High rate of common bile duct stones and postoperative abscess following percutaneous cholecystostomy

R Furtado, P Le Page, G Dunn, GL Falk

Concord Repatriation General Hospital, NSW, Australia

ABSTRACT

INTRODUCTION The short and long-term outcomes in patients managed with percutaneous cholecystostomy (PCY) at a single institution are described.

METHODS A retrospective study was conducted for patients treated between February 2000 and November 2012. Patient charts, imaging and biochemical data were reviewed. Patient demographics, presenting clinical features and treatment variables were noted. Outcome variables were length of admission, 30-day mortality, 30-day unplanned readmission, tube dislodgement, abscess formation, subsequent endoscopic retrograde cholangiography and surgery, complications after surgery and median overall survival.

RESULTS PCY was performed for 55 patients for acute cholecystitis where surgical risk was very high. The 30-day readmission rate was 20% ($n=11$), the 30-day mortality rate was 9% ($n=5$) and median survival was 59 months (95% confidence interval: 30–88 months). The median follow-up duration was 68 months. Tubes were dislodged in 15 patients (27%) and an abscess occurred after PCY in 5 patients (9%). Subsequent endoscopic common bile duct stone extraction was required in 20 patients (36%). Cholecystectomy was planned in 22 patients and an abscess occurred following the cholecystectomy in 5 (23%).

CONCLUSIONS Although a PCY is lifesaving, significant morbidity can arise during recovery. This study demonstrates a high rate of choledocholithiasis (44%), tube dislodgement (27%) and postoperative abscess (23%) compared with previous reports.

KEYWORDS

Cholecystostomy – Acute cholecystitis – Sepsis – Cholecystectomy

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CORRESPONDENCE TO

Ruelan Furtado, E: ruelanfurtado@yahoo.co.uk

Acute cholecystitis (AC) in elderly patients is associated with a mortality of 7–11%.¹ In severe cases, antibiotics are inadequate and the treatment risk is extreme. Percutaneous cholecystostomy (PCY) is often used in this cohort as a temporising measure to improve patient status. With this treatment, rapid drainage of sepsis can be obtained with image guidance, under local anaesthesia.

While PCY may pose less immediate risk than surgery, the clinical course of patients is seldom uncomplicated. Mortality rates have been reported from 0% to 15% and morbidity rates from 0% to 25%.^{2–9} Furthermore, as the majority of patients do not have definitive surgery, recurrent AC is common.¹⁰ This study was performed to quantify the risk of short and long-term morbidity and mortality for this cohort, using recognised scoring systems for co-morbidities and complications.

Methods

A retrospective review of all patients treated with PCY or surgical cholecystostomy for AC between February 2000

and November 2012 was carried out at Concord Repatriation General Hospital. This is a tertiary hospital in metropolitan Sydney that has a large geriatric referral base. AC is managed by general surgeons as well as specialist upper gastrointestinal surgeons. Patients were identified from a radiology database. Clinical parameters were extracted from chart review of hospital, surgeon and general practitioner records.

Data were collected on demographics, co-morbidities, duration of cholecystostomy drainage and tube size. Details were obtained of the initial white cell count, serum bilirubin levels and the presence/absence of apparent gallbladder perforation on imaging. AC was defined by the clinical, biochemical and radiological findings.¹¹ Findings considered were right upper quadrant tenderness, fever, a raised white cell count, ultrasonography features of cholecystitis (including tenderness localised to the gallbladder or an abnormal appearance of the wall of the gallbladder) and pericholecystic stranding on computed tomography (CT).

Patients with concomitant acute pancreatitis were excluded from the study ($n=1$) as well as those in whom

PCY was performed primarily for jaundice in the setting of hepatobiliary malignancy ($n=2$). Two patients with recurrent AC who had a background of hepatobiliary malignancy were included.

The severity of the presentation was based on the presence of severe sepsis or shock. Severe sepsis was defined as AC with systemic inflammatory response syndrome and evidence of organ dysfunction or hypoperfusion abnormality. Septic shock was defined as severe sepsis with hypotension, persisting despite adequate fluid resuscitation.¹² Patient co-morbidities were accounted for by the Charlson co-morbidity index.¹⁵ Both the raw scores and the age adjusted scores were used. Other indications for PCY besides severe sepsis and co-morbidities were also noted.

PCY was performed predominantly by one interventional radiologist (GD). The preferred method was with an ultrasonography guided, transhepatic approach. In almost all cases, locking all-purpose drainage catheters (Boston Scientific, Marlborough, US) were used. Cholangiography was planned after tube insertion to assess cystic duct patency and to rule out ductal calculi, distal obstruction and biliary leak.

The specific outcome measures were length of index admission, 30-day mortality, 30-day unplanned readmission, repeat biliary sepsis, subsequent endoscopic retrograde cholangiography (ERCP) or cholecystectomy, and bile leak, haematoma or abscess formation after PCY and surgery. Postoperative and post-cholecystostomy abscesses were defined as sepsis occurring within 30 days of either procedure, with a collection in the subphrenic or subhepatic space.¹⁴ The clinical picture and either ultrasonography or CT were used for diagnosis.

Surgical outcomes in the 30 days following PCY insertion were ranked according to the Clavien–Dindo classification.¹⁵ Significant outcomes were defined as complications classed as Clavien–Dindo grade III or greater, occurring within 30 days of the PCY. Both complications related directly to PCY (eg peritonitis requiring laparotomy) and exacerbations of systemic problems by the presenting condition were assessed in the postoperative outcomes.

Statistical analysis

Descriptive statistics were analysed with SPSS® version 21 (IBM, New York, US). Survival and median follow-up duration were calculated using Kaplan–Meier and reverse Kaplan–Meier¹⁶ methods.

Results

During the study period, there were 961 admissions for AC (2000–2012). PCY was performed on 55 patients (5.7%) (Table 1). The median Charlson co-morbidity index was 2 and when adjusted for age, it was 7. The median follow-up duration was 68 months (95% confidence interval [CI]: 16–120 months). Two patients (3.6%) were lost to follow-up.

On presentation, 11 patients (20%) had radiological signs of localised gallbladder perforation or an abscess. Calculi were seen in 50 patients (91%).

Table 1 Patient characteristics at the time of initial presentation with AC ($n=55$)

	<i>n</i>
Median age in years	80 (range: 39–100)
Male-to-female ratio	36:19
<i>Indication</i>	
Chronic cardiorespiratory disease precluding anaesthesia	25 (45%)
Severe sepsis	19 (35%)
Patient decided to not undergo surgery	5 (9%)
Other	6 (11%)
Median white cell count ($\times 10^9/l$)	15.4 (range: 5.9–45.1)
Median bilirubin in $\mu\text{mol/l}$	18 (range: 4–202)
Perforated AC	11 (20%)
Median initial admission length in days	15 (range: 4–264)
Calculi	50 (91%)
Median duration of PCY drainage in days	30 (range: 0–242)
Unplanned readmission within 30 days	10 (18%)
<i>Co-morbidities</i>	
Hypertension	23 (42%)
Ischaemic heart disease	22 (40%)
Arrhythmia	21 (38%)
Heart failure	17 (31%)
Type 2 diabetes mellitus	16 (29%)
Chronic obstructive pulmonary disease	11 (20%)
Asthma	10 (18%)
Pneumonia	9 (16%)
Hypercholesterolaemia	9 (16%)
Malignancy	8 (15%)
Neurocognitive disorders	14 (25%)
Charlson co-morbidity index	2 (range: 0–7)
Age adjusted Charlson co-morbidity index	7 (range: 1–12)
Recurrent AC	8 (15%)
ERCP after PCY	21 (38%)
Abscess after PCY	5 (9%)
Abscess after surgery	5 (23%)
Median survival in months	59 (95% CI: 30–88)
AC = acute cholecystitis; ERCP = endoscopic retrograde cholangiopancreatography; PCY = percutaneous cholecystostomy; CI = confidence interval	

Severe sepsis or septic shock was the indication for PCY in 19 patients (35%). Failure of conservative treatment was the indication in the remaining 36 (65%). Cholecystostomy was performed instead of cholecystectomy because of chronic cardiorespiratory conditions in 25 cases (45.5%), dementia in 2 cases (3.6%), malignancy in 2 cases (3.6%) and failed surgery in 2 cases (3.6%). Owing to patient frailty, a joint decision was made by the patient and the treating surgical team to defer cholecystectomy after failure of antibiotics in 5 cases (9.1%).

Technical success of PCY was achieved in 54 patients (98%). Tube placement was transhepatic in 52 and transperitoneal in 3 cases. A transperitoneal tube was placed at CT in one patient because of technical difficulty at ultrasonography. Surgical cholecystostomy was performed in two patients. One of these patients had a semielective, open cholecystostomy under local anaesthesia after a PCY tube was dislodged and symptoms recurred. The other patient had a cholecystostomy placed at laparoscopy as adhesions precluded a cholecystostomy and open conversion was thought unlikely to be tolerated. The tubes were 8–14Fr (81% were 8Fr), and they were left in situ for between 0 and 242 days (median: 30 days). Radiological studies (cholangiography, CT or US) or laparotomy showed dislodged tubes in 15 cases (27%).

Cholangiography was performed in 41 patients (75%) prior to tube removal, at a median of 7 days following tube insertion (range: 2–242 days). The cystic duct was completely occluded in two cases and contained filling defects in five. The bile duct had filling defects in 15 patients.

The median length of the initial admission for AC patients treated with PCY was 15 days (range: 4–264 days). Unplanned readmission to hospital within 30 days of discharge after AC occurred in 10 patients (18.2%). The 30-day mortality rate was 7.3% ($n=4$).

PCY results

Major complications in the 30 days following PCY tube insertion occurred in 24 patients (44%). Complications requiring management under local anaesthesia (Clavien–Dindo IIIa) occurred in six cases. This comprised rewiring or reinserting blocked tubes in four and percutaneous drainage of a subsequent abscess in two patients. An abscess developed in five patients after PCY placement and was associated with tube dislodgement in four, the fifth patient having presented with perforated AC.

Outcomes after PCY requiring management under general anaesthesia (Clavien–Dindo IIIb) occurred in 12 cases. This was for ERCP ($n=10$), cholecystectomy for failure of PCY to treat sepsis ($n=1$) and insertion of an implanted cardioverter defibrillator ($n=1$). Peritonitis (requiring an emergency laparotomy with an intensive care unit stay) occurred in one patient and death during the entire course of admission occurred in five cases (9%).

Following discharge, recurrent biliary sepsis occurred in eight cases (AC $n=7$, cholangitis $n=1$; 15%). Over the entire study period, ERCP for choledocholithiasis was performed in 20 patients (36%). Bile duct stones were removed at the time of cholecystectomy in another four cases, giving a

Table 2 Operations performed on patients ($n=22$)

Operation type	<i>n</i>
Laparoscopic cholecystectomy	9
Open cholecystectomy + BDE	3
Open cholecystectomy	3
Surgery abandoned	2
Laparoscopic cholecystectomy + BDE	2
Laparoscopic subtotal cholecystectomy	2
Open subtotal cholecystectomy	1
BDE = bile duct exploration	

prevalence of choledocholithiasis in this cohort of 44%. The median overall survival for the entire cohort was 59 months (95% CI: 30–88 months).

Surgical results

Cholecystectomy was intended in 22 patients (44% of patients with calculous cholecystitis) (Table 2) and performed in 20. The median interval to surgery from admission was 45 days (range: 3–752 days). Laparoscopic cholecystectomy (LC) was performed in 13 patients (2 subtotal cholecystectomies) and LC with bile duct exploration was performed in 2. Open surgery was required in seven cases, including one subtotal cholecystectomy and three bile duct explorations. Cholecystectomy was attempted unsuccessfully in two patients. Cholecystostomy was performed at laparoscopy in one patient owing to dense adhesions precluding safe dissection of Calot's triangle and on-table haemodynamic instability. Cardiac arrest occurred at induction of anaesthesia in another patient, who was treated with resuscitation and PCY in the same day.

Antibiotics were given at the induction of anaesthesia in all patients undergoing surgery. PCY tubes were removed at the time of surgery in 12 patients (60%). A closed suction drain was placed at the time of surgery in 19 cases (86%). A subphrenic or subhepatic abscess occurred in five patients (23%) after cholecystectomy, all having had drainage at cholecystectomy. There was no mortality or bile duct injury after surgery.

Discussion

Efficacy of PCY in frail patients

In our cohort, the survival rate for the index admission was 91%, even with severe sepsis or shock on presentation in 35% and perforated AC in 20%. Furthermore, patients were frail, with a median Charlson co-morbidity index of 7. These findings confirm that mortality after PCY is low despite sepsis and frailty.¹⁷

Even though patients were frail, the median survival following presentation was almost five years. This raises the question of whether cholecystectomy should be offered to more patients. Recurrent biliary sepsis occurred in 15%

Table 3 Major morbidity after percutaneous cholecystostomy	
Clavien–Dindo grade	n
IIIa	6
IIIb	12
IVa	1
IVb	0
V	5

over the time period studied, which can be explained by only 49% of patients having definitive treatment, all with interval cholecystectomy.

High rate of complications

Adverse outcomes were unexpectedly common after both PCY and cholecystectomy. Following PCY, outcomes classified as Clavien–Dindo grade III or greater occurred in 44% of cases (Table 3). The most common of these included the need for semiurgent biliary drainage with ERCP in 16% and a subsequent percutaneous drainage procedure in 14%. A complication rate of 6% after PCY has been reported.¹⁷ The studies on which this figure is based, however, did not include subsequent procedures as adverse outcomes so a direct comparison cannot be made. The current study shows that although PCY is minimally invasive and usually successful, there is a high rate of subsequent intervention needed.

After cholecystectomy, subphrenic or subhepatic abscesses occurred in 23% of cases. Preoperative ERCP and stone extraction was a common precursor, occurring in four of the five patients with an abscess. Cholecystectomy after ERCP is known to be longer and more difficult,^{18,19} often owing to adhesions in the hepatoduodenal ligament.²⁰

High rate of choledocholithiasis

Choledocholithiasis was found in 44% of cases in our study, requiring gallstone removal at endoscopy in 20 patients and at surgery in a further 4. This rate is substantially higher than those in other studies of patients undergoing PCY, which have reported rates of between 7% and 23% (Table 4).^{2–4} In elderly patients, a high index of suspicion for choledocholithiasis and early imaging of the bile duct could expedite biliary drainage.

Surgical technique

Interval cholecystectomy was preferred to early LC in the study cohort owing to severe compromise. During the same period, early cholecystectomy was practised as the preferred approach for AC. Although no benefit for routine, delayed laparoscopic cholecystectomy in cases of AC has been demonstrated,^{21,22} large trials have not been undertaken on elderly patients needing PCY. Instead, small studies have shown that early LC after PCY is associated with high rates of open conversion and morbidity.^{23,24}

A local series from 2014 found that early cholecystectomy in octogenarians is associated with significantly higher rates of bile duct stones, complications and mortality as well as a longer postoperative stay than for younger patients.²⁵ The rate of complications following LC in the elderly is estimated to be 22%.^{5,7,9,26–28} In the present study, a similar rate of major morbidity was observed (23%) to the rates reported for other series of patients undergoing interval cholecystectomy after PCY (Table 4).^{2–9,29}

Routine drainage at cholecystectomy did not prevent abscess formation in five patients. It is possible that abscesses in this group occur subsequent to dividing adhesions from the PCY track. It is speculated that drainage of both the subhepatic and subphrenic spaces as well as suturing the liver, where the catheter entered, may protect against abscess formation.

Tube complications

Table 4 Previous studies on cholecystectomy after cholecystostomy						
Study	Number of patients	Mean age (years)	Tube size (Fr)	Duration of PCY (days)	Proportion of patients offered a cholecystectomy	Postoperative morbidity
Hamy, 1997 ²	4	77.8	8.5	14	9.8%	0%
Sugiyama, 1998 ³	10	85	7	24	26%	0%
Borzellino, 1999 ⁴	70	81	7–8	5.4	84%	24%
Spira, 2002 ⁵	30	74	8.3	>60	80%	0%
Macri, 2006 ⁶	25	76	8	5–8	80%	24%
Morse, 2010 ⁷	11	72	8	49	36%	18%
Han, 2012 ⁸	67	70.8	8.5	2–21	96%	9%
Hsieh, 2012 ⁹	53	75.9	8	16	74%	19%
Byrne, 2003 ²⁹	22	63	8	54	43%	Not known
Present study	22	77.6	8	30	40%	23%

PCY = percutaneous cholecystostomy

The proportion of tubes that dislodged was relatively high (27%) compared with the average rate of 9% in the literature.¹⁷ Early dislodgement was associated with a collection or peritonitis. It is difficult to maintain tube position in older people, some of whom have dementia, visual impairment and need assistance with mobility. In one study with a very low rate of tube dislodgement (2%), tubes were secured with sutures as well as locking catheters.²⁹

Conclusions

PCY appears satisfactory for the treatment of AC in unwell patients. The data in this study are unusual in that the rates of tube dislodgement and procedural morbidity were higher than those reported previously. Despite being unwell at presentation, these patients have a median life-span of five years following discharge, supporting definitive management if the risk is acceptable.

References

1. Reiss R, Deutsch AA. State of the art in the diagnosis and management of acute cholecystitis. *Dig Dis* 1993; **11**: 55–64.
2. Hamy A, Visset J, Likholatnikov D *et al*. Percutaneous cholecystostomy for acute cholecystitis in critically ill patients. *Surgery* 1997; **121**: 398–401.
3. Sugiyama M, Tokuhara M, Atomi Y. Is percutaneous cholecystostomy the optimal treatment for acute cholecystitis in the very elderly? *World J Surg* 1998; **22**: 459–463.
4. Borzellino G, de Manzoni G, Ricci F *et al*. Emergency cholecystostomy and subsequent cholecystectomy for acute gallstone cholecystitis in the elderly. *Br J Surg* 1999; **86**: 1,521–1,525.
5. Spira RM, Nissan A, Zamir O *et al*. Percutaneous transhepatic cholecystostomy and delayed laparoscopic cholecystectomy in critically ill patients with acute calculus cholecystitis. *Am J Surg* 2002; **183**: 62–66.
6. Macri A, Scuderi G, Saladino E *et al*. Acute gallstone cholecystitis in the elderly: treatment with emergency ultrasonographic percutaneous cholecystostomy and interval laparoscopic cholecystectomy. *Surg Endosc* 2006; **20**: 88–91.
7. Morse BC, Smith JB, Lawdahl RB, Roettger RH. Management of acute cholecystitis in critically ill patients: contemporary role for cholecystostomy and subsequent cholecystectomy. *Am Surg* 2010; **76**: 708–712.
8. Han IW, Jang JY, Kang MJ *et al*. Early versus delayed laparoscopic cholecystectomy after percutaneous transhepatic gallbladder drainage. *J Hepatobiliary Pancreat Sci* 2012; **19**: 187–193.
9. Hsieh YC, Chen CK, Su CW *et al*. Outcome after percutaneous cholecystostomy for acute cholecystitis: a single-center experience. *J Gastrointest Surg* 2012; **16**: 1,860–1,868.
10. Riall TS, Zhang D, Townsend CM *et al*. Failure to perform cholecystectomy for acute cholecystitis in elderly patients is associated with increased morbidity, mortality, and cost. *J Am Coll Surg* 2010; **210**: 668–679.
11. Trowbridge RL, Rutkowski NK, Shojania KG. Does this patient have acute cholecystitis? *JAMA* 2003; **289**: 80–86.
12. Bone RC, Balk RA, Cerra FB *et al*. Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. *Chest* 1992; **101**: 1,644–1,655.
13. Charlson M, Szatrowski TP, Peterson J, Gold J. Validation of a combined comorbidity index. *J Clin Epidemiol* 1994; **47**: 1,245–1,251.
14. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control* 2008; **36**: 309–332.
15. Dindo A, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004; **240**: 205–213.
16. Schemper M, Smith TL. A note on quantifying follow-up in studies of failure time. *Control Clin Trials* 1996; **17**: 343–346.
17. Winbladh A, Gullstrand P, Svanvik J, Sandström P. Systematic review of cholecystostomy as a treatment option in acute cholecystitis. *HPB* 2009; **11**: 183–193.
18. Costi R, DiMauro D, Mazzeo A *et al*. Routine laparoscopic cholecystectomy after endoscopic sphincterotomy for choledocholithiasis in octogenarians: is it worth the risk? *Surg Endosc* 2007; **21**: 41–47.
19. Reinders JS, Gouma DJ, Heisterkamp J *et al*. Laparoscopic cholecystectomy is more difficult after a previous endoscopic retrograde cholangiography. *HPB* 2013; **15**: 230–234.
20. Donkervoort SC, van Ruler O, Dijkman LM *et al*. Identification of risk factors for an unfavorable laparoscopic cholecystectomy course after endoscopic retrograde cholangiography in the treatment of choledocholithiasis. *Surg Endosc* 2010; **24**: 798–804.
21. Lo CM, Liu CL, Fan ST *et al*. Prospective randomized study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. *Ann Surg* 1998; **227**: 461–467.
22. Kolla SB, Aggarwal S, Kumar A *et al*. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a prospective randomized trial. *Surg Endosc* 2004; **18**: 1,323–1,327.
23. Kim HO, Ho Son B, Yoo CH, Ho Shin J. Impact of delayed laparoscopic cholecystectomy after percutaneous transhepatic gallbladder drainage for patients with complicated acute cholecystitis. *Surg Laparosc Endosc Percutan Tech* 2009; **19**: 20–24.
24. Melloul E, Denys A, Demartines N *et al*. 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.
25. Nikfarjam M, Yeo D, Perini M *et al*. Outcomes of cholecystectomy for treatment of acute cholecystitis in octogenarians. *ANZ J Surg* 2014; **84**: 943–948.
26. Tambyraja AL, Kumar S, Nixon SJ. Outcome of laparoscopic cholecystectomy in patients 80 years and older. *World J Surg* 2004; **28**: 745–748.
27. Paran H, Zissin R, Rosenberg E *et al*. Prospective evaluation of patients with acute cholecystitis treated with percutaneous cholecystostomy and interval laparoscopic cholecystectomy. *Int J Surg* 2006; **4**: 101–105.
28. McGillicuddy EA, Schuster KM, Barre K *et al*. Non-operative management of acute cholecystitis in the elderly. *Br J Surg* 2012; **99**: 1,254–1,261.
29. Byrne MF, Suhocki P, Mitchell RM *et al*. Percutaneous cholecystostomy in patients with acute cholecystitis: experience of 45 patients at a US referral center. *J Am Coll Surg* 2003; **197**: 206–211.