World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(CASE REPORT)

Cholecystoduodenal fistula as an intraoperative finding in a patient with calculous cholecystitis: Case report and expanded discussion

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World Journal of Advanced Research and Reviews, 2025, 28(01), 790-795

Publication history: Received on 02 Setember 2025; revised on 08 October 2025; accepted on 11 October 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.28.1.3496

Abstract

Cholecystoduodenal fistula is the most common form of bilioenteric fistula and typically presents as a late complication of cholelithiasis with chronic cholecystitis. Its clinical expression is heterogeneous, and diagnosis is often established intraoperatively. We present the case of a 44-year-old woman with no comorbidities who presented with severe colicky pain in the right upper quadrant of 10 hours' duration, accompanied by malaise, subjective fever, and dark urine. On admission, physical examination revealed a positive Murphy sign, without relevant laboratory abnormalities. Ultrasound showed a distended gallbladder with thickened wall and gallstones, a liver with grade II steatosis, and nondilated bile ducts. An urgent surgical approach was chosen, and open cholecystectomy with closure of an intraoperatively diagnosed cholecystoduodenal fistula was performed. Postoperative recovery was favorable, with discharge on postoperative day 3 and drain removal on day 5. We provide a comprehensive discussion of pathophysiology, diagnostic approach, differentiation from other entities (Mirizzi syndrome, gallstone ileus, and Bouveret syndrome), and therapeutic strategies (laparoscopy vs open surgery, duodenal repair, antibiotic management, and the role of ERCP). This case underscores the need to maintain a high index of suspicion in calculous cholecystitis with atypical or persistent features and highlights the importance of timely surgical decision-making to prevent major complications. We also analyze perioperative aspects that optimize outcomes and reduce morbidity and mortality.

Keywords: Cholecystoduodenal fistula; Bilioenteric fistula; Cholelithiasis; Cholecystitis; Gallstone ileus; Bouveret syndrome; Biliary surgery; Duodenal closure; ERCP.

1. Introduction

Bilioenteric fistulas are abnormal communications between the biliary tract and the gastrointestinal tract that arise mostly as a consequence of chronic inflammatory processes related to cholelithiasis (1). Among them, the cholecystoduodenal fistula is the most prevalent variant. Although its overall incidence is low in routine clinical practice, recognition is crucial due to therapeutic and prognostic implications. Preoperative diagnosis is challenging: symptoms are often nonspecific, and imaging tools have variable performance depending on fistula caliber, stone burden, and the stage of inflammation (2). Contrast-enhanced computed tomography, MRCP, and in selected contexts contrast-enhanced ultrasonography or endoscopic retrograde cholangiopancreatography (ERCP) aid in clarifying the condition. However, a substantial proportion of cases are identified at the time of surgery (3).

The usual pathophysiology involves stone impaction in the gallbladder neck or cystic duct, with increased intraluminal pressure, wall ischemia, and subsequent necrosis that favors erosion into adjacent organs (4). Owing to its contiguity,

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the duodenum is the most common site of abnormal drainage. The resulting fistula may be silent or cause obstructive phenomena, upper gastrointestinal bleeding, malabsorption syndrome, or recurrent infections (5). Clinical presentation spans a wide spectrum: from typical biliary pain to afebrile courses with vague gastrointestinal symptoms, particularly when inflammation is chronic and the body establishes drainage pathways that transiently "relieve" intravesicular pressure (6).

From a therapeutic standpoint, gallbladder removal and adequate resolution of the abnormal communication are the cornerstones of treatment. The choice between laparoscopic or open approaches depends on team experience, severity of inflammation, hemodynamic stability, and suspicion of associated injuries (e.g., common bile duct involvement, complex perforations, or abscesses) (7). While laparoscopy offers advantages in morbidity and length of stay, open surgery retains an important role in scenarios of intense inflammation, dense adhesions, or severely distorted critical anatomy. In addition to detailing the patient's course, this article discusses decision strategies and repair techniques that influence procedural safety and postoperative recovery (8).

2. Case presentation

A 44-year-old woman, with no documented medical or surgical history, presented with severe colicky abdominal pain located in the right upper quadrant with dorsal radiation, approximately 10 hours in duration, accompanied by malaise, an unquantified subjective fever, and dark urine. At an initial visit in her locality she received unspecified intravenous medications with partial pain relief; however, during an ultrasound examination the pain worsened and the febrile sensation recurred, prompting referral to a tertiary hospital.

On admission, vital signs were blood pressure 90/60 mmHg, heart rate 54 bpm, respiratory rate 23 breaths/min, axillary temperature 36 °C, and oxygen saturation 98%. Physical examination revealed a painful facial expression, warm skin with preserved turgor, isocoric and normally reactive pupils, moist oral mucosa with thick saliva, clear lung fields, bradycardic heart sounds; a protuberant, soft, depressible abdomen with preserved bowel sounds, tenderness on palpation in the right upper quadrant, and a positive Murphy sign. Laboratory studies showed no relevant abnormalities in the complete blood count or biochemical profile, with no evidence of cholestasis or significant systemic inflammatory response at that time.

Abdominal ultrasound showed a liver of normal shape and size with diffuse increased echogenicity consistent with grade II steatosis and no dilation of intrahepatic or extrahepatic bile ducts; common bile duct diameter 4.4 mm. The gallbladder was distended, with preserved shape and size (59 × 20 mm) and a wall thickness of 4.2 mm; within it, hyperechoic images with posterior acoustic shadowing (7 and 6 mm) compatible with gallstones were identified. There was also mild right pelvicalyceal ectasia with a renal pelvis measuring 7.4 mm. The diagnostic impression included grade II hepatic steatosis and cholelithiasis with gallbladder wall thickening.

Given persistent pain, a positive Murphy sign, and the ultrasound findings, treatment was initiated with fluid therapy (Ringer's lactate, 1000 mL at 30 drops/min), antibiotic prophylaxis with ceftriaxone 1 g IV, an antiemetic (ondansetron 8 mg IV/day), and gastric protection (omeprazole 40 mg IV/day). Considering the clinical picture and suspected calculous cholecystitis, emergency surgery was decided. During laparotomy, a sclerotic-atrophic gallbladder measuring 6 × 5 cm with thick walls, dense perivesicular inflammatory adhesions, pyocystic content, and a clear cholecystoduodenal fistula was found. The cystic duct and common bile duct appeared normal macroscopically.

A conventional cholecystectomy was performed with careful dissection of Calot's triangle, lysis of adhesions, and hemostatic control. The communication with the duodenum was identified, delineated, and repaired with primary layered closure reinforced with an omental patch after verifying viable margins. The cavity was irrigated, and a Jackson–Pratt drain and a nasogastric tube were placed.

The immediate postoperative course was uneventful. The patient was hospitalized for three days, receiving normal saline at 30 drops/min, omeprazole 40 mg IV/day, ceftriaxone 1 g IV every 12 hours, ketorolac 60 mg IV every 8 hours, and tramadol 100 mg in 100 mL of normal saline at 30 drops/min (only in the immediate postoperative period). She had mild odynophagia and low serosanguineous drain output. Oral intake was reintroduced gradually after nasogastric tube removal. She was discharged on day 3 with favorable progress; the drain was removed on day 5 in the outpatient setting, with no evidence of biliary fistula or residual collections.

3. Discussion

Cholecystoduodenal fistula most often arises as the outcome of a chronic inflammatory process induced by gallbladder stones. Stone impaction in the neck or cystic duct perpetuates a vicious cycle of obstruction, increased intraluminal pressure, and parietal ischemia that, over time, results in necrosis and erosion into contiguous structures. The anatomic proximity of the duodenum, together with the relative mobility of the gallbladder and peristaltic dynamics, explains its greater frequency compared with other communications (cholecystocolic, cholecystogastric, or choledochoduodenal). This pathophysiology is consistent with the findings in our patient: a sclerotic-atrophic gallbladder, perivesicular adhesions, and evidence of local infection (pyocyst) at the time of surgery (9).

Clinical variability is one of the main diagnostic challenges. While some patients present with a typical acute cholecystitis pattern, others develop vague symptoms: intermittent nausea, postprandial fullness, insidious weight loss, or episodes of subclinical cholangitis. Laboratory findings may be normal when the fistula allows bile drainage and reduces intravesicular pressure. In our case, despite severe pain and a positive Murphy sign, blood tests did not show significant inflammatory markers; this apparent discordance is not uncommon and should be interpreted in light of pathophysiology, especially when the disease has evolved into chronicity (10).

Regarding imaging, ultrasound is usually the first-line tool due to availability, lack of radiation, and good performance for gallstones and wall thickening. However, its sensitivity for detecting small-caliber fistulas is limited. Contrast-enhanced CT may reveal air in the biliary tree (pneumobilia), perivesicular inflammatory changes, wall discontinuities, or ectopic gallstones; the concomitant presence of mechanical small-bowel obstruction due to a migrated stone constitutes the modified Rigler triad in the context of gallstone ileus (11). When the stone impacts in the duodenal bulb or second portion, the presentation may be that of Bouveret syndrome (gastric outlet obstruction), with hematemesis or melena if ulceration is present. MRCP provides noninvasive characterization of the biliary tree and helps plan complementary procedures. Although invasive, ERCP has diagnostic-therapeutic value in scenarios of concomitant choledocholithiasis, postoperative bile leak, or when sphincterotomy and stone extraction are required (12).

The differential diagnosis includes Mirizzi syndrome (extrinsic compression of the common bile duct by a stone impacted in the cystic duct or gallbladder neck, with or without fistulization into the common bile duct), acalculous cholecystitis in critically ill patients, a duodenal ulcer penetrating into the gallbladder, biliary or duodenal neoplasms eroding adjacent structures, and infectious complications with perivesicular abscesses. Distinction is not always evident preoperatively. Nevertheless, certain clues guide evaluation: pneumobilia in the absence of prior endoscopic manipulation suggests an abnormal communication; marked jaundice and dilation of the main bile duct point toward Mirizzi type II–IV; disproportionate anemia and weight loss with irregular wall thickening mandate ruling out malignancy (13).

From the surgical perspective, the goals are twofold: treat the underlying gallbladder disease and safely resolve the abnormal communication. In selected cases, laparoscopy is feasible and desirable; however, distortion of critical anatomy due to fibrosis and dense adhesions increases the risk of bile duct injury. In such circumstances, conversion to open surgery is not a failure but a safety strategy. Subtotal cholecystectomy fenestrating or reconstituting can be useful when the plane between the gallbladder neck and the common hepatic duct is especially hostile. In the present case, the open approach was chosen due to severe inflammation and allowed controlled dissection of Calot's triangle with identification of intact cystic duct and common bile duct (14).

Management of the duodenal fistula requires assessment of defect size, tissue viability at the margins, and contamination. Small defects with viable tissue are amenable to primary layered closure, preferably with long-lasting absorbable suture, reinforced with an omental patch or jejunal serosal patch to reduce the risk of dehiscence. For larger perforations, repair may be complemented by a Kocher maneuver to mobilize the duodenum; in complex cases with severe edema or friable tissue, some teams opt for temporary pyloric exclusion and a diverting gastrojejunostomy to protect the suture, especially if pancreatitis or intense duodenitis coexists. In our patient, reinforced primary closure sufficed, with no need for diversion procedures (15).

Infection control and management of free bile are crucial. Generous peritoneal lavage and drain placement allow early detection and management of potential leaks. Antibiotic selection should cover Enterobacterales and anaerobes, tailored to local epidemiology and intraoperative findings (pus, abscess, frank perforation). Ceftriaxone plus metronidazole or piperacillin–tazobactam are reasonable regimens; in patients at risk for enterococci or with prior exposure to broad-spectrum antibiotics, escalation may be necessary. Duration should be individualized: if source

control is achieved and there is no bacteremia or residual abscess, 3–5 days are usually sufficient; otherwise, extend based on clinical course (16).

Postoperatively, a nasogastric tube is indicated when the duodenum has been manipulated or repaired to decompress and decrease acid flow across the suture. Diet advancement should proceed cautiously, considering motility and the absence of signs of peritonitis or sepsis. Standard care bundles include thromboprophylaxis, multimodal analgesia, and gastric protection. In our patient, early tube removal and gradual oral reintroduction translated into early discharge without complications. Follow-up should focus on detecting early complications (bile leak, duodenal fistula, subhepatic collection) and late complications (common bile duct stricture, postcholecystectomy syndrome). Persistent pain, fever, or jaundice warrants ultrasound or CT. When a low-output bile leak is suspected, ERCP with sphincterotomy and biliary stenting can facilitate closure. Adequate nutrition and early rehabilitation positively influence convalescence (17).

Timing of treatment is a relevant issue. In patients with recurrent cholecystitis and multiple stones especially middle-aged or older women the possibility of fistulization should be part of clinical reasoning. A history of prior episodes, symptom-free intervals, response to anti-inflammatories, and fluctuating pain provide clues. Lack of striking elevation in acute-phase reactants does not exclude complicated disease if fistulous drainage has depressurized the gallbladder. Therefore, a low threshold for advanced imaging CT or MRCP is reasonable when the clinical picture is atypical or the course becomes protracted (18).

The role of therapeutic endoscopy has expanded. In the presence of choledocholithiasis, preoperative endoscopic extraction can simplify the operative field. In Bouveret syndrome, endoscopic laser or mechanical lithotripsy provides a less invasive alternative to enterotomy; however, when the stone is large or the patient is unstable, surgery remains definitive. In complex fistulas, ERCP can delineate tracts, although its sensitivity is not absolute. Coordination between surgery and endoscopy, with individualized decisions, optimizes outcomes (19).

Prognostically, mortality associated with bilioenteric fistulas has decreased thanks to improved diagnosis, accumulated hepatobiliary surgical experience, and perioperative care. Nontrivial risks persist when diagnosis is delayed: peritonitis, sepsis, bleeding, persistent duodenal fistula, or bile duct injury. Timely intraoperative recognition and appropriate repair mitigate these threats. Our patient illustrates a favorable scenario resulting from early surgical decision-making and meticulous technical repair (20).

Certain anatomic-surgical nuances, though subtle, make a difference. The Strasberg “critical view of safety,” even in open surgery, mandates clear visualization of the cystic duct and cystic artery before ligation. In extreme distortion, fenestrating subtotal cholecystectomy with mucosectomy of the bed and omentalization can avert injuries. If the fistula involves the antimesenteric border of the duodenum with edematous tissue, two-layer closure mucosa/submucosa and seromuscular with omental reinforcement reduces leak risk. Selective, rather than routine, drain placement should be based on the likelihood of dehiscence, tissue condition, and closure complexity (21).

Regarding analgesia, multimodal regimens that minimize opioids promote bowel function and shorten hospital stay. Combining anti-inflammatories, acetaminophen, and, when feasible, regional anesthesia reduces opioid consumption and adverse effects (nausea, postoperative ileus). Glycemic control, even in nondiabetics, may improve wound healing and reduce surgical site infections (22).

Finally, quality and safety aspects: intraoperative photographic documentation and detailed recording of critical anatomy and key decisions (e.g., why laparoscopy was not performed or why primary repair was chosen) enhance traceability and subsequent multidisciplinary discussion. Standardizing protocols for complicated cholecystitis management including criteria for preoperative CT, conversion thresholds, and duodenal repair algorithms facilitates training and reduces variability (23).

4. Conclusion

Cholecystoduodenal fistula is an infrequent complication of cholelithiasis but carries potentially serious consequences if not identified and treated promptly. The present case shows that the clinical picture may be deceptively bland from a laboratory standpoint and that ultrasound, although useful, does not always reveal the abnormal communication. The decision to perform emergency surgery based on persistent pain and suspected complicated cholecystitis enabled intraoperative diagnosis and definitive correction with cholecystectomy and primary closure of the duodenal defect. The favorable outcome reinforces the value of a safety-oriented surgical strategy tailored to inflammatory severity, with selective drainage and meticulous postoperative care. More broadly, maintaining a low threshold to consider this entity in patients with recurrent or atypical cholecystitis, judicious use of advanced imaging, and early coordination with

endoscopy when choledocholithiasis is present are measures that can reduce complications and improve outcomes.

Compliance with ethical standards

Acknowledgments

To the general surgery, anesthesiology, and nursing teams who participated in the patient's care and postoperative management.

Disclosure of conflict of interest

The authors declare no personal, professional, or financial conflicts of interest.

Statement of informed consent

Informed consent was obtained from the patient for publication of the case and dissemination of clinical images if needed, with preservation of anonymity.

Funding

No external funding was received; the study was self-funded by the authors.

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