



# Gallstone ileus

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## INTRODUCTION

Gallstone ileus is an important, though infrequent, cause of mechanical bowel obstruction, affecting older adult patients who often have other significant medical conditions. It is caused by impaction of a gallstone in the ileum after being passed through a biliary-enteric fistula. The diagnosis is often delayed since symptoms may be intermittent and investigations fail to identify the cause of the obstruction. The mainstay of treatment is removal of the obstructing stone after resuscitating the patient. Gallstone ileus continues to be associated with relatively high rates of morbidity and mortality.

Other causes of intestinal obstruction are discussed elsewhere. (See "[Etiologies, clinical manifestations, and diagnosis of mechanical small bowel obstruction in adults](#)".)

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## INCIDENCE

Gallstone ileus is an unusual complication of cholelithiasis, occurring in fewer than 0.5 percent of patients who present with mechanical small bowel obstruction [1]. Female and older patients are disproportionately affected [1,2].

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## PATHOGENESIS

The usual means of gallstone entry into the bowel is through a biliary enteric fistula, which complicates 2 to 3 percent of all cases of cholelithiasis with associated episodes of cholecystitis. Sixty percent are cholecystoduodenal fistulas, but cholecystocolonic and cholecystogastric fistulas can also result in gallstone ileus [3]. (See "[Acute calculous cholecystitis: Clinical features and diagnosis](#)".)

The Mirizzi syndrome refers to common hepatic duct obstruction caused by an extrinsic compression from an impacted stone in the cystic duct. An association between the Mirizzi syndrome and the presence of a cholecystoenteric fistula has been suggested because when a stone is impacted in the cystic duct it can result in narrowing of the common hepatic duct, which can lead to a cholecystenteric fistula, thus providing an exit route for gallstones [4].

In a surgical series that included 5673 cholecystectomies, 327 patients (5.7 percent) had Mirizzi syndrome and 105 (1.8 percent) had a cholecystoenteric fistula [5]. Of patients who had a cholecystoenteric fistula, 90 percent had Mirizzi syndrome. Thus, the presence of a coexisting Mirizzi syndrome should be considered when a cholecystoenteric fistula is encountered. (See "[Mirizzi syndrome](#)".)

The following sequence is probably responsible for most cases of fistula formation that lead to gallstone ileus. Pericholecystic inflammation after cholecystitis leads to the development of adhesions between the biliary and enteric systems. Pressure necrosis by the gallstone against the biliary wall then causes erosion and fistula formation. In addition, cases of gallstone ileus have occurred after endoscopic sphincterotomy. In this setting, the stone is presumed to have passed into the small bowel through the sphincterotomy and to have been large enough to cause obstruction [6]. Gallstone ileus can also complicate Crohn disease when a gallstone obstructs a diseased segment of the bowel [7].

Gallstone ileus results in obstruction if the gallstone is of large enough size. Ninety percent of obstructing stones are greater than 2 cm in diameter, with the majority measuring over 2.5 cm [8]. Fifty to 70 percent of gallstones impact in the ileum, which is the narrowest segment of the intestine. The jejunum and stomach are the next most frequently affected sites [2,9]. Colonic obstruction tends to occur where there is preexisting pathology, such as a post-diverticulitis stricture, since the normal colonic diameter usually permits passage of gallstones [9]. Multiple gallstones may be found along the obstructed bowel.

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## CLINICAL FEATURES

- **Symptoms** – The classic clinical presentation of gallstone ileus is in an older woman with episodic subacute obstruction. The episodic obstruction or "tumbling obstruction" is a result of the stone tumbling through the bowel lumen. Transient gallstone impaction produces diffuse abdominal pain and vomiting, which subside as the gallstone becomes disimpacted, only to recur again as the stone lodges in the more distal bowel lumen. As a result, vague and intermittent symptoms may be present for some days prior to evaluation. The mean symptom duration before hospital admission is approximately five days [9]. Hematemesis is an occasional complication that is due to hemorrhage at the site of the biliary enteric fistula [3].

Rarely, the gallstone becomes impacted within the pyloric channel or duodenum, causing gastric outlet obstruction (Bouveret's syndrome). The offending stone travels from the biliary tree via a cholecystoduodenal fistula, formed in the setting of cholecystitis and pericholecystic inflammation. The presenting symptoms are abrupt onset of epigastric pain, nausea, and vomiting. (See "[Gastric outlet obstruction in adults](#)", section on '[Bouveret syndrome](#)'.)

- **Signs** – On physical examination, the patient may be febrile and often appears dehydrated. Common abdominal signs include distension and increased bowel sounds. Jaundice is uncommon, occurring in fewer than 15 percent of cases [9]. In addition, 20 percent of patients in one series had signs consistent with acute cholecystitis [10]. (See "[Acute calculous cholecystitis: Clinical features and diagnosis](#)".)
- **Laboratory** – The biochemical abnormalities that accompany ileus are nonspecific and may include leukocytosis, electrolyte imbalance due to dehydration, and elevated aminotransferase levels [9].
- **Comorbidities** – Many affected patients have serious concomitant medical illnesses, including coronary disease, pulmonary disease, and diabetes mellitus. In a series of 22 patients with gallstone ileus, 86 percent of patients belonged to the American Society of Anesthesiology class 3 or 4 ( [table 1](#)) [2]. (See "[Overview of anesthesia](#)", section on '[Risk assessment](#)'.)

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## DIAGNOSIS

Gallstone ileus should be suspected in older adult patients with the above clinical features suggestive of acute or subacute small bowel obstruction and can be confirmed by either radiologic evaluation or, in some patients, at the time of surgery for small bowel obstruction. In

the latter setting, the removal of a gallstone from the site of the small bowel obstruction is diagnostic.

In the past, the diagnosis of gallstone ileus was not made until surgery in approximately one-half of the patients, because such patients lacked a history of biliary disease [11]. However, in a contemporary series, gallstone ileus was diagnosed in 77 percent of patients preoperatively with computed tomography (CT), plain film, or ultrasound [2].

**Confirm the diagnosis** — In patients suspected of having gallstone ileus, abdominal imaging is needed to confirm the diagnosis, identify the location of bowel obstruction, and look for complications related to obstruction (ischemia, necrosis, perforation). Among available imaging modalities, CT is the most widely used. When CT is not available, plain films or ultrasound can be used.

**Computed tomography** — Abdominal CT is the imaging modality of choice for gallstone ileus. On abdominal CT scan, findings consistent with gallstone ileus include ( [image 1](#)) [12-14]:

- Gallbladder wall thickening
- Pneumobilia
- Intestinal obstruction
- Obstructing gallstones

Pneumobilia occurs in 30 to 60 percent of patients with gallstone ileus but is a nonspecific finding. Air can enter the biliary tree from the gastrointestinal tract via a patent cystic duct or enterobiliary fistula. Alternatively, air in the biliary tree can also result from an incompetent sphincter of Oddi or prior biliary procedure/surgery [9,11].

**Plain radiography** — When CT is not available, plain films or ultrasound can be used in patients with suspected gallstone ileus. The classic findings of gallstone ileus on a plain abdominal film are listed below. Two of the first three findings were found in up to 50 percent of cases of gallstone ileus in one study. Rigler's triad is the appearance on plain radiograph of pneumobilia, small bowel obstruction, and gallstone (usually in the iliac fossa) [15].

- Signs of partial or complete intestinal obstruction ( [image 2](#)).
- Pneumobilia ( [image 3](#)).
- Visualization of the gallstone (fewer than 15 percent of gallstones are visible on the plain abdominal film due to two reasons: most stones are radiolucent, and bowel gas or bony structures can obscure gallstones).

- Change in position of a previously located stone.

**When to obtain other tests** — Other tests may be performed when CT scan and plain radiography of the abdomen have been performed but are not diagnostic of gallstone ileus. In addition, ultrasonography and cholescintigraphy (HIDA scan) may be used to monitor residual gallstones or fistula in patients who undergo enterolithotomy alone without a concomitant biliary procedure. (See '[Second stage: Risk dependent](#)' below.)

- If ultrasonography is performed to evaluate a patient with right upper quadrant abdominal pain, it can demonstrate fistulas, pneumobilia, impacted gallstones, and residual cholelithiasis and choledocholithiasis in the biliary tract [16]. However, intestinal gas reflects ultrasound waves, thereby limiting gallstone visualization [17]. Ultrasonography is not the preferred imaging modality to evaluate a patient with suspected bowel obstruction.
- HIDA scan may reveal the presence of a gallbladder-enteric fistula, which can occur with gallstone ileus. However, it is an insensitive test [18].
- Endoscopy is of limited value in diagnosing gallstone ileus. Gastroduodenoscopy may rarely demonstrate an impacted gallstone in the duodenum (Bouveret's syndrome), and therapeutic endoscopy with lithotripsy may be the preferred technique for treatment of isolated Bouveret's syndrome [19]. Endoscopic retrograde cholangiopancreatography (ERCP) may rarely show an enterobiliary fistula by filling the gallbladder with contrast injected from the duodenum. In addition, patients who have Mirizzi syndrome diagnosed by ERCP may have coexisting gallstone ileus. (See "[Gastric outlet obstruction in adults](#)", section on '[Bouveret syndrome](#)'.)

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## TREATMENT

The treatment for gallstone ileus is primarily surgical. Gallstone ileus involves three key elements, cholelithiasis, biliary-enteric fistula, and intestinal obstruction. Intestinal obstruction is typically addressed with an enterolithotomy (ie, enterotomy with stone removal). Cholelithiasis and biliary-enteric fistula are typically addressed together with a combined biliary procedure involving cholecystectomy and fistula closure.

**Surgical candidates** — All patients with gallstone ileus who are surgical candidates should undergo an enterolithotomy with the goal of relieving intestinal obstruction. Low-risk patients may also undergo the biliary procedure at the same time as the enterolithotomy. High-risk patients may defer the biliary procedure until a later date or postpone the biliary procedure

indefinitely unless they develop recurrences. In a retrospective study of a sample of inpatients in the United States that included 3268 patients treated for gallstone ileus, 62 percent underwent enterolithotomy alone, and 19 percent underwent enterolithotomy combined with a biliary procedure [1].

**First stage: Enterolithotomy** — Patients with gallstone ileus are typically treated with an enterolithotomy first, typically via a laparotomy. A bowel resection may be required where there is perforation, significant ischemia, or a gallstone that cannot be dislodged. In one study, a bowel resection was performed in 19 percent of patients treated for gallstone ileus [1].

Enterolithotomy can be performed via laparotomy or laparoscopy. Prophylactic antibiotics are administered for both since the most common cause of postoperative morbidity is wound infection [8]. (See "[Antimicrobial prophylaxis for prevention of surgical site infection in adults](#)".)

- **Laparotomy** – At laparotomy, a longitudinal enterotomy is made along the antimesenteric border proximal to the point of impaction [3]. The stone is milked proximally and removed. Careful transverse closure of the enterotomy is required to avoid residual bowel stenosis. Manipulation of stones through the cecum has been associated with mucosal injury and undetected serosal rupture and therefore should not be performed routinely [9].

The entire bowel should be carefully inspected for more gallstones, which occur in 3 to 16 percent of cases. These can be removed by milking the gut, thereby moving smaller stones toward bigger ones. Faceted or cylindrical gallstones are considered to increase the likelihood of multiple stones being present [11]. The majority of cases of recurrent gallstone ileus are due to faceted stones, presumably missed at initial operation [20].

- **Laparoscopy** – Laparoscopic-guided enterolithotomy has been performed in selected cases [2,21,22]. However, this approach can be technically challenging because of the difficulty of examining a dilated small bowel and identifying the gallstone through the laparoscope. Conversion to laparotomy is common [1]. The laparoscopic approach is best confined to extremely experienced surgeons in highly selected patients [2,22].

If a laparoscopic approach is used, it is preferable to mobilize and identify the obstructed loop of the bowel and perform the stone extraction after eviscerating the loop of the bowel through a limited incision (hence laparoscopic-guided surgery). This minimizes the spillage of enteral contents freely in the abdomen, as would likely result from laparoscopic enterotomy of obstructed bowel.

**Second stage: Risk dependent** — Following a successful enterolithotomy with or without bowel resection, the intestinal obstruction is relieved. Further management needs to be

individualized based upon patient characteristics.

**High-risk patients: Observe** — For patients who are identified as high risk (American Society of Anesthesiologists [ASA] class III or IV) ( [table 1](#)), who present in shock, or who have significant intra-abdominal inflammation/dense adhesion, enterolithotomy alone should be performed, followed by observation for resolution, persistence, or recurrence of symptoms [23,24]. High-risk patients can be managed expectantly after enterolithotomy alone because biliary-enteric fistulas may close or shrink spontaneously, especially if the cystic duct is patent or there are no residual stones [11,24].

For individuals with residual or recurrent symptoms from cholelithiasis, an elective laparoscopic cholecystectomy can be performed at a later time when the patient's condition permits. Other high-risk patients can be managed expectantly unless recurrent gallstone ileus or cholecystitis demands a definitive biliary procedure [8,9,11]. (See '[Recurrent symptoms](#)' below.)

**Low-risk patients: Biliary surgery** — Low-risk patients (ASA class I or II) ( [table 1](#)) may undergo the definitive biliary procedure at the same time as the enterolithotomy as a one-stage procedure, if the operative findings in the right upper quadrant warrant biliary tract inspection and cholecystectomy [2,25,26]. A one-stage procedure includes enterolithotomy, cholecystectomy, and biliary-enteric fistula closure, with an optional common bile duct exploration.

Compared with enterolithotomy alone, the one-stage procedure reduces recurrences of gallstone ileus; prevents malabsorption and weight loss from a persistent biliary-enteric fistula; and prevents cholecystitis, cholangitis, and gallbladder carcinoma, but at the risk of higher surgical morbidity and mortality [9]. (See '[Morbidity and mortality](#)' below.)

**Nonsurgical candidates** — The mainstay of gallstone ileus treatment is surgical. It is rare that a patient cannot tolerate any surgical treatment of such disease. Nevertheless, nonsurgical treatments for gallstone ileus, such as extracorporeal and electrohydraulic lithotripsy of obstructing stones (jejunum, stomach, colon), and endoscopic removal of gallstones (colon, duodenum), have been described [17,27-30].

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## OUTCOMES

**Morbidity and mortality** — Since the majority of patients with gallstone ileus are older adults and have other serious medical conditions, the mortality rate for gallstone ileus remains high; the rate ranges from 4.5 to 25 percent in early series to between 5.5 and 6.7 percent in



contemporary studies [1,11,31]. The mortality rate of gallstone ileus is 5 to 10 times higher than those of other causes of mechanical small bowel obstruction.

**Recurrent symptoms** — Recurrent gallstone ileus may occur in 4.7 to 17 percent of patients treated with enterolithotomy alone [11]. Fifty-seven percent of recurrences occurred within six months of the original surgery. In addition to recurrent gallstone ileus, symptomatic biliary tract disease developed in 15 percent of patients whose gallbladders were not removed, according to one study [11].

It should be noted that cholecystectomy performed with enterolithotomy as a part of the one-stage procedure does not preclude patients from recurrent gallstone ileus for two reasons: retained common bile duct stones can migrate distally and produce intestinal obstruction, and missed stones already in the bowel can lead to repeated obstruction.

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## SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "[Society guideline links: Gallbladder surgery](#)".)

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## SUMMARY AND RECOMMENDATIONS

- **Definition** – Gallstone ileus is an important, though rare, cause of mechanical bowel obstruction, affecting older adult patients who often have significant comorbid conditions. It is most commonly caused by impaction of a gallstone in the ileum after being passed through a biliary-enteric fistula. (See '[Introduction](#)' above.)
- **Clinical features** – The classic clinical presentation of gallstone ileus is episodic subacute obstruction in an older woman. Transient gallstone impaction produces abdominal pain and vomiting, which subside as the gallstone becomes disimpacted, only to recur again as the progressively larger stone lodges in the more distal bowel lumen. As a result, vague and intermittent symptoms may be present for some days prior to evaluation. (See '[Clinical features](#)' above.)
- **Diagnosis** – Gallstone ileus should be suspected in older adult patients with clinical features suggestive of acute or subacute small bowel obstruction and is confirmed by either radiologic evaluation or, in some patients, at the time of surgery for small bowel obstruction. In the latter setting, the removal of a gallstone from the site of the small bowel obstruction is diagnostic. (See '[Diagnosis](#)' above.)



- **Treatment** – The treatment for gallstone ileus is primarily surgical. (See ['Treatment'](#) above.)
  - In all patients, intestinal obstruction must be addressed first with an enterolithotomy (ie, enterotomy with stone removal). (See ['First stage: Enterolithotomy'](#) above.)
  - A biliary procedure, including cholecystectomy and biliary-enteric fistula closure, can be performed concomitantly with the enterolithotomy in low-risk patients (American Society of Anesthesiologists class I or II, not in shock, no severe intra-abdominal inflammation or adhesion). (See ['Low-risk patients: Biliary surgery'](#) above.)
  - High-risk patients (American Society of Anesthesiologists class III or IV, in shock, with severe intra-abdominal inflammation or adhesion) can be managed expectantly after enterolithotomy alone. In those patients who develop recurrent symptoms, a biliary procedure can then be performed separately. (See ['High-risk patients: Observe'](#) above.)

Nonsurgical treatments of gallstone ileus have been described but are rarely used. (See ['Nonsurgical candidates'](#) above.)

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Topic 3683 Version 19.0

## GRAPHICS

### American Society of Anesthesiologists Physical Status (ASA PS) Classification System

ASA PS classification	Definition	Examples, including, but not limited to:
ASA I	A normal healthy patient	Healthy, nonsmoking, no or minimal alcohol use.
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Current smoker, social alcohol drinker, pregnancy, obesity ( $30 < \text{BMI} < 40$ ), well-controlled DM/HTN, mild lung disease.
ASA III	A patient with severe systemic disease	Substantive functional limitations; one or more moderate to severe diseases. Poorly controlled DM or HTN, COPD, morbid obesity ( $\text{BMI} \geq 40$ ), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESKD undergoing regularly scheduled dialysis, premature infant PCA $< 60$ weeks, history ( $> 3$ months) of MI, CVA, TIA, or CAD/stents.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent ( $< 3$ months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARDS, or ESKD not undergoing regularly scheduled dialysis.
ASA V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction.
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	

The addition of "E" to the numerical status (eg, IE, IIE, etc) denotes Emergency surgery (an emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part).

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BMI: body mass index; DM: diabetes mellitus; HTN: hypertension; COPD: chronic obstructive pulmonary disease; ESKD: end-stage kidney disease; PCA: post conceptual age; MI: myocardial infarction; CVA: cerebrovascular accident; TIA: transient ischemic attack; CAD: coronary artery disease; DIC: disseminated intravascular coagulation; ARDS: acute respiratory distress syndrome.

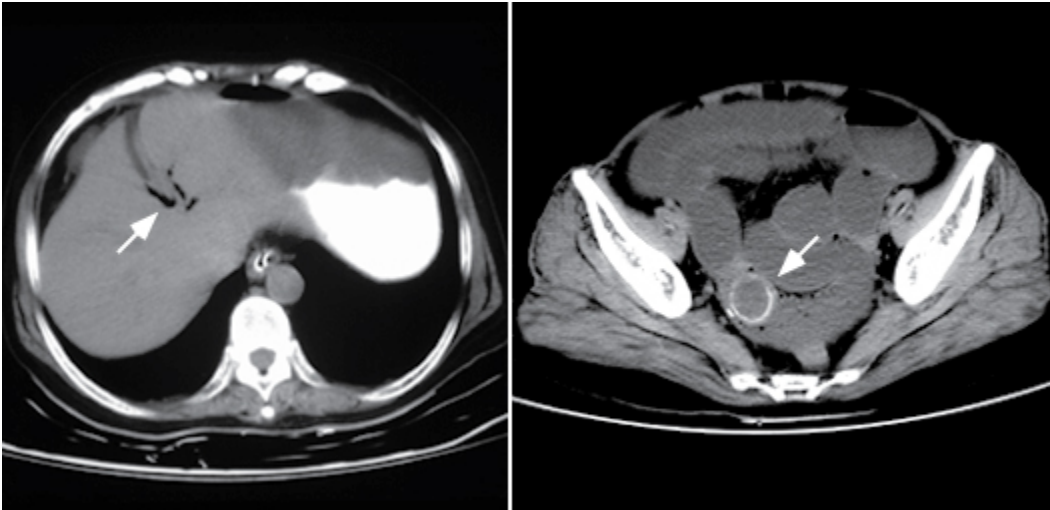
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Graphic 87504 Version 9.0

## Gallstone ileus seen on computed tomography (CT) scan



CT scan in a 75-year-old woman with small bowel obstruction due to gallstone ileus. Left panel: Free air is seen in the biliary tree and gallbladder (arrow). Right panel: Dilated loops of small bowel with large gallstone with a calcified rim (arrow) impacted in the terminal ileum.

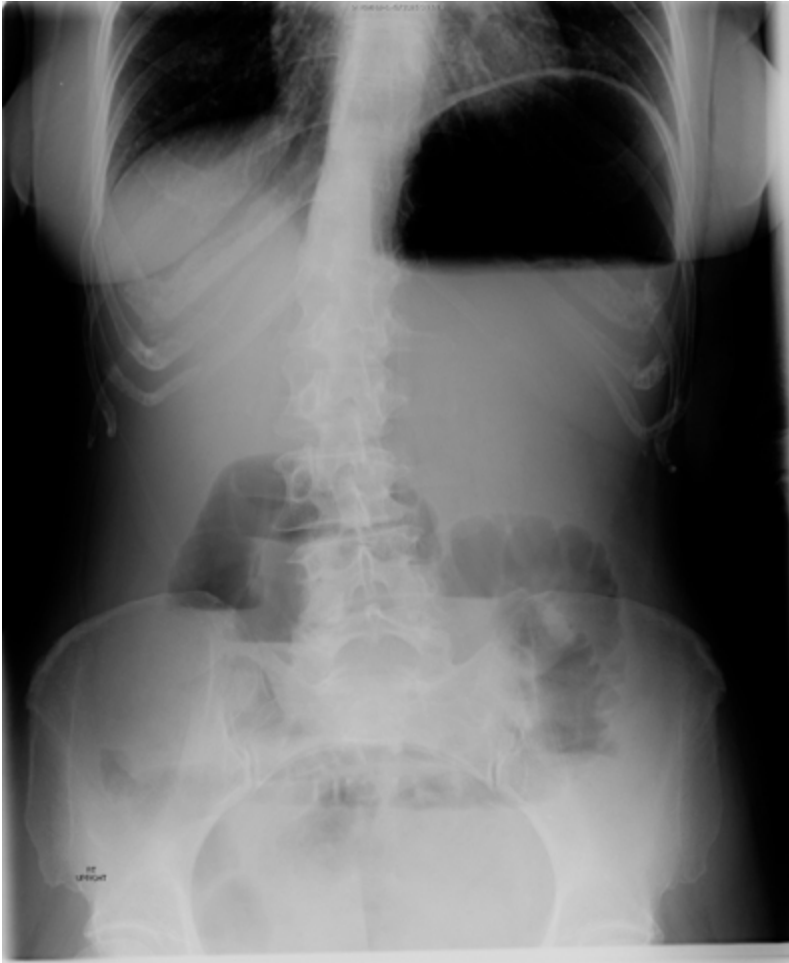
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*Courtesy of Nezam Afdhal, MD.*

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Graphic 80522 Version 5.0

## Small bowel obstruction on plain abdominal radiograph



Plain upright abdominal film shows a distended stomach and slightly dilated loops of small bowel with air fluid levels and a paucity of colonic gas, consistent with small bowel obstruction.

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Graphic 68029 Version 4.0



## Pneumobilia due to gallstone ileus



Plain film of the abdomen showing air in the intrahepatic biliary tree (arrows) and dilated loops of small bowel. Pneumobilia implies either a patent cystic duct or a fistula involving the common bile duct. The gallstone cannot be identified on this film. This is a common finding that is due to two factors: most stones are radiolucent, and gas or bony structures can obscure gallstones outside the biliary tree.

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*Courtesy of Nezam Afdhal, MD.*

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Graphic 68491 Version 5.0

## Contributor Disclosures

**Andrew P Keaveny, MD, FRCPI** No relevant financial relationship(s) with ineligible companies to disclose. **Nezam H Afdhal, MD, FRCPI** No relevant financial relationship(s) with ineligible companies to disclose. **Steven Bowers, MD** Patent Holder: Suture Shield [Robotic suturing]. All of the relevant financial relationships listed have been mitigated. **Stanley W Ashley, MD** No relevant financial relationship(s) with ineligible companies to disclose. **Sanjiv Chopra, MD, MACP** No relevant financial relationship(s) with ineligible companies to disclose. **Wenliang Chen, MD, PhD** No relevant financial relationship(s) with ineligible companies to disclose.

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