Clinical Report

Journal of INTERNATIONAL MEDICAL RESEARCH

Journal of International Medical Research
2017, Vol. 45(3) 1090–1097

DOI: 10.1177/0300060517699038
journals.sagepub.com/home/imr
SAGE

Laparoscopic management of cholecystoenteric fistula: A single-center experience

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Abstract

Aim: To report our experience regarding management of cholecystoenteric fistula (CEF) and identify the most effective diagnostic methods and surgical treatment.

Methods: In total, 10,588 patients underwent laparoscopic cholecystectomy for cholecystolithiasis from January 2000 to December 2014 at the Research Institute of General Surgery, Jinling Hospital (Nanjing, China). Twenty-nine patients were diagnosed with CEF preoperatively or intraoperatively. Data were retrospectively collected on demographics, preoperative diagnostics, intraoperative findings, laparoscopic procedures, complications, and follow-up.

Results: Twenty-nine patients (female/male ratio, 2.2; mean age, 68.7 years) with CEF were evaluated. Twenty-three (79.3%) patients had a cholecystoduodenal fistula (CDF), four (13.8%) had a cholecystocolonic fistula (CCF), one (3.4%) had a cholecystogastric fistula, and one (3.4%) had a CDF combined with a CCF. Only nine (31.0%) patients obtained a preoperative diagnosis. All patients initially underwent laparoscopic treatment, but five (17.2%) underwent conversion to open surgery; three of these five developed postoperative morbidity or mortality, and the other two had an uneventful postoperative course. Among patients managed successfully by laparoscopy, the hospital stay ranged from 3 to 6 days (mean, 4 days). All patients were asymptomatic at a mean follow-up of 13 months (range, 3–21 months).

Conclusion: Ultrasound and computed tomography can provide valuable diagnostic clues for CEF. Laparoscopic management of CEF in experienced hands is safe, feasible, and associated with rapid postoperative recovery.

Keyword

Cholecystoenteric fistula; management; diagnosis; laparoscopic

Date received: 19 June 2016; accepted: 20 February 2017

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Introduction

Since the late 1980s, laparoscopic cholecystectomy (LC) has been a widely accepted method for treating gallbladder disease.[1] LC has many advantages over open cholecystectomy, including marked pain relief and a shorter recovery time. In addition, LC is not associated with increased mortality or morbidity.[2] Cholecystoenteric fistula (CEF) is a rare and late complication of cholecystolithiasis and is defined as a spontaneous tract between an inflamed gallbladder and one or more parts of the surrounding gastrointestinal tract.[3] According to a large cholecystectomy series, the incidence of CEF ranges from 0.5% to 0.9%.[4,5] Cholecystoduodenal fistula (CDF) is the most frequently encountered type of CEF, comprising 75% to 80% of all such fistulas, followed by cholecystocolic fistula (CCF).[5] Because of the nonspecific symptoms of CEF compared with cholecystitis, the preoperative diagnosis of CEF is very difficult. Historically, CEF was always an incidental finding during the operation and thus a challenge to surgeons, and it was considered a contraindication for LC at the beginning of the laparoscopy era.[6] Fortunately, along with the improvement of computed tomography (CT) resolution and the application of endoscopic technology, preoperative diagnosis of CEF has been greatly improved. In addition, CEF has been successfully managed laparoscopically in several cases with the advent of the endoscopic stapling device (Endo GIA; Medtronic, Minneapolis, MN) and increasing technical ability of laparoscopic surgeons.[7–10] However, bleeding, severe local adhesions, and technical difficulties in intestinal suturing are usually encountered when performing laparoscopy.[11] Thus, the rate of conversion to open surgery is still very high. The main purpose of this study was to identify the most effective diagnostic method and surgical management for CEF.

Materials and methods

During the 15 years from January 2000 to December 2014, 10,588 patients underwent elective LC for cholecystolithiasis at our institution. Among them, 29 patients were diagnosed with CEF intraoperatively or preoperatively.

Once hospitalized, all patients underwent laboratory examinations (routine blood, urine, and stool examinations; liver function testing; electrolyte measurement; coagulation function testing; and tumor marker measurement), electrocardiography, chest radiography, and upper abdominal ultrasound (US) after providing a detailed disease history and undergoing a careful physical examination. Other accessory examinations, such as CT, magnetic resonance cholangiopancreatography, gastroscopy, and colonoscopy, were performed according to the patients' conditions. If the patient was diagnosed with choledocholithiasis, endoscopic retrograde cholangiopancreatography (ERCP) was performed and stones in the common bile duct were extracted through sphincterotomy before LC.

All 29 patients initially accepted laparoscopic treatment. Like open surgery, the principle of laparoscopic management of CEF is removal of the gallbladder and closure of the fistula. If sufficient spaces were present between contiguous organs, the Endo GIA was applied to transect the fistula. Otherwise, the fistula was closed by hand sewing. When dense adhesions and impacted stones in Hartmann's pouch made access to Calot's triangle difficult, a fundus-first technique and subtotal cholecystectomy were performed. A suction drain was left in the hepatorenal pouch in all patients. The drain was removed 24 h after surgery if no fluid was evident. Patients were discharged from the hospital when their anal exhaust had recovered, they were able to take liquids at ease, and they were confirmed to have no complications.

The following data were retrospectively collected: patients' demographics, preoperative diagnostic information, intraoperative findings, conversion rate and reasons, postoperative complications, hospital stay, and follow-up. Continuous variables are expressed as mean (range), and categorical variables are presented as number (frequency).

Results

Incidence and patient characteristics

The incidence of CEF among patients undergoing LC for cholecystolithiasis in this study was 0.27%. CDF was the most common type, followed in turn by CCF and cholecystogastric fistula. Among these patients, 20 were women and 9 were men, with a female/male ratio of 2.2. Notably, >80% of the included patients were >60 years old, and >60% of them had a >5-year history of abdominal pain. Most of the included patients had comorbidities; diabetes and hypertension encountered most commonly, partly because of the old age of the included patients.

Symptoms and signs

All 29 patients presented with a history of pain in the right upper quadrant and/or epigastrium, which was also the main clinical symptom. Flatulent dyspepsia, nausea, and vomiting are common presenting symptoms of gallstone disease, and many patients with CEF in the present study exhibited these symptoms. A recent history of jaundice was present in five patients, and stones were found in the common bile duct through further examination of all of these patients. Three patients had relatively severe diarrhea, and they were later diagnosed with CCF.

Accessory examinations

All 29 patients were assessed by US, which was routinely performed when biliary disease was suspected. An ill-defined border between the gallbladder and neighboring gastrointestinal tract was found in 80% of patients. In comparison, only 26% of the patients with CEF had gallbladder wall thickening (>3 mm), an unclear boundary, and/or atrophic cholecystitis according to our institutional data.

Fifteen patients underwent CT examinations because of unexplained abdominal pain or abnormal findings on other examinations (US, gastroscopy, or colonoscopy). Seven patients who were diagnosed with choledocholithiasis by US and/or magnetic resonance cholangiopancreatography underwent ERCP, and all stones in the common bile duct were extracted through a sphincterotomy. Five patients underwent gastroscopy because of severe vomiting and/or epigastric pain. Three patients with diarrhea underwent colonoscopy to rule out the possibility of inflammatory bowel disease. Table 1 summarizes the results of the accessory examinations among all 29 patients.

Preoperative diagnosis

Of all 29 patients with CEF, 9 (31.0%) obtained a preoperative diagnosis. As a routine examination, US can provide important clues to the diagnosis of CEF by detecting cholecystitis and pneumobilia (Figure 1(a)).

Of the 23 patients with CDF, 6 (26.1%) were diagnosed preoperatively. Three patients' diagnoses were confirmed by CT: the borderline between the duodenum and gallbladder could not be identified, and both stones and air were seen in the gallbladder (Figure 1(b),(c)). Three patients' diagnoses were confirmed by ERCP: the fistula communication was seen between the gallbladder and duodenum under contrast enhancement and/or the endoscope directly revealed the orifice of the fistula on the first or second part of the duodenum.

Table 1. Accessory examinations of the 29 patients in the present study.

Examinations	Signs	n (%)
US (n = 29)	Thick-walled gallbladder	17 (58.6)
	Atrophic cholecystitis	12 (41.4)
	Combination of above two signs	5 (17.2)
	Pneumobilia	2 (6.9)
CT (n = 15)	Unidentified borderline between gallbladder and part of intestinal tract	12 (80.0)
	Pneumobilia	5 (33.3)
ERCP (n = 7)	Fistula communication observed with contrast enhancement and/or the orifice of the fistula is identified with bile excretion	4 (57.1)
Gastroscopy (n = 5)	Presence of stone and identification of orifice of the fistula	1 (20.0)
Colonoscopy (n = 3)	Observation of the opening of the fistula and bile excretion	1 (33.3)
	Inflammatory reaction at the hepatic flexure of the colon	2 (66.7)

US: ultrasound, CT: computed tomography, ERCP: endoscopic retrograde cholangiopancreatography.

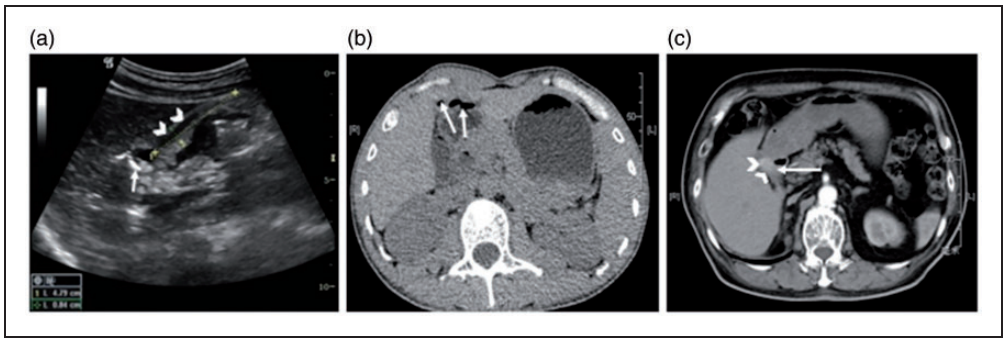

Figure 1. Ultrasound and computed tomography findings of cholecystoenteric fistula.
(a) Ultrasound suggested atrophic cholecystitis (arrow) and pneumobilia (arrowhead).
(b). Computed tomography showed pneumobilia (white arrows).
(c). An ill-defined border between the gallbladder and duodenum (white arrow), atrophic cholecystitis, and cholecystolithiasis were simultaneously present (arrowhead).

Of the four patients with CCF, two (50.0%) were diagnosed preoperatively. Both patients underwent CT examinations: the hepatic flexure of the colon was closely adjacent to the gallbladder, and pneumobilia was detected. One of these patients also underwent a colonoscopic examination, which detected the opening of the fistula and bile excretion.

The one patient with the cholecystogastric fistula was diagnosed preoperatively by gastroscopy, which showed a large

gallstone in the antrum of the stomach. However, endoscopic retrieval of the stone was unsuccessful.

Intraoperative findings and laparoscopic procedure

During laparoscopic surgery, nearly all of the patients had extensive, dense adhesions around the gallbladder. After separating the omentum from the gallbladder, the gallbladder and the injured part of gastrointestinal tract were connected with each other in all patients. Twenty-four (82.8%) patients were successfully treated by laparoscopy. Among them, the Endo GIA was applied in 16 (66.7%) patients; the remaining patients underwent hand sewing. The Endo GIA showed clear superiority over hand sewing with respect to the operation time, anal ventilation time, hospitalization time, complications, and other parameters ($P < 0.05$) (Table 2).

The anatomy of Calot's triangle could not be clearly identified in seven (29.2%) patients; therefore, a fundus-first technique and subtotal cholecystectomy were performed. Two patients successfully underwent laparoscopic surgery; after careful adhesiolysis, we performed subtotal cholecystectomy because the adhesion was relatively heavy, and the Endo GIA was used to close the fistula between the gut and gallbladder. However, five patients underwent open surgery because of heavy adhesions. In these patients, subtotal cholecystectomy was performed and when the gallbladder was transected closer to the fundus, and we ligated and stitched the infundibulum of the gallbladder and intestines. The fistulas in these seven patients were not initially recognized; only when the adhesions between the gallbladder and intestines were cut off could we locate the fistula within the adhesions.

Table 2. Comparison between open and laparoscopic surgery.

	Conversion from laparoscopic to open surgery	Laparoscopic surgery
Operation time (min, $x \pm s$)**	150 ± 30	85 ± 30
Blood loss (ml, $x \pm s$)**	120 ± 60	45 ± 25
Hospitalization (days)*	7–15	3–6
Complications (%)*	60	0
Mortality (%)**	2	0

*$P < 0.01$, **$P < 0.0001$.

Conversion to open surgery

Five (17.2%) patients underwent conversion to open surgery because of dense inflammatory adhesions, bleeding, and avulsion of the colon. In two patients, dense inflammatory adhesions made exposure of the fistula and Calot's triangle completely impossible. In another two patients, a large amount of bleeding occurred at the time of adhesiolysis and affected our ability to visualize the operative field. In the remaining patient, blunt dissection led to avulsion of the colon, and laparoscopic suturing could not secure closure.

After meticulous adhesiolysis, the fistula tract was identified. First, the fistula was excised; next, a clamp was advanced through the opening to check for stones. This maneuver showed that the fistula had reached the enteral lumen. The enteral defect was primarily repaired by hand sewing, and cholecystectomy was then performed.

Postoperative complications and follow-up

Two patients who underwent conversion to open surgery died. One developed severe pulmonary infection on postoperative day 3. Despite tracheotomy and active anti-infective

therapy, he died on postoperative day 9. The other patient developed severe diarrhea on postoperative day 2, and a fecal culture indicated infection by methicillin-resistant *Staphylococcus aureus*. Despite treatment with imipenem/cilastatin and fluid support, this patient died of multiple organ dysfunction syndrome on postoperative day 11. One patient who underwent conversion to open surgery developed an incisional infection. Another patient (3.4%) developed a small amount of bile leakage, which was resolved by drainage. The postoperative course of the other 25 patients was uneventful. All patients underwent routine pathological examination, which showed chronic inflammation.

Among the patients successfully managed by laparoscopy, the hospital stay ranged from 3 to 6 days (mean, 4 days). Three patients who underwent open surgery were discharged on postoperative days 7, 9, and 15, respectively. Laparoscopic surgery and open surgery showed significant differences in the operation time, blood loss, anal ventilation time, hospitalization time, complications, and mortality ($P < 0.05$). All patients were asymptomatic at a mean follow-up of 13 months (range, 3–21 months).

Discussion

Epidemiology

The data of this study indicate that CEF is an uncommon clinical entity. CEF was present in only 0.27% of patients who underwent elective LC; this incidence is lower than that in early reports. This phenomenon may be explained by (1) the widespread use of ultrasonography, which has allowed for early discovery of cholecystolithiasis even in underdeveloped regions, and (2) advancement of the laparoscopic era, which has allowed increasingly more patients to undergo cholecystectomy at a younger age.[12]

Preoperative diagnosis

With the development of radiological and endoscopic examination techniques, more diseases can be definitively diagnosed preoperatively. However, the preoperative diagnosis of CEF remains challenging. In the present study, a preoperative diagnosis of CEF was achieved in only 31.0% of patients.

However, failure to diagnose CEF preoperatively may result in challenges for the surgeon, who may be required to perform unanticipated complex and lengthy procedures.[12] In addition, this circumstance may cause catastrophic damage to the patients, most of whom are aged and have comorbidities. Therefore, a preoperative diagnosis, although difficult, is essential to ensure appropriate management.

Most of the patients in the present study had experienced repeated episodes of cholecystitis for a long period of time, usually >5 years. Therefore, a long history of cholecystolithiasis, especially >5 years, should raise suspicion for the presence of CEF. The predictive value of US for detecting CEF remains low, but a thick-walled gallbladder and atrophic cholecystitis were relatively common among our patients with CEF. These US findings may indicate the need for further examinations to exclude the presence of CEF. The quality of imaging has been greatly improved, and coronal CT reconstruction can help to reveal the relationship between adjacent organs. Therefore, we recommend the application of CT to investigate the presence of CEF when the results of previous examinations are suspicious. An ill-defined border between the gallbladder and neighboring gastrointestinal tract was found in 80% of patients. Although this sign is unspecific, it can raise our suspicion of the presence of CEF and assist in the intraoperative exploration. Yamashita et al.[13] reported that ERCP is the most valuable diagnostic method for revealing the presence of CEF. In the present study, seven patients underwent

ERCP due to choledocholithiasis. Among them, four (57.1%) patients were diagnosed by ERCP. However, ERCP is an invasive method and is restricted to patients with jaundice and/or choledocholithiasis. In addition, incomplete fistulas cannot always be found by ERCP.[14]

In summary, when US reveals contact between the gallbladder and inflamed intestinal wall in an elderly female patient with a long history of cholecystitis, the surgeon should suspect the presence of CEF. CT is the recommended imaging modality with which to further investigate the presence of CEF among these patients. If the patient has jaundice or is diagnosed with choledocholithiasis, ERCP can be used to detect CEF before extracting the stones from the common bile duct.

Treatment

Because the preoperative diagnosis of CEF is usually difficult, prompt recognition during the operation is crucial to successful treatment of CEF. If the CEF is not identified, the surgeon may inadvertently tear the infected gastrointestinal tract, contaminating the peritoneum with enteric contents.[7] Based on the operative findings in the present study, we suggest that dense inflammatory adhesions around the gallbladder and a shrunken and fibrotic gallbladder stuck firmly to the adjoining viscera should alert the surgeon to the possibility of CEF.

Glenn et al.[5] recommended that CEF should be treated by open cholecystectomy combined with excision and closure of the fistula. In particular, if a patient has both a double fistula and severe adhesion, open surgery will be an ideal surgical procedure.[14] Fortunately, with more experience and improved techniques, increasing numbers of case reports have introduced laparoscopic approaches to treat CEF successfully, with all of the benefits of minimally invasive surgery.[7–10]

The rate of conversion to open surgery is still high.[3] The need for conversion is most likely related to bleeding, difficulty in intestinal suturing, and inflammation around the gallbladder.[11] In the present study, five (17.2%) patients underwent conversion to open surgery for these reasons. However, the conversion rate in our study is markedly lower than that in early reports, mainly because of the increased experience and advancements in laparoscopic techniques that have occurred over time.

The laparoscopic management of CEF is tedious and hazardous. Conversion to open surgery in debilitated patients will increase the risks of postoperative morbidity and mortality. Therefore, according to our experience, the following factors are essential for successful laparoscopic treatment of CEF. (1) Ensure that each step of the operation is meticulously performed under direct vision. (2) The surgeon must be experienced in the techniques of advanced laparoscopic surgery, including laparoscopic suturing. (3) If the sinus between the gallbladder and gastrointestinal tract cannot be completely exposed, some amount of gallbladder tissue can be retained when repairing the sinus. (4) If the anatomical structure of the gallbladder triangle is not clear, partial cholecystectomy is a safe and effective surgical procedure.

Conclusion

When US displays a thick-walled and shrunken gallbladder in an elderly female patient with a long history of cholecystitis, CT is recommended. If an ill-defined border between the gallbladder and neighboring gastrointestinal tract is found, the surgeon should consider the possibility of CEF. Conservative management is recommended for patients with a low functional reserve

who cannot tolerate complex surgical treatment. During LC, if the gallbladder is embedded by extensive inflammatory adhesions and is tightly attached to neighboring organs, the surgeon should be highly suspicious of the presence of CEF. The good postoperative condition of the patients and markedly decreased rate of conversion to open surgery in the present study clearly demonstrate that laparoscopic management of CEF in experienced hands is safe, feasible, and associated with rapid postoperative recovery.

Acknowledgements

I would like to express my gratitude to all those who have helped me during the writing of this thesis. I gratefully acknowledge the help of my classmate Guangli Yin. Last, my gratitude also extends to my family who have been assisting, supporting and caring for me all of my life.

Declaration of conflicting interest

The Authors declare that there is no conflict of interest.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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