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Case Report

What are the clues to gallstone ileus when stones don't show up on scans? A case presentation and literature review ☆

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ABSTRACT

Gallstone ileus is a rare yet significant cause of mechanical bowel obstruction, particularly in elderly patients. This condition arises when gallstones migrate into the gastrointestinal tract through a cholecystoenteric fistula, often due to chronic inflammation. Despite medical advancements, gallstone ileus remains associated with high morbidity and mortality rates due to delayed diagnosis and nonspecific symptoms. The clinical presentation typically includes intermittent nausea, vomiting, abdominal pain, and constipation, which can obscure the diagnosis. Advanced imaging techniques, especially computed tomography (CT), are crucial for identifying key diagnostic features such as pneumobilia, ectopic gallstones, and signs of bowel obstruction. Gallstone ileus should be considered in any case of small bowel obstruction, even if CT imaging is inconclusive, as gallstones can be radiolucent. Indirect clues like pneumobilia and dilated small bowel loops can lead to the diagnosis.

Effective management of gallstone ileus requires prompt surgical intervention to remove the obstructing gallstone and restore bowel patency. The primary surgical procedure is enterolithotomy, although additional procedures such as cholecystectomy and fistula repair may be necessary depending on the patient's condition and intraoperative findings. The choice of surgical approach should be individualized, considering the patient's overall health and the specific characteristics of the obstruction. Early recognition and timely surgical management are essential to prevent complications and improve patient outcomes.

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Introduction

Gallstone ileus is an uncommon but serious complication of cholelithiasis that results in mechanical bowel obstruction [1,2]. This condition predominantly affects elderly individuals and represents 1%-4% of all mechanical small bowel obstructions [3–5]. The underlying mechanism involves the formation of a fistula between the gallbladder and the gastrointestinal tract, often driven by chronic inflammation [6,7]. This fistula allows gallstones to pass into the bowel and potentially cause an obstruction [2].

Diagnosing gallstone ileus can be difficult due to its nonspecific symptoms and the varied presentation of gastrointestinal obstruction [8–10]. Patients often exhibit intermittent and progressive symptoms such as nausea, vomiting, and abdominal pain, which can delay the correct diagnosis and subsequent treatment [11]. Imaging studies, particularly computed tomography (CT), are essential for detecting key indicators like pneumobilia, ectopic gallstones, and signs of bowel obstruction [6,12].

However, CT scans and other radiologic imaging techniques do not always reveal the presence of a gallstone, as some stones may be radiolucent and invisible on standard radiographs or even CT scans, particularly if they lack sufficient calcium [13]. The presence of pneumobilia and a nonvisualized gallbladder, when combined with clinical suspicion, often helps guide the diagnosis even when the gallstone itself is not clearly visible [12,14]. This highlights the necessity for a high index of suspicion and thorough evaluation in patients, especially elderly individuals, presenting with symptoms indicative of bowel obstruction [3,8].

In the following section, we present a case of an elderly patient diagnosed with gallstone ileus, illustrating the diagnostic challenges and the approach to surgical management.

Case presentation

An 84-year-old male with a past medical history of gastroesophageal reflux presented to the emergency department with complaints of intractable nausea and vomiting, accompanied by constipation, for 4 days. The patient reported his last bowel movement occurred 4 days prior, and he also experienced obstipation. He denied any history of prior abdominal surgeries but mentioned a long-standing history of chronic constipation.

On physical examination, the patient's vital signs were stable, and he was afebrile. His abdomen was soft, nondistended, and nontender to palpation. Laboratory tests revealed an elevated lactate level of 3.0 mmol/L, creatinine of 1.9 mg/dL, and a white blood cell count of $15.3 \times 10^3/\mu L$, suggesting a possible underlying infection or inflammatory process.

A computed tomography (CT) scan of the abdomen and pelvis was performed, revealing multiple prominent fluid-filled loops of the small bowel, suggestive of ileus or small bowel obstruction. Additionally, the gallbladder was not visualized on the CT scan, and pneumobilia was noted, raising concern for gallstone ileus (Figs. 1 and 2). Given the patient's stable hemodynamic status and absence of fever, the initial plan included intravenous fluid resuscitation to address the elevated creatinine and lactate levels, along with a small bowel follow-through (SBFT) study on the same day of admission. Operative intervention was considered if the obstruction was confirmed.

The SBFT showed high-grade ileus versus low-grade partial small bowel obstruction, with dilated small bowel loops and delayed transit of contrast material to the colonic loops. A follow-up kidney, ureter, and bladder (KUB) radiograph the next day demonstrated marked gastric distention with a large amount of contrast still present in the stomach. There were dilated loops of small bowel throughout the abdomen, and some contrast was seen within the colon. These radiographic findings suggested a high-grade partial small bowel obstruction, with a significant amount of contrast remaining in the stomach and small bowel (Fig. 3).

Given these findings, the decision was made to proceed with surgical intervention. The patient underwent a diagnostic laparoscopy, which revealed dense omental adhesions and a large gallstone obstructing the proximal ileum. An enterolithotomy was performed through a small laparotomy incision to remove the gallstone. The enterotomy was closed in 2 layers, ensuring no leakage and confirming the bowel's viability. The abdomen was then closed, and the patient tolerated the procedure well, showing no immediate postoperative complications. The patient's recovery was uneventful, and he was discharged home after demonstrating stable bowel function and resolution of his symptoms.

Discussion

Gallstone ileus is a rare but significant cause of mechanical bowel obstruction, most commonly affecting the elderly [3,12]. It results from the passage of gallstones into the gastrointestinal tract through a cholecystoenteric fistula, often due to chronic inflammation and adhesions between the gallbladder and the GI tract [12]. This condition is responsible for 1%-4% of all cases of small bowel obstruction and up to 25% of such obstructions in the elderly [15,16]. Despite advances in radiological imaging and surgical techniques, gallstone ileus continues to be associated with high morbidity and mortality, primarily due to diagnostic delays and the often intermittent nature of its symptoms [6,17].

The clinical presentation of gallstone ileus is typically nonspecific and may include symptoms such as crampy, intermittent abdominal pain, nausea, vomiting, and constipation [8,18]. These symptoms are often intermittent due to the "tumbling" of the stone within the gastrointestinal tract, leading to variable degrees of obstruction. Physical examination findings can be nonspecific, though abdominal distension, tenderness, high-pitched bowel sounds, and obstructive jaundice may be noted [11]. The nonspecific and intermittent nature of these symptoms often leads to a delay in diagnosis, which can contribute to the high mortality rates associated with the condition [19].

The "tumbling phenomenon" refers to the intermittent nature of symptoms experienced in gallstone ileus, caused by

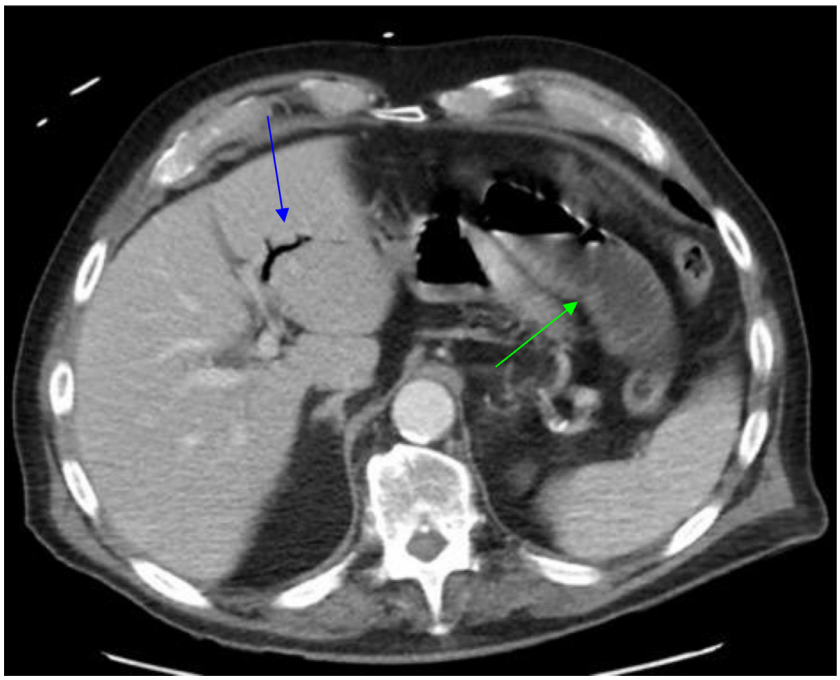

Fig. 1 – CT Abdomen and pelvis with IV contrast, axial view. The blue arrow indicates pneumobilia, signifying the presence of air within the biliary tree. The green arrow points to dilated loops of the small bowel, indicative of small bowel obstruction.

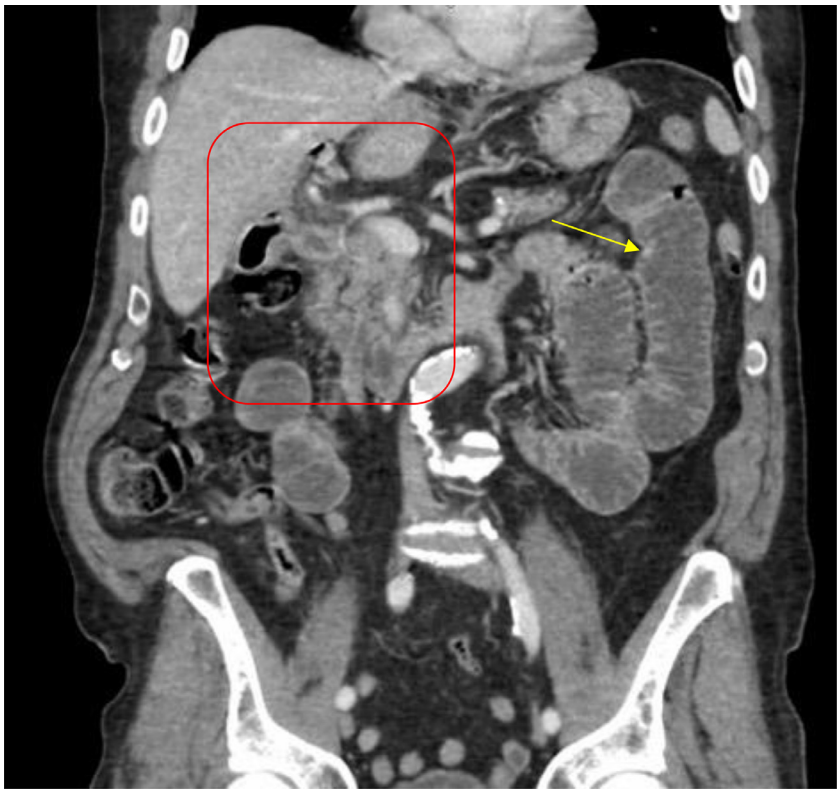

Fig. 2 – CT abdomen and pelvis with contrast, coronal view. The gallbladder is not visualized, and there is air present within the gallbladder fossa (highlighted by a red square). The yellow arrow indicates the "stack of coins" sign, which is characteristic of small bowel obstruction, showing dilated loops of the small bowel.

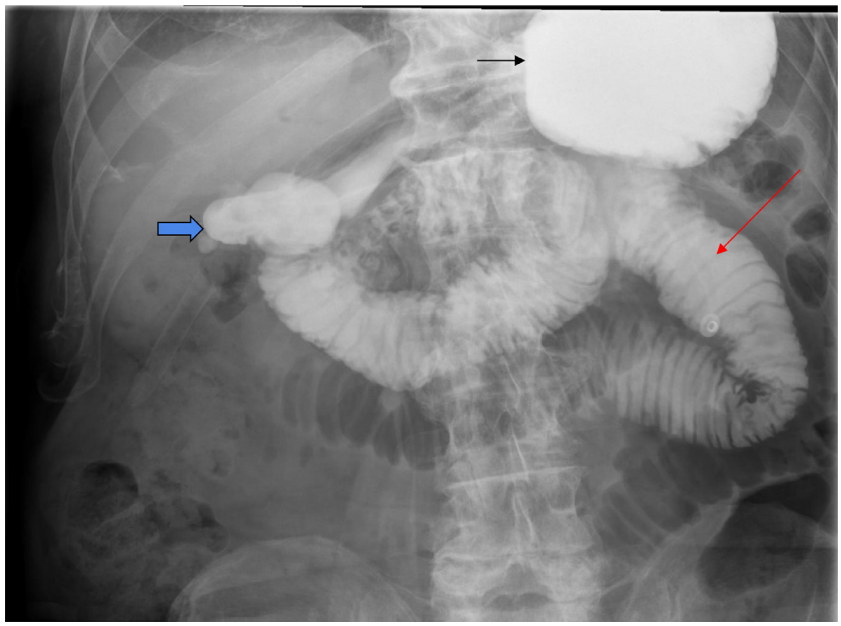

Fig. 3 – Small bowel follow-through series, coronal AP view. Contrast within the distended stomach (black arrow), gallbladder (blue arrow), and dilated portion of small bowel with reduced contrast distally (red arrow).

the movement or "tumbling" of the gallstone through various segments of the gastrointestinal tract. As the stone travels, it may temporarily relieve obstruction, leading to fluctuating symptoms such as intermittent abdominal pain, nausea, vomiting, and variable levels of bowel obstruction [11]. This phenomenon can complicate the diagnosis, as the transient relief of symptoms might mask the underlying condition, delaying definitive identification and treatment. Recognizing this pattern is crucial for maintaining a high index of suspicion for gallstone ileus, particularly in elderly patients with intermittent gastrointestinal symptoms [3].

Diagnostic imaging is crucial in identifying gallstone ileus. Plain abdominal radiographs can show Rigler's triad—pneumobilia, an ectopic gallstone, and bowel obstruction—though this is only present in about 40%-70% of cases [20,21]. Computed tomography (CT) scans have a higher sensitivity (up to 93%) and can provide detailed visualization of gallbladder wall thickening, pneumobilia, intestinal obstruction, and obstructing gallstones [19,22]. While CT is the preferred imaging modality, other diagnostic tools such as ultrasound, hepatobiliary iminodiacetic acid (HIDA) scans, and magnetic resonance cholangiopancreatography (MRCP) can also be used, particularly if initial findings are inconclusive [4,23].

Gallstones are classified into 3 main types based on their composition: cholesterol stones, pigment stones, and mixed stones. Cholesterol stones, which are the most common, are primarily composed of cholesterol and are typically yellow-green in color [10]. These stones are often radiolucent and may not be visible on standard radiographs, making ultrasound and CT scans essential for their detection [24]. Pigment stones are smaller, darker, and made up of bilirubin and calcium salts [25]. They are further divided into black pigment stones, associated with hemolytic disorders and cirrhosis, and brown pigment stones, often linked to biliary tract infections [17]. Black pigment stones are usually radiopaque and can be detected on plain radiographs, whereas brown pigment stones are more likely to be radiolucent, necessitating ultrasound or CT imaging for accurate identification [12,17]. Mixed stones contain varying proportions of cholesterol, bilirubin, and calcium, and their radiologic visibility depends on the specific composition [21]. While they can be partially radiopaque, making them detectable on plain radiographs, ultrasound and CT scans provide more reliable and comprehensive imaging for all types of gallstones, ensuring accurate diagnosis and assessment [10,21,25].

Pneumobilia and portal venous gas are 2 distinct radiologic findings that can be identified on CT scans, each with different clinical implications [26]. Pneumobilia is the presence of air within the biliary tree and is often associated with conditions such as gallstone ileus, recent biliary surgery, or endoscopic procedures [8,26]. On CT, pneumobilia appears as branching areas of gas within the liver that follow the path of the biliary ducts, typically localized to the central portions of the liver [21]. In contrast, portal venous gas represents air within the portal venous system, often indicating a more severe underlying pathology such as bowel ischemia, necrotizing enterocolitis, or severe infection [6,25]. Portal venous gas on CT manifests as linear or branching radiolucencies extending to the periphery of the liver, which can be differentiated from pneumobilia by their more peripheral location and the pattern of gas distribution [16]. The importance of recognizing pneumobilia lies in identifying conditions such as gallstone ileus, which require timely surgical intervention to prevent complications. Meanwhile, the presence of portal venous gas is typically a critical finding that suggests a need for urgent evaluation and management due to the high risk of life-threatening conditions [16]. Accurate differentiation between these 2 findings on CT is crucial for guiding

appropriate clinical management and ensuring prompt and effective treatment [27].

Bouveret's Syndrome is a rare cause of gastric outlet obstruction (GOO) resulting from a gallstone that has migrated into the duodenal bulb through a bilioduodenal fistula [12]. This uncommon condition occurs when a large gallstone erodes through the gallbladder wall into the duodenum, leading to mechanical obstruction [12,23]. Due to its rarity, only a limited number of cases have been documented in the medical literature [23]. Patients typically present with symptoms of GOO, such as nausea, vomiting, and epigastric pain, which can be mistaken for other more common gastrointestinal disorders. The diagnosis is often challenging and requires a high index of suspicion and imaging studies such as CT scans or endoscopy to identify the obstructing gallstone and the presence of a fistula. Early recognition and appropriate management, often involving endoscopic or surgical intervention, are crucial to prevent complications and ensure optimal patient outcomes [23].

Surgical intervention is the cornerstone of treatment for gallstone ileus [14,20]. The primary goal is to relieve the obstruction, typically involving an enterolithotomy to remove the obstructing stone [24]. There are different surgical approaches, including simple enterolithotomy, a one-stage procedure (enterolithotomy with cholecystectomy and fistula repair), and a two-stage procedure (initial enterolithotomy followed by cholecystectomy and fistula repair at a later date) [28]. The choice of procedure depends on the patient's overall condition and the presence of comorbidities [13]. Most experts advocate for a simple enterolithotomy in high-risk patients due to its shorter operative time and lower immediate risk [6].

Despite surgical management, gallstone ileus remains a condition with a high risk of postoperative complications, including bowel obstruction, infection, and acute renal failure [3]. Therefore, a multidisciplinary approach involving surgeons, radiologists, gastroenterologists, and critical care specialists is essential to optimize patient outcomes. Postoperatively, patients require close monitoring for signs of complications such as recurrent obstruction, infection, and sepsis. Education on the signs of complications and the importance of follow-up care is crucial for these patients [20].

In summary, gallstone ileus is a challenging diagnosis due to its nonspecific and intermittent symptoms [4]. Early and accurate diagnosis facilitated by advanced imaging techniques and timely surgical intervention is crucial for improving outcomes [23]. The high morbidity and mortality associated with gallstone ileus highlight the importance of maintaining a high index of suspicion in elderly patients presenting with symptoms of bowel obstruction [2,21]. A multidisciplinary approach is essential for managing this complex condition and optimizing patient outcomes [3].

Conclusion

Gallstone ileus is a rare but significant cause of mechanical bowel obstruction in the elderly, often presenting with nonspecific symptoms like intermittent nausea, vomiting, and abdominal pain. Gallstones can be radiolucent and may not be visible on imaging, making diagnosis challenging. Key indirect clues such as pneumobilia and signs of small bowel obstruction on CT are essential for diagnosis. Prompt surgical intervention is crucial for relieving the obstruction and improving outcomes. Clinicians should maintain a high index of suspicion for gallstone ileus in elderly patients with bowel obstruction symptoms, even when gallstones are not visible on imaging.

Patient consent

We confirm that we have obtained written, informed consent from the patient for the publication of this case report. The patient has been thoroughly informed about the details that will be published and understands the implications of the publication. The written consent is stored securely and is available for review by the editorial team upon request.

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