

Acute acalculous cholecystitis immediately after gastric operation: Case report and literatures review

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tive complication; Gastric surgery

Core tip: Acute acalculous cholecystitis (AAC) after gastric surgery is not common but it progresses rapidly once it occurs. Manifestations of AAC after gastric surgery are usually atypical and cannot be easily distinguished from other complications, which leads to delayed diagnosis and treatment and even death. Here, we report three such cases and review the literature, to give more attention to this disease. Early diagnosis and prompt surgical intervention are the keys to successful treatment.

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Abstract

Acute acalculous cholecystitis (AAC) is a rare complication of gastric surgery. The most commonly accepted concepts regarding its pathogenesis are bile stasis, sepsis and ischemia, but it has not been well described how to identify and manage this disease in the early stage. We report three cases of AAC in elderly patients immediately after gastric surgery, which were treated with three different strategies. One patient died 42 d after emergency cholecystectomy, and the other two finally recovered through timely cholecystostomy and percutaneous transhepatic gallbladder drainage, respectively. These cases informed us of the value of early diagnosis and proper treatment for perioperative AAC after gastric surgery. We further reviewed reported cases of AAC immediately after gastric operation, which may expand our knowledge of this disease.

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Key words: Acute acalculous cholecystitis; Postopera-

INTRODUCTION

Radical gastrectomy is the main procedure for advanced gastric carcinoma in spite of the rapid progress in adjuvant strategies such as chemotherapy and radiotherapy. Although the exact mechanisms are still not clear, gastric surgery may affect gallstone formation by altering cholecystokinin secretion, gallbladder reaction to cholecystokinin, and subsequently impairing gallbladder filling and emptying. It remains to be elucidated whether gallstone formation and gallstone-related symptoms in patients with previous upper gastrointestinal (GI) surgery are more frequent. It has been revealed that symptomatic postoperative gallbladder stone formation may occur in 17.5% of gastric cancer (GC) patients^[1]. Until now, there has been no general consensus about whether it is necessary to remove the gallbladder during gastric surgery.

Acute acalculous cholecystitis (AAC) following radical

gastrectomy, which may result from bile stasis and gallbladder ischemia associated with vagotomy and gastrohepatic ligament dissection, has been sporadically but rarely reported^[2,3]. In the general population, AAC immediately after radical gastrectomy, a clinical situation which is not easily recognized in elderly patients, is characterized by delayed diagnosis and high mortality rate. In this paper, we report its clinical features, management strategies, and outcomes in three patients.

CASE REPORT

Case 1

A 60-year-old Chinese male patient suffered from upper abdominal pain for > 1 year, and this painful feeling had become more severe since 2 mo ago. Endoscopy revealed an ulcerated tumor at the back wall of the upper gastric body, close to the greater curvature. Biopsy showed poorly differentiated adenocarcinoma, and the clinical stage was cT2N0M0 according to preoperative computer tomography (CT), and the gallbladder seemed normal (Figure 1A). Total gastrectomy (D2 lymphadenectomy) and Roux-en-Y reconstruction were performed. He was able to tolerate liquid food on day 4 and semi-fluid on day 7 after the operation and was discharged on day 9 without any discomfort. The postoperative pathological stage was pT2N0M0. Ten days after the operation, the patient suddenly showed upper abdominal discomfort accompanied by nausea and hyperpyrexia after a greasy meal, and his body temperature was as high as 39.5 °C. Ultrasound examination was performed but no abnormality was found and the possibility of abdominal infection was considered, so antibiotic treatment was performed but was ineffective, and he was readmitted on day 13. Physical examination showed apparent tenderness in the right upper abdomen and concussive pain in the liver region, and white blood cell (WBC) count $24.35 \times 10^9/L$. Renal and liver function and serum amylase were within the normal range. Ultrasound and abdominal/pelvic CT showed swelling of the gallbladder and moderate effusion in the abdominal cavity and around the gallbladder. The gallbladder was about 8 cm × 4 cm × 4 cm (Figure 1B). Imipenem was used for 24 h but his symptoms were not relieved, and on day 2 after readmission, the patient suddenly presented with symptoms of septic shock and blurred consciousness, anuria, decreasing blood pressure (BP, from 100/60 to 85/55 mmHg) and increasing heart rate (HR). Emergency exploratory laparotomy was performed with fluid resuscitation and adequate intravenous antibiotics. During surgery, we found that the gallbladder was about 9 cm × 5 cm × 6 cm, and severely adhered to adjacent tissues such as duodenum and colon. There were several gangrenous lesions on the gallbladder fundus wall with no perforation. Fistulization of the gallbladder was performed, and a large amount of purulent bile was exuded. After the operation, the body temperature returned to normal, and antibiotic therapy was continued until day 5. Semifluid was started on the day 9 and he was dis-

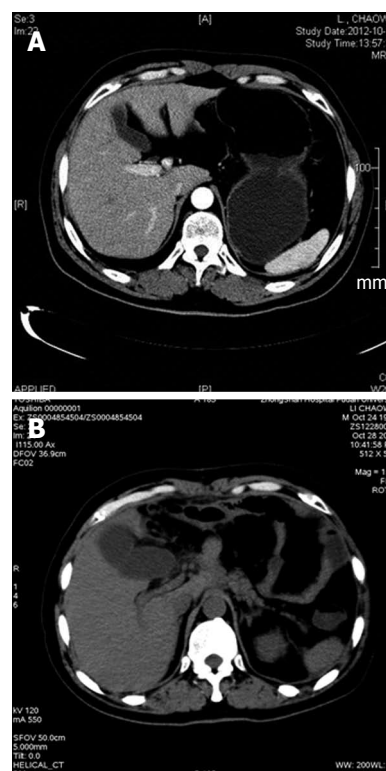


Figure 1 Computed tomography scan in case 1 showing normal gallbladder (A) before operation and a swelling gallbladder with thickened wall (B).

charged on day 14. Two months after the emergency surgery, the gallbladder fistulization tube was removed successfully, and no more associated discomfort occurred.

Case 2

A 79-year-old male patient had repeated melena for 2 wk. Gastric endoscopy revealed an ulcerated tumor (1.0 cm in size) at the back wall of gastric fundus, close to the lesser curvature, and further biopsy confirmed poorly differentiated adenocarcinoma. The patient was ASA grade 3, had no history of gallstones or cholecystitis, but was suffering from impaired cardiac function, moderate disorder of pulmonary ventilation, and a 10-year history of cerebral infarction, without taking anti-coagulation or anti-platelet treatment. Preoperative ultrasound and CT displayed a normal gallbladder and multiple hepatic cysts (Figure 2A), and the clinical stage was cT4N + M0. Total gastrectomy (D2 lymphadenectomy) with Roux-en-Y reconstruction was performed, and the pathological stage was pT4aN2M0 pathologically. Semi-liquid diet was well tolerated on day 7 and drainage tubes were removed within 8 d postoperatively. His body temperature was normal, and he did not feel any discomfort. However, in the morning of day 9, a sudden feeling of severe pain arose in his right upper abdomen, with fever (38.5 °C), fast heart rate (120 bpm) and high WBC count ($17.8 \times 10^9/L$). Laboratory examinations showed impaired liver and renal function: total bilirubin/conjugated bilirubin (TB/CB) 85/74 μmol/L, aspartate aminotransferase (AST)/alanine aminotransferase (ALT) 225/671 U/L, serum creatinine

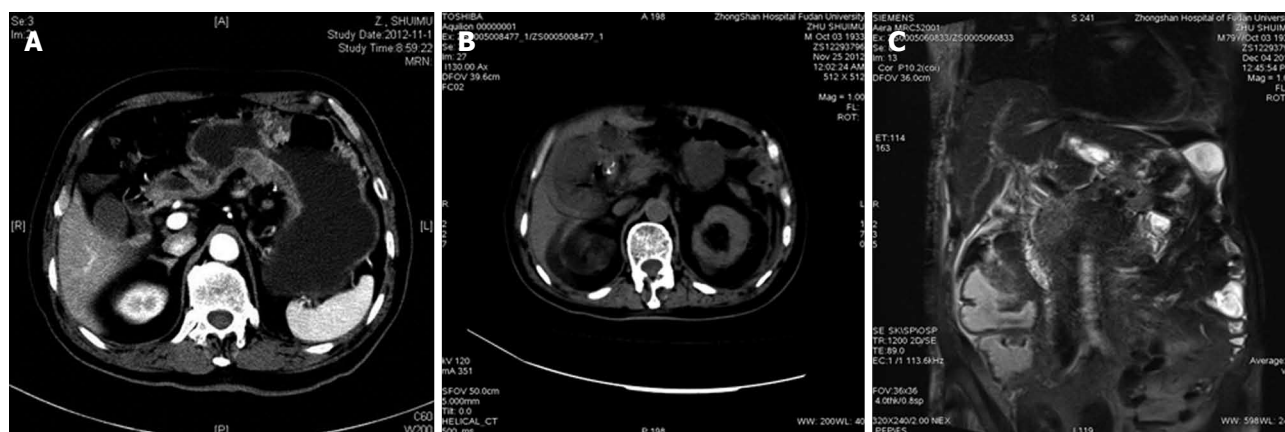


Figure 2 Computed tomography scan in case 2 displaying normal gallbladder (A) before operation, thickened gallbladder wall and swelling gallbladder (B), and magnetic resonance imaging showing no dilation of bile ducts on the 19th day after operation (C).

151 $\mu\text{mol/L}$. Pro-calcitonin (PCT) was elevated to $> 100 \text{ ng/mL}$, and serum amylase was normal. Emergency abdominal CT showed an enlarged gallbladder with thickened wall, intestinal obstruction and fluid accumulation in the abdominal and pelvic cavities (Figure 2B). In consideration of the possibility of strangulating intestinal obstruction with bloody ascites, abdominocentesis was performed and 20 mL transparent and faint yellow ascites was obtained. The patient was treated with antibiotics. At 05:00 AM on the next day, typical manifestations of septic shock appeared, including hypoxemia (SpO_2 85%), loss of consciousness, tachycardia (124 bpm) and a sharp decrease in BP (85/50 mmHg). Emergency exploratory laparotomy was carried out. There was severe adhesion in the abdomen among the intestines, and about 400 mL slightly turbid and yellow ascites was drained during the operation. The hypertonic gallbladder was about $10 \text{ cm} \times 6 \text{ cm} \times 5 \text{ cm}$, and the wall was apparently edematous with several gangrenous lesions in the body and fundus of the gallbladder. Due to the severe adhesion in the region of the hepatoduodenal ligament and difficulties in clearly detecting the structures of the bile ducts and Calot's triangle, most of the gallbladder was removed instead of performing total cholecystectomy, and the stumps were sutured. Antibiotic therapy with meropenem was continued after the patient was transferred to intensive care after the operation, and his body temperature fluctuated around 38°C . Liver function of the first day after the operation showed: TB/CB 150.2/140.5 $\mu\text{mol/L}$, and liver protective therapy was given, but he showed an increasingly elevated direct bilirubin level, with a relatively normal level of transaminase (Table 1). For better judgment of the function of the common bile duct and hepatic ducts, magnetic resonance imaging and ultrasound were both performed several times after surgery and no dilated bile ducts and obstruction were detected (Figure 2C). However, total and direct bilirubin kept on increasing as high as TB/CB 541.1/491.4 $\mu\text{mol/L}$. The patient gradually developed severe pulmonary infection with multiresistant bacteria and fungi 2 wk after the operation. Chronic heart failure occurred and finally he died from

severe multiple organ dysfunction syndrome and septic shock 42 d after the operation.

Case 3

A 72-year-old male patient had been suffering from upper abdominal distension accompanied with repeated nausea and vomiting for nearly 1 mo. Gastric endoscopy showed a large mass in the antrum with involvement of the pylorus, and biopsy showed mucinous adenocarcinoma. Preoperative CT and positron emission CT (PET-CT) showed lymph node metastasis in the peri-gastric, hepatic portal and peri-pancreatic region at cT4N3M1. According to the strong wishes of the patient and his family, reductive distal gastrectomy with Billroth I reconstruction was performed. On day 6 after the operation, the patient complained of tachypnea and fever (38.9°C). CT and ultrasound showed fluid accumulation and intra-abdominal infection, so a drainage tube was placed guided by ultrasound, and tentative antibiotic treatment was given. On day 12, he presented with an incision infection. On day 18, his temperature returned to normal, and repeated CT showed that fluid accumulation in the abdomen decreased. Semi-liquid diet was well tolerated on day 21 and drainage tubes were all removed by day 28 after surgery, so he was discharged on the next day. On day 37, the patient suddenly felt upper abdominal distension accompanied by nausea and vomiting, and the body temperature was still normal. He was treated by adequate fluid perfusion and fasting in the emergency room but the symptoms were not released. Right upper abdominal pain and fever arose on the next day, and he was readmitted again. Physical examination showed temperature 38.9°C , heart rate 105 bpm, BP 160/80 mmHg, and apparent tenderness and concussion in the right upper abdomen, with positive Murphy's sign. Laboratory examination showed WBC count was elevated ($18.05 \times 10^9/\text{L}$). Liver function, renal function and serum amylase were all within the normal range. Emergency ultrasound showed an enlarged gallbladder ($9 \text{ cm} \times 4.5 \text{ cm}$ in size) with exudation around it (Figure 3). Percutaneous transhepatic gallbladder drainage was practiced immediately, and the

Table 1 Clinical data of the three cases

	Case 1	Case 2	Case 3
First admission			
Gender	Male	Male	Male
Age (yr)	54	79	72
BP (mmHg)	130/70	120/80	120/80
Diagnosis	Gastric cancer	Gastric cancer	Gastric cancer
Gallbladder disease	No	No	No
Surgery	Total gastrectomy	Total gastrectomy	Distal gastrectomy
Anastomosis	Roux-en Y	Roux-en Y	Billroth I
Complications	No	No	Infection of abdominal cavity and the incision
Time of feeding	Day 7	Day 7	Day 22
Time of discharge	Day 8	Day 9	Day 28
Pathology	Poorly differentiated adenocarcinoma	Poorly differentiated adenocarcinoma	Mucinous adenocarcinoma
TNM stage	T2bn0m0	T4aN3M0	T4an3m0
Onset of acute acalculous cholecystitis after gastric surgery			
Symptoms	Fever, upper abdominal discomfort, vomiting	Fever, upper abdominal pain	Fever, upper abdominal pain, vomiting
Onset time	Day 13	Day 9	Day 38
Incentive	Postprandial	Postprandial	Postprandial
Temperature (°C)	39.5	38.5	38
BP (mmHg)	100/60	90/60	160/100
Physical examination	Percussion pain of hepatic region	Percussion pain of hepatic region	Tenderness of right upper quadrant abdomen
Septic shock	Day 1 after onset	Day 0 after onset	No septic shock
WBC (10 ⁹ /L)	24.35	17.8	11.9
PLT (10 ⁹ /L)	121	106	403
Amyl (U/L)	46	73	74
TB/CB (μmol/L)	6.7/5	85/74	11.4/6
ALT/AST (U/L)	47/51	225/671	27/22
r-GT (U/L)	118	338	61
PCT (ng/mL)	21.23	> 100	NA
CRP (mg/L)	136.3	138.1	NA
Cr (μmol/L)	156	151	52
APTT/PT (s)	36.8/16.5	42.8/18.7	40.8/13.3
INR	1.33	1.62	1.16
CT performance	Pericholecystic fluid collection, gallbladder enlargement	Pericholecystic, abdominal and pelvic fluid collection, gallbladder enlargement	NA
Ultrasonography	Thickened wall of enlarged gallbladder	NA	Thickened wall of enlarged gallbladder
Severity grading (Tokyo guideline)	Severe	Severe	Mild
Treatment for acute acalculous cholecystitis			
Time of treatment	36 h after onset	17 h after onset	10 h after onset
Type of treatment	Cholecystostomy	Cholecystectomy	Interventional percutaneous gallbladder drainage
Ascites	No	400 mL	No
Gallbladder size (cm)	8 × 4	10 × 6	10 × 4.5
Gangrene formation	Yes	Yes	NA
Complications	No	Hepatic failure and respiratory dysfunction	No
Pathology	Necrosis of gallbladder wall	Necrosis of gallbladder wall	NA
Survival	Yes	No	Yes
Time of recovery or death	Day 14 after the treatment	Day 42 after the treatment	Day 5 after the treatment

NA: Not available; BP: Blood pressure; WBC: White blood cell; PLT: Platelet; Amyl: Amylase; TB/CB: Total bilirubin/Conjugated bilirubin; ALT/AST: Alanine aminotransferase/Aspartate aminotransferase; r-GT: r-Glutamyl transferase; PCT: Procalcitonin; CRP: C reactive protein; Cr: Creatinine; APTT/PT: Activated partial thromboplastin time/Prothrombin time; INR: International normalized ratio.

fluid drained out was slightly turbid, and antibiotic therapy was continued. His temperature returned to normal and abdominal pain was apparently resolved on the next day. On day 4, he started a semi-fluid diet, and he was discharged on day 5 after readmission, with the drainage tube in place. On day 19, the tube was removed.

DISCUSSION

AAC is defined as acute cholecystitis (AC) without detection of any gallstones, which accounts for 2%-12% of AC cases^[4,5]. AAC immediately after gastric operation is also rare. To gain a better understanding of the clinical

Table 2 Acalculous cholecystitis after gastric operation

Ref.	Year	Gender	Age (yr)	Prior surgery	Days after surgery	Treatment	Gangrene formation	Survival
Schwegman <i>et al</i> ^[27]	1953	Male	43	TG	11	CO/PTGD	No	Yes
Glenn <i>et al</i> ^[28]	1979	Male	65	PG	45	CE	NA	No
Howard ^[5]	1981	Male	42	DG	NA	CE	No	NA
Lens <i>et al</i> ^[29]	1981	Male	75	TG	NA	CO/PTGD	NA	Yes
	1981	Male	77	TG	NA	CE	NA	Yes
Glenn <i>et al</i> ^[30]	1982	Male	55	DG	42	CO/PTGD	NA	Yes
Becker <i>et al</i> ^[31]	1986	Male	37	TG	7	CE	No	NA
Fabian <i>et al</i> ^[32]	1986	Male	68	PG	NA	CE	NA	No
Jensen <i>et al</i> ^[33]	1987	Male	NA	TG	NA	NA	NA	NA
	1987	Male	NA	TG	NA	NA	NA	NA
	1987	Male	NA	PG	NA	NA	NA	NA
Berger <i>et al</i> ^[34]	1989	NA	NA	TG	NA	CO/PTGD	NA	NA
	1989	NA	NA	TG	NA	CO/PTGD	NA	NA
Wu <i>et al</i> ^[35]	1995	Male	56	TG	18	CE	Yes	No
	1995	Male	62	TG	21	CO/PTGD	NA	Yes
	1995	Male	66	TG	19	CE	Yes	No
	1995	Male	64	TG	8	CE	Yes	Yes
	1995	Male	65	TG	11	CE	Yes	Yes
	1995	Male	57	TG	14	CE	No	Yes
	1995	Male	75	TG	18	CE	Yes	Yes
	1995	Male	72	TG	16	CE	Yes	Yes
	1995	Male	74	TG	18	CE	No	Yes
Paul ^[36]	2001	Female	71	PG	11	CE	Yes	Yes
Oh <i>et al</i> ^[37]	2009	NA	NA	TG	NA	CE	NA	Yes
	2009	NA	NA	TG	NA	CE	NA	Yes
	2009	NA	NA	TG	NA	CE	NA	Yes
	2009	NA	NA	TG	NA	CE	NA	Yes
	2009	NA	NA	TG	NA	CO/PTGD	NA	Yes
Liu <i>et al</i> ^[38]	2010	Female	64	DG	9	AA	NA	Yes
	2010	Male	76	DG	14	CO/PTGD	NA	Yes
	2010	Male	64	TG	14	CO/PTGD	NA	Yes
Liu (our report)	2013	Male	60	TG	10	CO/PTGD	Yes	Yes
	2013	Male	79	TG	9	CE	Yes	No
	2013	Male	72	DG	37	CO/PTGD	NA	Yes

TG: Total gastrectomy; DG: Distal gastrectomy; PG: Proximal gastrectomy; NA: Not available; PTGD: Percutaneous transhepatic gallbladder drainage; CE: Cholecystectomy; CO: Cholecystostomy; AA: Antibiotics alone.

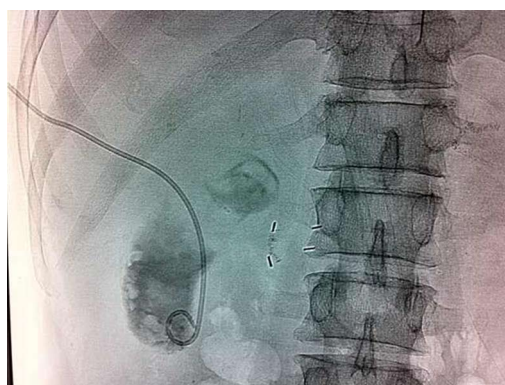


Figure 3 Ultrasound guided percutaneous transhepatic gallbladder drainage in case 3.

features of AAC and guide our diagnosis and treatment, we reviewed previous studies. We systematically searched the English-language articles in the PubMed (1950-2013), using the following terms: “acute cholecystitis”, “acute acalculous cholecystitis”, “postoperative acute cholecystitis” and “postoperative acute acalculous cholecystitis”, and 7928 articles were obtained, among which, 1952 were

case reports and 101 were meta-analyses or systematic reviews. The studies after gastric surgery were clearly defined, and the criteria for no stones on imaging, no stones detected at surgery, and histology-confirmed acute cholecystitis were used. Cases excluded were those with postoperative AAC after trauma, non-gastric operations, and where the antecedent surgery was not clearly identified. Patients with common bile duct and intrahepatic stones were also excluded. All obtained articles were carefully examined and their reference lists were systematically reviewed to identify other studies for potential inclusion in this review. None of the 101 reviews concerned postoperative AAC except for one Japanese case report^[6]. Finally, 13 articles/case reports and 34 cases (as well as the three cases reported in the present report) were included in the following review (Table 2, partially adapted from Crichlow *et al*^[7]). We concluded that this disease occurred mostly in men (25 men and 2 women) at an average age of 64.13 ± 11.32 years (range: 37-79 years), similar to that in previous reports of male and elderly predominance^[4,8-10]. The mean time to manifestation of postoperative AAC symptoms was 17.6 d (range: 7-45 d). According to the available data, gangrene formation was

Table 3 Statistical analysis for all 34 cases of acute acalculous cholecystitis after gastric operation *n* (%)

	Gender		Age		<i>P</i> value	Surgery				Treatment				Gangrene formation	
	Male	Female	< 65 yr	≥ 65 yr		TG	DG	PG	<i>P</i> value	CE	CO/ PTGD	AA	<i>P</i> value	Yes	No
Age (yr)															
< 65	10 (45.5)	1 (50.0)			1.000										
≥ 65	12 (54.5)	1 (50.0)													
Surgery					0.111										
TG	18 (72.0)	0 (0.0)	8 (72.7)	8 (61.5)	0.217										
DG	4 (16.0)	1 (50.0)	3 (27.3)	2 (15.4)											
PG	3 (12.0)	1 (50.0)	0 (0.0)	3 (23.1)											
Treatment					0.003				0.054						
CE	14 (63.6)	1 (50.0)	5 (45.5)	10 (76.9)	0.221	15 (65.2)	1 (20.0)	3 (100.0)							
CO/PTGD	8 (36.4)	0 (0.0)	5 (45.5)	3 (23.1)		8 (34.8)	3 (60.0)	0 (0.0)							
AA	0 (0.0)	1 (50.0)	1 (9.1)	0 (0.0)		0 (0.0)	1 (20.0)	0 (0.0)							
Gangrene formation					1.000				0.303				1.000		
Yes	8 (61.5)	1 (100.0)	3 (42.9)	6 (85.7)		8 (66.7)	0 (0.0)	1 (100.0)		8 (66.7)	1 (50.0)	0 (0.0)			
No	5 (38.5)	0 (0.0)	4 (57.1)	1 (14.3)		4 (33.3)	1 (100.0)	0 (0.0)		4 (33.3)	1 (50.0)	0 (0.0)			
Survival					1.000				0.058				0.165		0.509
Yes	15 (75.0)	2 (100.0)	8 (88.9)	9 (69.2)		17 (85.0)	4 (100.0)	1 (33.3)		12 (70.6)	7 (100.0)	1 (100.0)		6 (66.7)	3 (100.0)
No	5 (27.8)	0 (0.0)	1 (11.1)	4 (30.8)		3 (15.0)	0 (0.0)	2 (66.7)		5 (29.4)	0 (0.0)	0 (0.0)		3 (33.3)	0 (0.0)

TG: Total gastrectomy; DG: Distal gastrectomy; PG: Proximal gastrectomy; PTGD: Percutaneous transhepatic gallbladder drainage; CE: Cholecystectomy; CO: Cholecystostomy; AA: Antibiotics alone.

found in 64.3% of patients (9/14) at the time of diagnosis and treatment, and overall mortality rate was 25% (5/20). All the statistical results are listed in Table 3.

Although various factors are associated with AAC, such as critical illness, surgery, trauma, burns, and total parenteral nutrition, bile stasis and ischemia of the gallbladder wall are the two principle proposed etiologies^[11]. After operation, persistent fasting, hypovolemia, parental nutrition and even ileus all can result in bile stasis^[11,12]. From pathological examination, we usually obtain evidence for gallbladder ischemia, which documents multiple arterial occlusions with minimal venous filling^[11]. Associated risk factors for ischemia include hemorrhage, dehydration, administration of vasoactive drugs, and microcirculation disorder such as long-term hypertension, diabetes and congestive heart failure^[11], which is similar to that of Case 2 (hypertension, history of cerebral infarction, and persistent infusion of vasoactive drugs during surgery). In these patients, any insult can exacerbate gallbladder ischemia.

The signs and symptoms of ACC after gastric surgery are usually similar to those of calculous cholecystitis, but due to the recent operation, physical examination can be unreliable. Furthermore, surgeons mostly intend to attribute this kind of abnormality to the previous surgery, so diagnosis can be delayed and confused with other postoperative complications, such as duodenal stump leakage, postanastomotic leakage, abdominal cavity infection, and incisional discomfort. It has been reported that gangrene occurs in 40%-80% of patients with AAC and in 2%-31% of patients with acute calculous cholecystitis^[13-16], which seems to be an important risk factor of poor outcome. However, on most occasions, gangrene is simply caused by delayed diagnosis and treatment. Imaging modalities such as ultrasound and CT usually work in the diagnosis. Importantly, the mortality rate of AAC after gastric surgery is high (25% in this review) which may result, to some extent, from delayed diagnosis and treatment, and the mortality of patients with postoperative cholecystitis and calculous cholecystitis is as high as 23%-40%. The mortality of elderly patients (≥ 75 years) tends to be higher than that of younger patients^[2,4,17-19], and comorbidity such as diabetes may increase the risk of death^[20]. At the same time, the impact of diagnostic delay can be reflected by a 64.3% rate of gangrene formation, which is higher than that in outpatients (25%-36.4%)^[10,21]. It has been reported that mortality of AAC was lower in a case series of emergency patients who had no prior immediate operations^[22].

The symptoms and treatments differed among the present three cases, as did the outcomes. However, there was still something in common that could be preliminary pro-

posed. Clinical manifestations are usually not typical, but the disease course can progress rapidly, which can even threaten patients' lives. In the perioperative period, local inflammatory exudation and adhesion are severe, which may further increase the pressure within the biliary tract and promote bacteremia or even septic shock. In contrast, patients usually suffer from weakness, dehydration and suppressed immunity, which damage the compensational ability to some extent when infection occurs. In the present three cases, the time of onset ranged from day 9 to 38 after prior surgery. All three patients demonstrated high fever and right upper abdominal discomfort, with sharply elevated WBC counts. In Cases 1 and 2, C-reactive protein and PCT were apparently elevated (not available in Case 3), and finally bacteremia and septic shock developed. These symptoms are easily confused with other complications immediately after gastric surgery, especially with duodenal stump leakage. Although ultrasound and CT are helpful in diagnosis, sometimes diagnosis can only be confirmed during emergency exploratory laparotomy. If diagnosed and managed in time, more efficiency treatment and better outcome can be expected, as in Case 3.

Percutaneous transhepatic gallbladder drainage (PTGD) can seldom be considered first, due to the difficulty of early precise diagnosis of immediate AAC after gastric surgery. Unfortunately, the exact reason for obstructive jaundice in Case 2 was not clear, because there was no evidence of bile duct occlusion. Furthermore, the management of AAC is still controversial. Actually, three different treatment strategies were carried out in these three patients, including cholecystostomy, cholecystectomy, and PTGD, and hospitalization days, cost and outcomes also completely differed among them. The major clinical information for all the three cases is listed in Table 3.

In most cases, it is difficult to remove the inflammatory gallbladder, especially to dissect the triangle of Calot, due to prior surgery, local exudation and adhesions, therefore, cholecystostomy was performed in the first case, because of the difficulty and impropriety of cholecystectomy. Regardless of the prior operation, the optimal treatment of acute cholecystitis with sepsis in critically ill patients is not well defined, and there is only limited evidence about whether percutaneous drainage or cholecystectomy is preferred. The reported mortality rates do not show any difference^[23]. However, we considered on the basis of the present three cases and former reports that timely surgical intervention is usually necessary, such as exploratory laparotomy, especially when the disease progresses without definite diagnosis, or direct ultrasound-guided PTGD if a diagnosis of AAC has been confirmed. Of note, mortality is predominantly related to the severity of the underlying disease rather than the ongoing gallbladder sepsis because prompt treatment is performed in time, as in Case 2.

From the experience of our three cases and literature review, we preliminarily propose that for patients with AAC immediately after GC, timely management is necessary. Patients after surgery for GI anastomosis

may profit from supportive examinations such as CT to exclude complications like leakage of the anastomosis. However, in these circumstances, minor cholecystitis can be neglected, and fluid accumulation around the gallbladder can result from the former operation, especially when symptoms are atypical. Occasionally, an emergency situation requires immediate exploratory laparotomy to save the patient's life, or even for the purpose of confirming the diagnosis, although such an operation is not always the best choice. However, if we are sure that cholecystitic sepsis has arisen, ultrasound-guided PTGD is the proper course to treat the sepsis. It has been reported that 35% of AAC patients treated with PTGD did not need any further treatment for cholecystitis and eventually remained symptom free. Besides, the rate of complication is much lower in PTGD treated patients compared with that of cholecystitis (8.7% *vs* 47%)^[23]. PTGD has even been recommended in some studies as a definitive treatment for AAC^[24,25]. PTGD has been shown to be a life-saving, minimally invasive, alternative management in high-risk AAC patients^[25,26], especially for those who have undergone a recent gastric operation. Last but not least, there were some other important problems in the whole process of treatment in addition to delayed diagnosis and management. For example, gastrojejunal bypass in a symptomatic patient might be less invasive in an elderly GC patient with a stage T4N + M1 tumor, as in Case 3, in spite of the insistence of the patient and his family. In Case 2, we considered exploratory laparoscopy to confirm the diagnosis, but finally we abandoned it, because we were not sure whether intestinal obstruction had occurred, in which situation, inhalation pneumonia could have been caused by laparoscopy. Exploratory laparoscopy might be another effective treatment choice in these situations.

AAC is a rare but severe complication immediately after gastric operation. It can advance rapidly and be hard to diagnose at an early stage. Emergency surgical intervention is usually necessary when it happens, and if there are no contraindications, cholecystectomy combined with antibiotic therapy should be performed. If inoperability and diagnosis of AAC are confirmed, a cholecystostomy and PTGD are possible and usually effective procedures.

COMMENTS

Case characteristics

Three male gastric cancer patients presented with fever and abdominal pain after gastric surgery.

Clinical diagnosis

Murphy's sign and percussion pain in the liver region were more or less positive in these cases.

Differential diagnosis

Duodenal stump leakage, postanastomotic leakage, abdominal cavity infection, intestinal obstruction, and incisional discomfort.

Laboratory diagnosis

White blood cell count and pro-calcitonin were significantly elevated.

Imaging diagnosis

A swelling gallbladder with fluid accumulation can be found by computed tomography or ultrasound.

Pathological diagnosis

Bronchoscopy and biopsy have revealed wild-type K-ras adenocarcinoma of the colon, CDX2/CK20 positive and TTF1/CK7/CD58 negative.

Treatment

Percutaneous transhepatic gallbladder drainage or other timely surgical interventions such as cholecystectomy and cholecystostomy are necessary.

Related reports

Acute acalculous cholecystitis (AAC) after gastric operations has seldom been reported, but the disease is usually serious once it happens. Besides, the argument about synthetic cholecystectomy during gastric operation has never stopped.

Experiences and lessons

This case report not only presents the symptoms and treatments of AAC after gastric operation, but also indicates the severity of the disease and necessity of timely management; otherwise, septic shock may happen, which will threaten patient's life.

Peer review

This article reviews and analyzes reported cases to confirm the prevalence and common treatments of AAC after gastric operation, and is helpful in clinical settings.

REFERENCES

- Gillen S, Michalski CW, Schuster T, Feith M, Friess H, Kleeff J. Simultaneous/Incidental cholecystectomy during gastric/esophageal resection: systematic analysis of risks and benefits. *World J Surg* 2010; **34**: 1008-1014 [PMID: 20135313 DOI: 10.1007/s00268-010-0444-1]
- Kalliafas S, Ziegler DW, Flancbaum L, Choban PS. Acute acalculous cholecystitis: incidence, risk factors, diagnosis, and outcome. *Am Surg* 1998; **64**: 471-475 [PMID: 9585788]
- Maggiore D. [Acute postoperative acalculous cholecystitis: case report and review of the literature]. *G Chir* 1999; **20**: 457-460 [PMID: 10645061]
- Savoca PE, Longo WE, Zucker KA, McMillen MM, Modlin IM. The increasing prevalence of acalculous cholecystitis in outpatients. Results of a 7-year study. *Ann Surg* 1990; **211**: 433-437 [PMID: 2322038 DOI: 10.1097/0000658-199004000-00009]
- Howard RJ. Acute acalculous cholecystitis. *Am J Surg* 1981; **141**: 194-198 [PMID: 7457736 DOI: 10.1016/0002-9610(81)90155-0]
- Hatada T, Kobayashi H, Tanigawa A, Fujiwara Y, Hanada Y, Yamamura T. Acute acalculous cholecystitis in a patient on total parenteral nutrition: case report and review of the Japanese literature. *Hepatogastroenterology* 1999; **46**: 2208-2211 [PMID: 10521969]
- Crichlow L, Walcott-Sapp S, Major J, Jaffe B, Bellows CF. Acute acalculous cholecystitis after gastrointestinal surgery. *Am Surg* 2012; **78**: 220-224 [PMID: 22369833]
- Lebigot J, Aubé C, Vuillemin E, Anglade E, Adam B, Caron C. [Percutaneous cholecystostomy in non-surgical patients]. *J Radiol* 2000; **81**: 1627-1632 [PMID: 11104978]
- Ryu JK, Ryu KH, Kim KH. Clinical features of acute acalculous cholecystitis. *J Clin Gastroenterol* 2003; **36**: 166-169 [PMID: 12544202 DOI: 10.1097/00004836-200302000-00015]
- Parithivel VS, Gerst PH, Banerjee S, Parikh V, Albu E. Acute acalculous cholecystitis in young patients without predisposing factors. *Am Surg* 1999; **65**: 366-368 [PMID: 10190365]
- Barie PS, Eachempati SR. Acute acalculous cholecystitis. *Gastroenterol Clin North Am* 2010; **39**: 343-57, x [PMID: 20478490 DOI: 10.1016/j.gtc.2010.02.012]
- Huffman JL, Schenker S. Acute acalculous cholecystitis: a review. *Clin Gastroenterol Hepatol* 2010; **8**: 15-22 [PMID: 19747982 DOI: 10.1016/j.cgh.2009.08.034]
- Wilson AK, Kozol RA, Salwen WA, Manov LJ, Tennenberg SD. Gangrenous cholecystitis in an urban VA hospital. *J Surg Res* 1994; **56**: 402-404 [PMID: 8170139 DOI: 10.1006/jsre.1994.1064]
- Boggi U, Di Candio G, Campatelli A, Oleggini M, Pietrabissa A, Filippini F, Bellini R, Mazzotta D, Mosca F. Percutaneous cholecystostomy for acute cholecystitis in critically ill patients. *Hepatogastroenterology* 1999; **46**: 121-125 [PMID: 10228775]
- Merriam LT, Kanaan SA, Dawes LG, Angelos P, Prystowsky JB, Rege RV, Joehl RJ. Gangrenous cholecystitis: analysis of risk factors and experience with laparoscopic cholecystectomy. *Surgery* 1999; **126**: 680-65; discussion 680-65; [PMID: 10520915]
- Laurila J, Syrjälä H, Laurila PA, Saarnio J, Ala-Kokko TI. Acute acalculous cholecystitis in critically ill patients. *Acta Anaesthesiol Scand* 2004; **48**: 986-991 [PMID: 15315616 DOI: 10.1111/j.0001-5172.2004.00426.x]
- Inoue T, Mishima Y. Postoperative acute cholecystitis: a collective review of 494 cases in Japan. *Jpn J Surg* 1988; **18**: 35-42 [PMID: 3290556 DOI: 10.1007/BF02470844]
- Haffif A, Gutman M, Kaplan O, Winkler E, Rozin RR, Skornick Y. The management of acute cholecystitis in elderly patients. *Am Surg* 1991; **57**: 648-652 [PMID: 1928982]
- Glenn F. Surgical management of acute cholecystitis in patients 65 years of age and older. *Ann Surg* 1981; **193**: 56-59 [PMID: 7458450 DOI: 10.1097/0000658-198101000-00009]
- Ransohoff DF, Miller GL, Forsythe SB, Hermann RE. Outcome of acute cholecystitis in patients with diabetes mellitus. *Ann Intern Med* 1987; **106**: 829-832 [PMID: 3579069 DOI: 10.7326/0003-4819-106-6-829]
- Ganpathi IS, Diddapur RK, Eugene H, Karim M. Acute acalculous cholecystitis: challenging the myths. *HPB (Oxford)* 2007; **9**: 131-134 [PMID: 18333128 DOI: 10.1080/13651820701315307]
- Strasberg SM. Clinical practice. Acute calculous cholecystitis. *N Engl J Med* 2008; **358**: 2804-2811 [PMID: 18579815 DOI: 10.1056/NEJMcip0800929]
- Melloul E, Denys A, Demartines N, Calmes JM, Schäfer M. Percutaneous drainage versus emergency cholecystectomy for the treatment of acute cholecystitis in critically ill patients: does it matter? *World J Surg* 2011; **35**: 826-833 [PMID: 21318431 DOI: 10.1007/s00268-011-0985-y]
- Granlund A, Karlson BM, Elvin A, Rasmussen I. Ultrasound-guided percutaneous cholecystostomy in high-risk surgical patients. *Langenbecks Arch Surg* 2001; **386**: 212-217 [PMID: 11382324 DOI: 10.1007/s004230100211]
- Shirai Y, Tsukada K, Kawaguchi H, Ohtani T, Muto T, Hatakeyama K. Percutaneous transhepatic cholecystostomy for acute acalculous cholecystitis. *Br J Surg* 1993; **80**: 1440-1442 [PMID: 8252358 DOI: 10.1002/bjs.1800801129]
- Davis CA, Landercasper J, Gundersen LH, Lambert PJ. Effective use of percutaneous cholecystostomy in high-risk surgical patients: techniques, tube management, and results. *Arch Surg* 1999; **134**: 727-31; discussion 731-2 [PMID: 10401823 DOI: 10.1001/archsurg.134.7.727]
- Schwegman CW, de Muth WE. Acute cholecystitis following operation for unrelated disease. *Surg Gynecol Obstet* 1953; **97**: 167-172 [PMID: 13077154]
- Glenn F, Wantz GE. Acute cholecystitis following the surgical treatment of unrelated disease. *Surg Gynecol Obstet* 1956; **102**: 145-153 [PMID: 13299028]
- Lens J, Lagaay EL, van Schilfgaarde R, Feuth JD. Acute acalculous cholecystitis. *Neth J Surg* 1981; **33**: 190-194 [PMID: 7301161]
- Glenn F, Becker CG. Acute acalculous cholecystitis. An increasing entity. *Ann Surg* 1982; **195**: 131-136 [PMID: 7055388 DOI: 10.1097/0000658-198202000-00002]
- Becker CD, Burckhardt B, Terrier F. Ultrasound in postoperative acalculous cholecystitis. *Gastrointest Radiol* 1986; **11**: 47-50 [PMID: 3510933 DOI: 10.1007/BF02035031]
- Fabian TC, Hickerson WL, Mangiante EC. Posttraumatic and postoperative acute cholecystitis. *Am Surg* 1986; **52**: 188-192 [PMID: 3954269]

- 33 **Jensen C**, Aparicio R, Cardemil G, Fernandez M, Braghetto I. Postoperative acute acalculous cholecystitis. *Ital J Surg Sci* 1987; **17**: 27-30 [PMID: 3294736]
- 34 **Berger H**, Pratschke E, Arbogast H, Stäbler A. Percutaneous cholecystostomy in acute acalculous cholecystitis. *Hepatogastroenterology* 1989; **36**: 346-348 [PMID: 2620902]
- 35 **Wu CC**, Chen CY, Wu TC, Iiu TJ, P'eng PK. Cholelithiasis and cholecystitis after gastrectomy for gastric carcinoma: a comparison of lymphadenectomy of varying extent. *Hepatogastroenterology* 1995; **42**: 867-872 [PMID: 8847037]
- 36 **Paull DE**. Acute cholecystitis in the immediate postoperative period following esophagogastrectomy. *Am Surg* 2001; **67**: 97-99 [PMID: 11206907]
- 37 **Oh SJ**, Choi WB, Song J, Hyung WJ, Choi SH, Noh SH. Complications requiring reoperation after gastrectomy for gastric cancer: 17 years experience in a single institute. *J Gastrointest Surg* 2009; **13**: 239-245 [PMID: 18850251 DOI: 10.1007/s11605-008-0716-3]
- 38 **Liu XS**, Zhang Q, Zhong J, Zhu KK, Mu YC, Yu JR. Acute cholecystitis immediately after radical gastrectomy: a report of three cases. *World J Gastroenterol* 2010; **16**: 2702-2704 [PMID: 20518096 DOI: 10.3748/wjg.v16.i21.2702]

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