Extraction of the gallstone was the most challenging aspect of the described procedure. Even with adequate exposure and an incision directly over the gallstone, it was firmly lodged within a segment of colonic stricture and required piecemeal extraction and extension of the colotomy.

Our case and the previously mentioned reports demonstrate the significant impact that diverticular disease can have on the management of colonic gallstone ileus. In addition to hemodynamic instability and evidence of bowel compromise, perhaps evidence of diverticulosis, either with preoperative imaging or patient history, should support the decision to proceed directly to the operating room. Although our patient's clinical presentation precluded her from endoscopic retrieval, any attempts would have been futile and delayed care. Future studies are needed to determine the rate at which the presence of diverticular disease coincides with failed or complicated gallstone extraction.

Conclusion

We present a severe case of gallstone ileus resulting in colonic obstruction and feculent peritonitis. Our case demonstrates the importance of early surgical intervention and the technical challenges associated with gallstone extraction in the setting of severe diverticular disease.

Lessons Learned

Gallstone ileus carries a high mortality rate, and patients are often septic and decompensating upon arrival. Clinicians should be cautious when there is evidence of diverticulosis on preoperative workup or patient history. Recent literature describes failed attempts at endoscopic gallstone retrieval due to adhesions and strictures associated with recurrent episodes of diverticulitis. Moreover, our case demonstrates that surgical gallstone extraction may be difficult in the setting of severe diverticular disease. A multi-stage surgical approach focusing on relieving obstruction and diversion at the index operation resulted in adequate source control and expedited our resuscitation efforts.

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