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Pathogenic Synergy in Intestinal Obstruction: Incomplete Malrotation, Cholecystoduodenal Fistula, and Gallstone Ileus

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Abstract

Incomplete intestinal malrotation (IIM) is a congenital anomaly of embryonic gut rotation, usually asymptomatic in adults, while gallstone ileus and cholecystoduodenal fistulas represent rare complications of chronic cholelithiasis. We report an unusual case of acute distal intestinal obstruction in a 71-year-old female patient, revealing an IIM with an incomplete obstructive Ladd's band, complicated indirectly by a tubulated cholecystoduodenal fistula causing gallstone ileus.

A 71-year-old female patient with no baseline hemodynamic instability or systemic decompensation was admitted for acute distal intestinal obstruction. Her symptoms presented with a paroxysmal pattern, characterized by colicky epigastric pain accompanied by bilious and partially digested emesis. Her medical history was notable for prior episodes of biliary colic. Laboratory workup revealed normal serum lactate levels, effectively ruling out overt bowel ischemia or advanced tissue compromise at this stage, while upper gastrointestinal (GI) series and abdominal computed tomography (CT) scan revealed a "double-bubble" sign, severe duodenal ectasia (15 cm), aerobilia, and an impacted intraluminal gallstone.

Emergency exploratory laparotomy confirmed the diagnosis, with surgical management including section of Ladd's band with complete duodenal mobilization, enterolithotomy with transverse enteroraphy to extract the stone, and a prophylactic appendectomy. Given the inactive nature of the fistula and the emergency setting, conservative management of the biliary fistula was selected, leading to an uneventful postoperative course with bowel transit recovery on day 3 and complete clinical recovery.

This observation highlights an unprecedented obstructive synergy, wherein chronic duodenal stasis caused by Ladd's band promoted local hyperpressure and inflammation, accelerating cholecystoduodenal fistula formation and subsequent gallstone ileus, demonstrating that in emergency settings, surgical priority must focus on immediate relief of the intestinal obstruction. Ultimately, the combination of Ladd's band and gallstone ileus is exceptionally rare, and emergency surgical treatment should focus on relieving mechanical obstruction, while conservative management of an inactive fistula remains a safe option in elderly patients.

Categories: General Surgery
Keywords: cholecystoduodenal fistula, duodenal ectasia, elderly, enterotomy, gallstone ileus, high intestinal obstruction, incomplete intestinal malrotation, intestinal malrotation, ladd's band

Introduction

Incomplete intestinal malrotation (IIM) is a congenital anomaly resulting from an aberration in the normal embryonic rotation and fixation of the midgut [1]. Although typically diagnosed during the neonatal period or early childhood, IIM can remain entirely asymptomatic until advanced adulthood. In elderly patients, it is often discovered incidentally or when presenting with acute abdominal complications [2]. Conversely, gallstone ileus and cholecystoduodenal fistulas represent rare and late complications of long-standing, untreated cholelithiasis, occurring predominantly in elderly female populations [3]. The pathogenesis of these fistulas involves a focal, recurrent peritoneal inflammatory process that leads to dense adhesions and eventual erosion between the gallbladder fundus and the adjacent duodenal wall [4]. We report an exceptional medicosurgical case of acute distal intestinal obstruction in a 71-year-old female patient. This case highlights a rare convergence of congenital and acquired pathologies: an IIM with an obstructive Ladd's band, complicated by a tubulated cholecystoduodenal fistula causing an intraluminal gallstone ileus [5].

Case Presentation

Patient information and clinical presentation

A 71-year-old female patient with no prior history of major abdominal surgery presented to the emergency visceral surgery department with acute signs of distal mechanical intestinal obstruction. On admission, she was hemodynamically stable without systemic decompensation. Her clinical presentation was characterized by a sudden-onset, paroxysmal pattern of severe, colicky epigastric pain accompanied by persistent, forceful

bilious and alimentary (partially digested) emesis, alongside absolute constipation with cessation of both flatus and feces. Her medical history was notable for recurrent episodes of biliary colic, raising a high index of suspicion for an underlying gallstone-related etiology. On physical examination, the abdomen showed isolated epigastric tympanites with marked localized tenderness upon palpation of the right upper quadrant.

Diagnostic assessment and workup

Emergency laboratory investigations revealed a marked biological inflammatory syndrome, characterized by a leukocytosis of 14.5 x 10^3/uL (normal range: 4.0-10.0 x 10^3/uL) with a significant predominance of neutrophils at 82% (11.9 x 10^3/uL), alongside an elevated C-reactive protein (CRP) level of 88 mg/L (normal: < 5.0 mg/L). Importantly, serum lactate levels remained strictly normal, effectively ruling out overt bowel ischemia or advanced tissue compromise at this stage.

Liver function tests demonstrated a distinct cholestatic and moderately cytolytic profile. Alkaline phosphatase (ALP) levels were significantly elevated to 320 IU/L (approximately 2.3 times the upper limit of normal, where the reference threshold is <= 140 IU/L), accompanied by gamma-glutamyl transferase (GGT) reaching 245 IU/L (normal: 8-61 IU/L), strongly suggesting acute biliary stasis or localized biliary tract distress. Concurrently, total bilirubin was 28.5 umol/L (conjugated fraction: 21.0 umol/L), while transaminases showed a mild-to-moderate elevation with aspartate aminotransferase (AST) at 85 IU/L and alanine aminotransferase (ALT) at 96 IU/L (reference ranges: <40 IU/L).

Electrolyte panel evaluation revealed a significant electrolyte imbalance characterized by a marked hypokalemia at 2.7 mmol/L (normal range: 3.5-5.0 mmol/L), requiring prompt correction, while serum sodium remained within normal limits at 138 mmol/L. Concurrently, renal function parameters showed a slight movement, with serum creatinine registering at 128 umol/L and blood urea nitrogen at 8.4 mmol/L.

Radiological evaluation combined an upper gastrointestinal (GI) contrast series, prompted by marked localized tenderness in the right upper quadrant and succussion splash (clapotage), suggesting a concomitant proximal obstruction or an ulcerative disease complicated by stenosis or perforation, with a contrast-enhanced abdominal computed tomography (CT) scan, which confirmed an acute distal intestinal obstruction.

The upper GI series demonstrated a classic double-bubble sign (Figure *1*), highly characteristic of a duodenal or immediate postduodenal mechanical obstruction [6]. Importantly, the examination formally excluded pneumoperitoneum, showing no abnormal free intraperitoneal gas under the diaphragmatic domes. This modality was deliberately chosen as the initial imaging approach due to its rapid accessibility and its high diagnostic reliability in quickly ruling out acute peptic ulcer perforation.

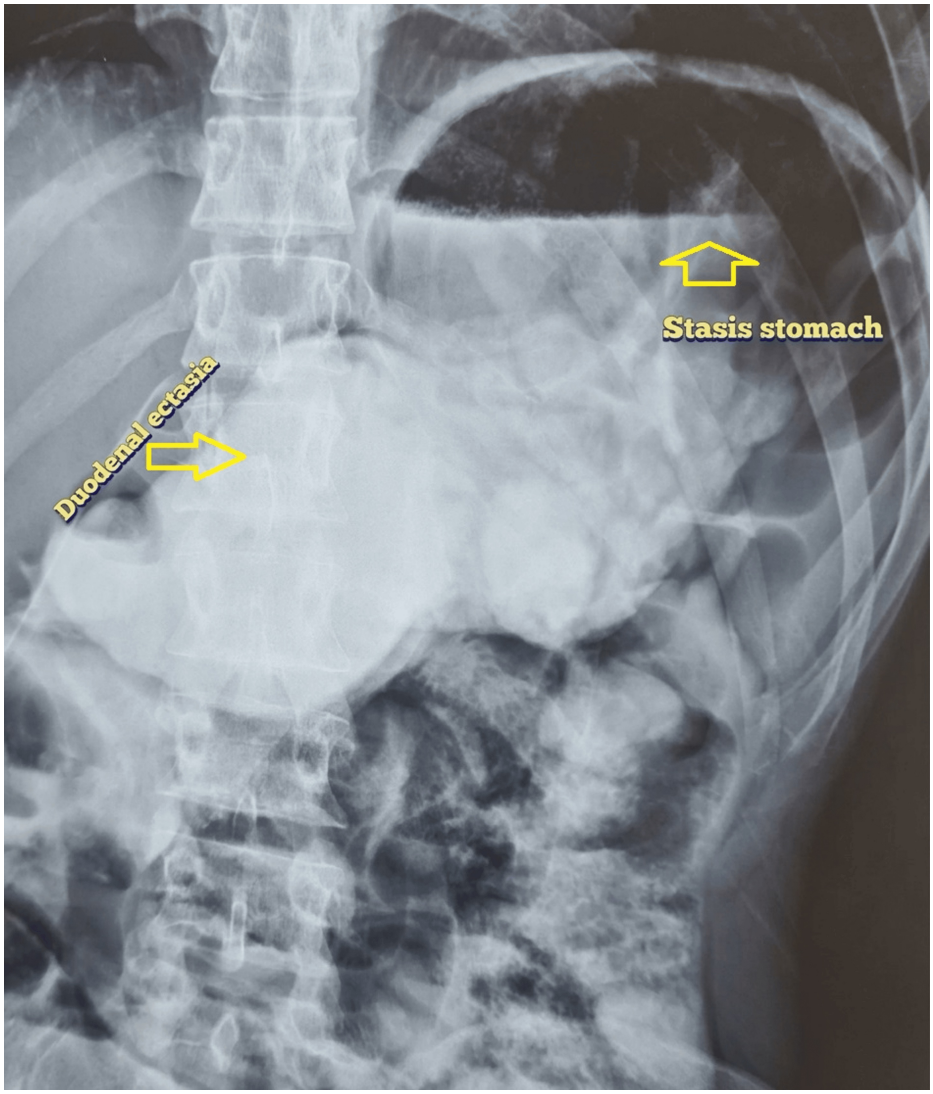


FIGURE 1: The upper gastrointestinal transit study (TOGD) formally excluded pneumoperitoneum, demonstrating gastric stasis and duodenal dilatation.

The abdominal CT scan confirmed a severe duodenal ectasia measuring 15 cm in maximum axis proximal to a zone of mechanical stricture (Figure *2*) [7].

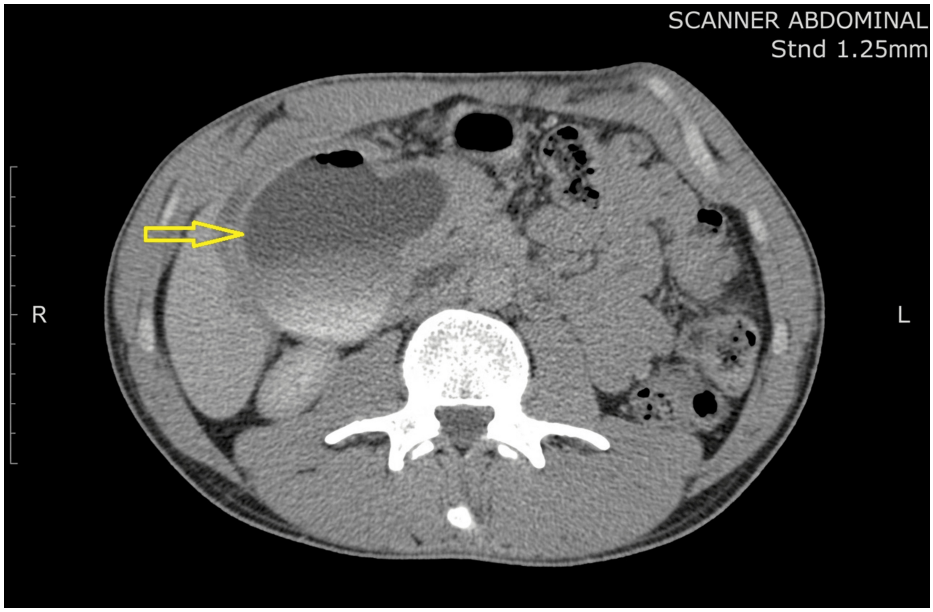


FIGURE 2: Axial CT scan showing duodenal ectasia

Additional key findings included aerobilia and a large, dense intraluminal gallstone impacted within the digestive tract lumen (Figures *3*-*4*) [8].

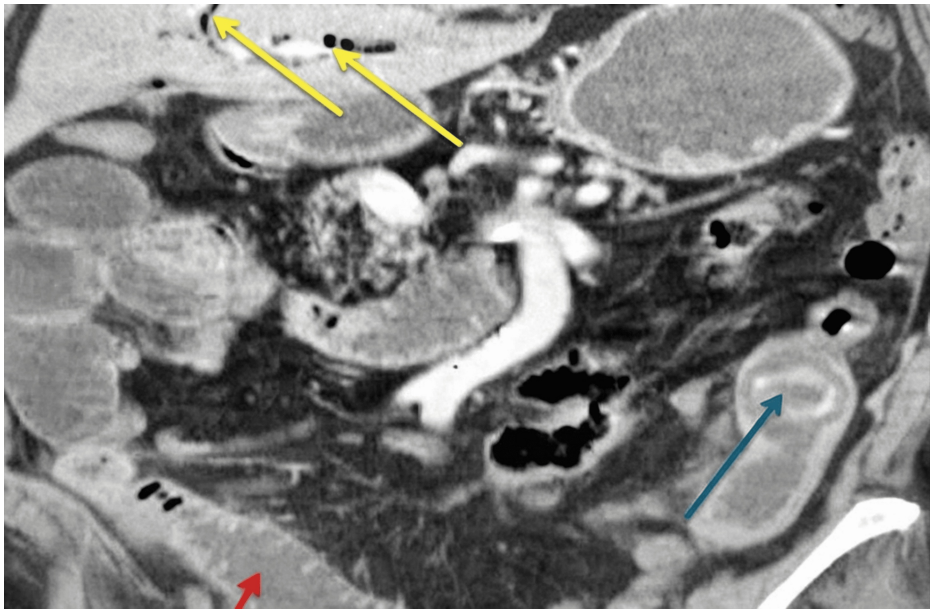


FIGURE 3: Coronal CT scan showing gallstone ileus (blue arrow), pneumobilia (yellow arrows), and small bowel distension (red arrow)

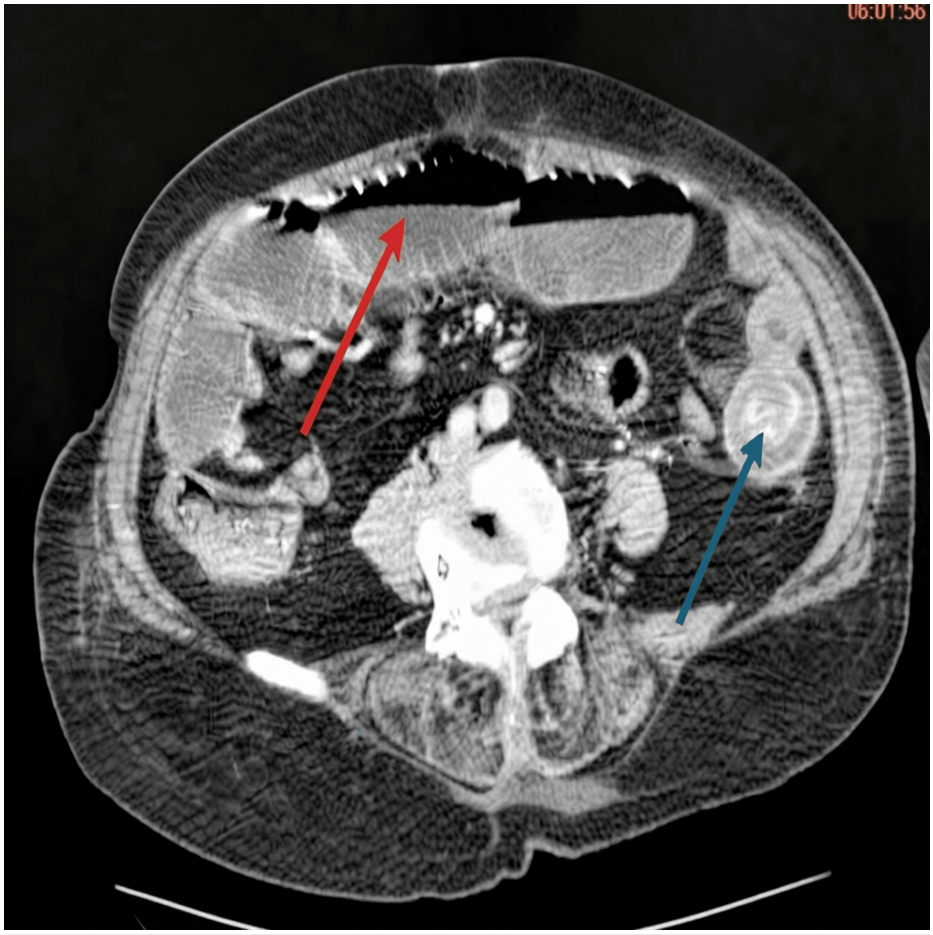


FIGURE 4: Axial CT scan showing small bowel hydroaerial levels (red arrow) and an ectopic gallstone (blue arrow) indicative of gallstone ileus

Therapeutic intervention and intraoperative findings

Given the persistence of the high bowel obstruction and the heightened risk of digestive perforation, an emergency exploratory laparotomy was performed. Intraoperative explorations revealed three key pathological findings. First, a congenital anomaly showed confirmation of an IIM associated with a fibrous, obstructive Ladd's band crossing the second part of the duodenum (Figure *5*) [9].

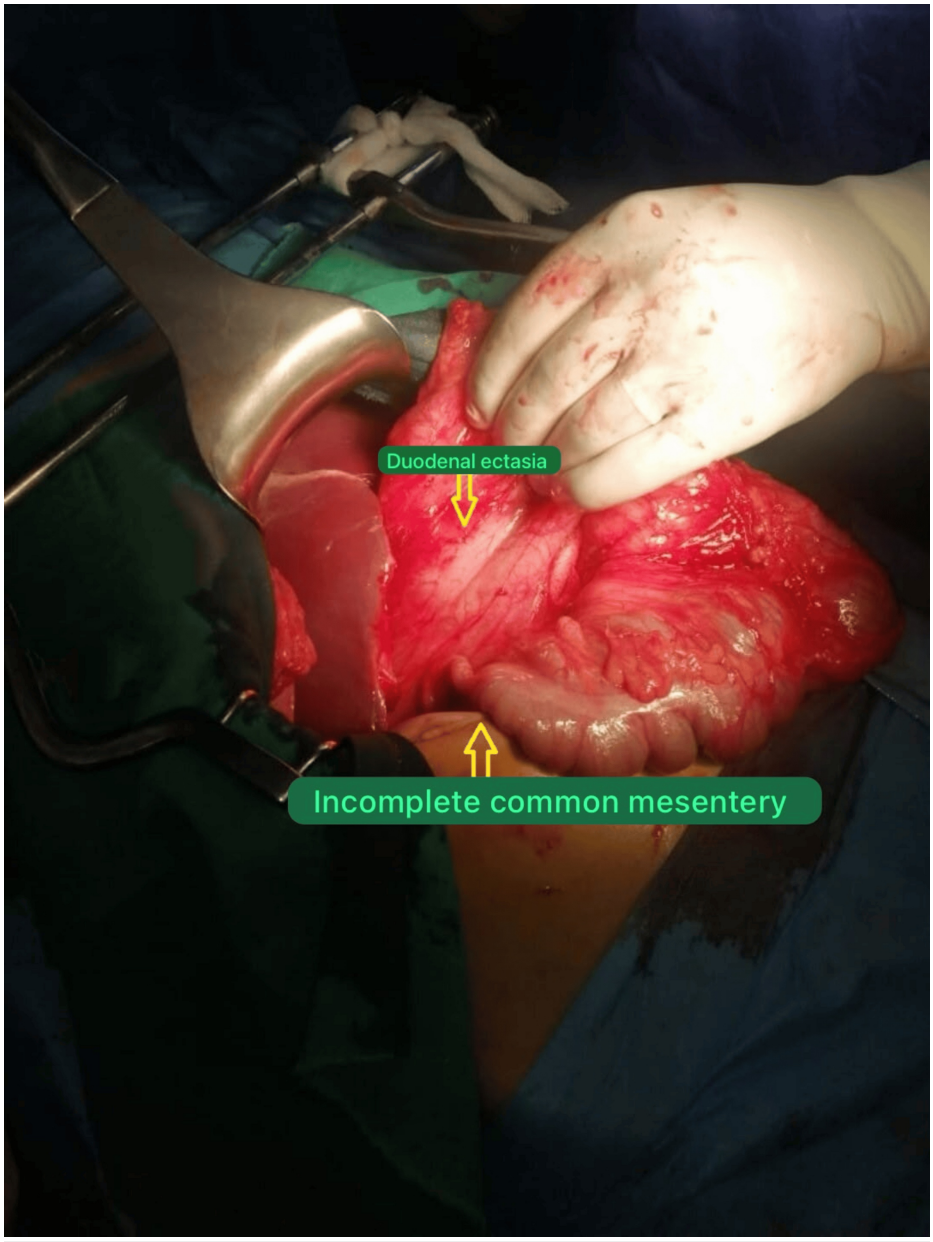


FIGURE 5: Intraoperative view showing duodenal ectasia and incomplete common mesentery

Second, chronic impact was demonstrated by a massive proximal duodenal ectasia measuring 15 cm, reflecting long-standing, partial mechanical obstruction [10]. Third, identification of a fistula and ileus (Figure *6*) revealed a tubulated cholecystoduodenal fistula connecting the gallbladder bed to the duodenum [11], through which a large gallstone had migrated and become impacted intraluminally, exacerbating the obstruction [12].

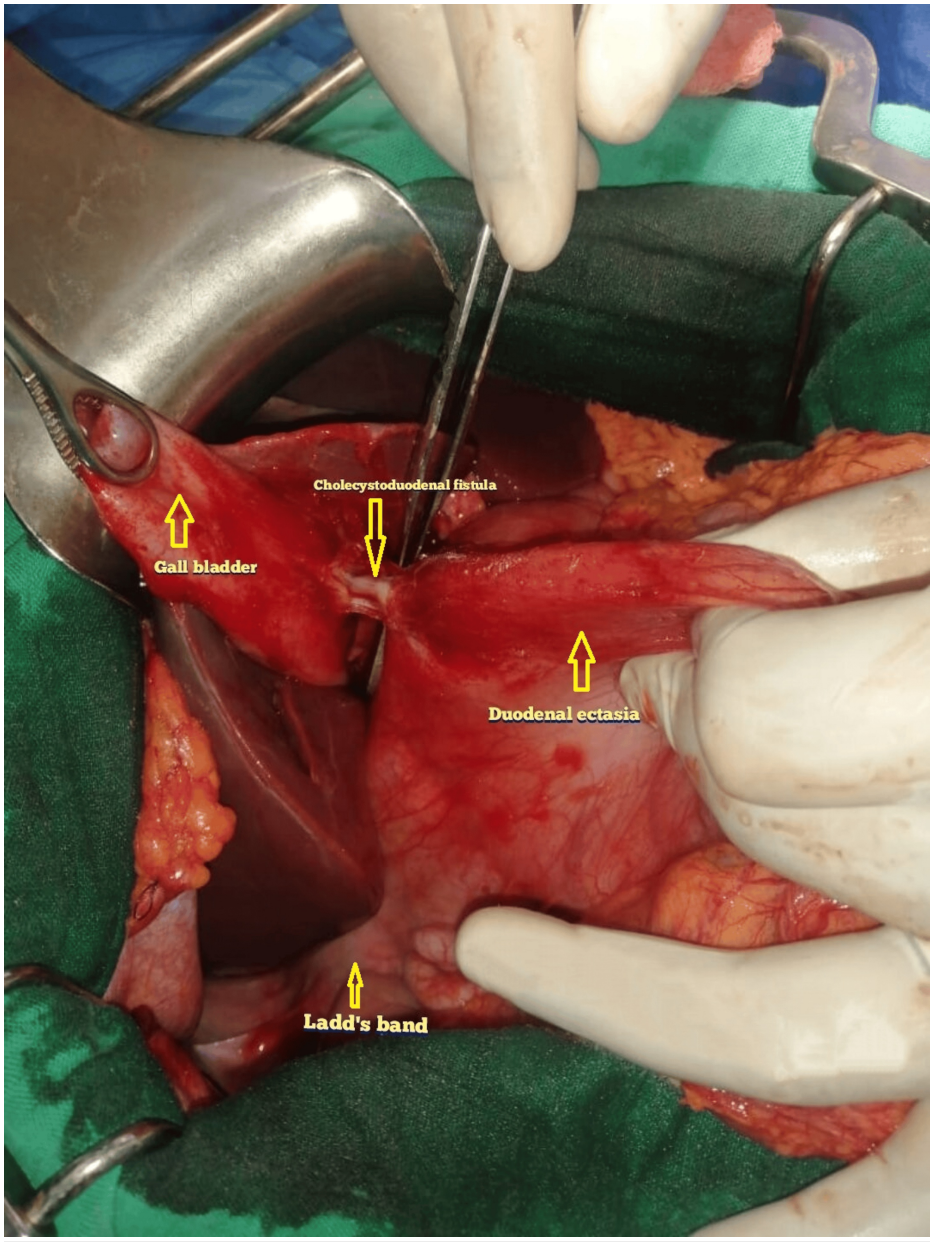


FIGURE 6: Intraoperative view showing a cholecystoduodenal fistula, duodenal ectasia, and a Ladd's band

The surgical strategy was executed sequentially. Relief of congenital obstruction was achieved through meticulous division of Ladd's band to fully free the duodenum and realign the digestive tract [13]. The restored anatomical orientation is as follows: The small bowel was repositioned along the right side of the abdominal cavity (extending from the left upper quadrant down toward the right iliac fossa). The cecum and the appendix were placed in the left iliac fossa, completing the malrotation correction.

Enterolithotomy and Tract Exploration

Impaction site: The large gallstone (4,3 cm) was impacted in the ileum, located eight bowel loops proximal to the ileocecal valve (not at the duodenal Ladd's bands).

Proximal manipulation: The calculus was gently guided and repositioned proximally into a healthier bowel segment prior to enterotomy.

Enterolithotomy and closure: Enterotomy was performed in this healthy proximal zone, and the stone was extracted manually. The enterotomy and subsequent transverse closure were performed four bowel loops proximal to the terminal branches of the superior mesenteric artery (SMA).

Tract exploration: Because the nondistended segments of the intestine surrounding the index gallstone identified on CT could potentially mask smaller or secondary lesions, meaning they were not 100% excluded by imaging alone, performing a rapid, targeted manual palpation of the GI tract was both prudent and necessary to rule out synchronous retained luminal calculi prior to abdominal closure (Figure *7*) [14].

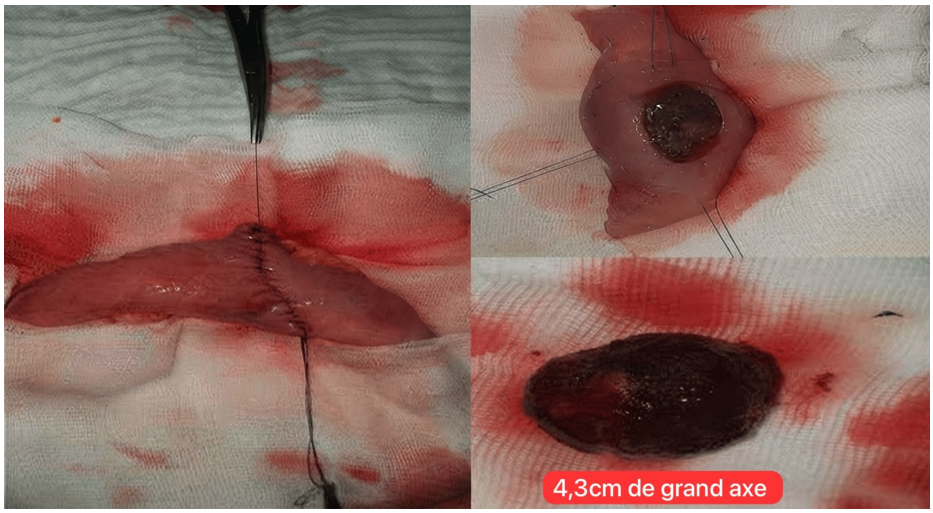


FIGURE 7: Intraoperative photographs showing (left) the enterotomy closure following enterolithotomy, (right top) extraction of the ectopic gallstone through the enterotomy, and (right bottom) the retrieved large gallstone (4,3 cm)

A prophylactic standard retrograde appendectomy consisting of ligation and division of the mesoappendix and the appendiceal base without stump inversion was performed systematically as part of the malrotation repair to eliminate future diagnostic confusion related to cecal or appendiceal malposition [15]. Regarding the management of the biliary-digestive fistula, a conservative approach consisting of abstaining from immediate biliary reconstruction or cholecystectomy was adopted to minimize operative morbidity. This strategy was chosen because the fistula was well-sealed and tubulated without active bile spillage, surrounded by dense local scarring, and encountered within an emergency setting involving relative peritoneal contamination [16].

Outcomes and follow-up

The postoperative course was uneventful. Bowel function returned on postoperative day 3, confirmed by passing gas and stool. Clear liquids were started on the first postoperative day, semisolid foods on the second, and solid foods on the third, with the patient discharged free of infection, bowel obstruction, or biliary complications. Furthermore, cholecystectomy was intentionally omitted given her advanced age and the absence of gallstones, thereby avoiding unnecessary morbidity and mortality without any clear clinical benefit [17].

Discussion

This clinical observation illustrates an unprecedented pathogenic synergy between a congenital defect and an acquired biliary disease [5]. The presence of Ladd's band, remaining undiagnosed for over seven decades, maintained a state of chronic duodenal stasis and elevated intraluminal pressure [9]. This hyperpressurized local inflammatory environment acted as a major mechanical and biological promoter, accelerating the chronic adhesion and eventual erosion between the gallbladder wall and the contiguous duodenum [13]. The subsequent migration of the gallstone converted a chronic, partial sub-occlusion into an acute, life-threatening high gallstone ileus [8].

Embryological anomalies of intestinal rotation, while classically manifesting in the neonatal period as midgut volvulus, can occasionally remain completely silent throughout adulthood. In this particular patient, the fibrous peritoneal band created a chronic, low-grade partial obstruction of the second portion of the duodenum. Over decades, this ongoing mechanical hindrance fostered persistent stasis, elevated intraluminal pressures, and localized micro-inflammation. These factors likely promoted direct contact friction and ischemic erosion against the adjacent gallbladder wall, facilitating the rare formation of a cholecystoduodenal fistula [14]. Once the large biliary calculus traversed this newly formed tract into the duodenal lumen, the preexisting narrowing caused by the congenital band precipitated an acute, high-level mechanical obstruction that completely halted normal digestive transit [3].

Managing such a complex combined entity in an emergency setting requires clear prioritization. The primary objective focuses on the immediate relief of the mechanical obstruction via Ladd's band division and enterolithotomy. Because the patient presented with acute, severe signs of high bowel obstruction, restoring intestinal continuity and decompressing the proximal digestive tract took absolute precedence over extensive reconstructive procedures [11].

Regarding fistula management, in an elderly patient undergoing emergency surgery, immediate repair of a cholecystoduodenal fistula combined with cholecystectomy significantly increases operative duration, risk of tissue breakdown, and contamination. Aggressive attempts to resect the fistula tract or perform a simultaneous cholecystectomy in the presence of acute bowel distension, localized tissue edema, and potential bacterial translocation carry a disproportionately high risk of postoperative morbidity and mortality [12]. Thus, a conservative approach toward a silent, sealed fistula proves to be a safe, effective, and tailored strategy, ensuring that the surgical intervention remains as life-saving and minimally traumatic as possible [10].

Conclusions

The co-occurrence of IIM and gallstone ileus represents an exceptionally rare cause of high intestinal obstruction in adults. Emergency management should focus strictly on relieving the mechanical intestinal blockage through Ladd's band section and enterolithotomy. Conservative management of an inactive cholecystoduodenal fistula remains a reliable and effective surgical choice in elderly patients operated on under emergency conditions. In this case, prompt surgical intervention successfully averted severe ischemic and septic complications, culminating in an entirely uneventful postoperative recovery and the restoration of normal digestive autonomy by postoperative day three.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

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