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ORIGINAL ARTICLE

Clinical outcomes of a percutaneous cholecystostomy for acute cholecystitis: a multicentre analysis

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Abstract

Background: The aim of this study was to review a series of consecutive percutaneous cholecystostomies (PC) to analyse the clinical outcomes.

Methods: All patients who underwent a PC between 2000 and 2010 were reviewed retrospectively for indications, complications, and short- and long-term outcomes.

Results: Fifty-three patients underwent a PC with a median age was 74 years (range 14–93). 92.4% (n = 49) of patients were American Society of Anesthesiologists (ASA) III and IV. 82% (43/53) had ultrasound-guided drainage whereas 18% (10/53) had computed tomography (CT)-guided drainage. 71.6% (n = 38) of PC's employed a transhepatic route and 28.4% (n = 15) transabdominal route. 13% (7/53) of patients developed complications including bile leaks (n = 5), haemorrhage (n = 1) and a duodenal fistula (n = 1). All bile leaks were noted with transabdominal access (5 versus 0, P = 0.001). 18/53 of patients underwent a cholecystectomy of 4/18 was done on the index admission. 6/18 cholecystectomies (33%) underwent a laparoscopic cholecystectomy and the remaining required conversion to an open cholecystectomy (67%). 13/53 (22%) patients were readmitted with recurrent cholecystitis during follow-up of which 7 (54%) had a repeated PC. 12/53 patients died on the index admission. The overall 1-year mortality was 37.7% (20/53).

Conclusions: Only a small fraction of patients undergoing a PC proceed to a cholecystectomy with a high risk of conversion to an open procedure. A quarter of patients presented with recurrent cholecystitis during follow-up. The mortality rate is high during the index admission from sepsis and within the 1 year of follow-up from other causes.

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Introduction

Acute cholecystitis is a common cause of acute surgical admissions and an early cholecystectomy at the index admission is a widely accepted method of treatment.[1] A laparoscopic cholecystectomy for acute cholecystitis in selected patients is associated with a good outcome with minimal morbidity.[2] However, the morbidity and mortality rates are significantly higher in high-risk groups to as high a 14–46%.[3] A percutaneous cholecystectomy (PC) is a commonly used procedure to treat acute cholecystitis in patients with significant co-morbid disease,[4] either as a bridging procedure in patients with severe sepsis[5] followed by an interval cholecystectomy or a definitive procedure in patients who are unlikely to be fit for further surgery.[6–8] This study aims to define the indications, complications and clinical outcomes of a PC in the treatment of acute cholecystitis at two university hospitals.

Methods

All consecutive patients who underwent a PC at two university hospitals, Ninewells Hospital, Dundee, UK and Auckland City Hospital (ACH), Auckland, New Zealand between January 2000 and October 2010 were reviewed from a prospectively maintained patient database.

The data collected included demographics, indications, American Society of Anesthesiologists (ASA) grading, duration of symptoms, results of laboratory and radiological investigations and the interval between admission and PC. The clinical outcomes included the duration of hospital stay, duration of PC catheter retention, presence of common bile duct stones, index cholecystectomy, morbidity and mortality. In addition, data on readmissions with recurrent cholecystitis requiring a repeat PC and 1-year mortality were obtained.

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Definitions

Acute cholecystitis was defined as right upper quadrant pain associated with pyrexia, leucocytosis>11 × 109/ml, and ultrasound/computed tomography (CT) evidence of acute inflammation. The severity grading of acute cholecystitis was made according to the Tokyo Guidelines.[9]

Technique of percutaneous cholecystostomy

The PC was performed by consultant interventional radiologists under CT or ultrasound guidance. The later was used in conjunction with fluoroscopic screening to more accurately guide placement. A similar technique was used in both centres. The choice of modality varied according to the personal preference of the operator. A transhepatic approach was the preferred option as it reduces the risk of bile leak. However, a transperitoneal approach was employed when the gall bladder was grossly distended and adherent to the abdominal wall, or when an unfavourable anatomy renders transhepatic access very difficult.

Ultrasound or CT was used to guide the site of local anaesthetic and the subsequent cholecystostomy. Access was achieved using the Seldinger technique, in which a fine bore needle is initially directed into the gallbladder. If using CT guidance, the position of the needle, wires and catheter were identified on sequential focused CT scans. Contrast was not usually required. However, for fluoroscopic screening, contrast was instilled via the needle to ensure accurate placement of the needle tip within the gallbladder lumen. Using a series of dilators and wires, the tract was dilated to site a pigtail catheter (Flexima; Boston Scientific, Natick, MA, USA). The size of the catheter depended on the viscosity of the gallbladder contents but an 8-F was typical. The gallbladder contents were aspirated and sent for cultures, after which the catheter was left on free drainage.

The PC catheters were left *in situ* for a minimum period of 6 weeks prior to removal. Prior to removal of the catheter, all patients underwent a cholangiogram through the cholecystostomy to ensure flow of contrast into the common bile duct (CBD) and also to exclude CBD obstruction from stones. In the presence of CBD stones, an endoscopic retrograde cholangiopancreatography (ERCP) was performed to clear the CBD prior to removal of the catheter.

Statistical analysis

Statistical analysis was performed using SPSS software version 17 (SPSS, Chicago, IL, USA). Continuous data were described using median and range. Fisher's exact tests were used to analyse categorical data. A two-tailed *P*-value less than 0.05 was considered statistically significant.

Results

A total of 53 patients were identified with a median age of 74 years (range, 14–93). The demographics, ASA grading, laboratory parameters and radiological investigations are summarized in Table 1. Thirty-three patients (63%) had calculus cholecystitis, whereas 20 (37%) had acalculous cholecystitis. Seventy-seven per cent (41/53) of the patients had pericholecystic fluid confirming inflammation. Based on the Tokyo guidelines,[9] 40 patients were graded as grade 2 (moderate cholecystitis) and 13 patients as grade 3 (severe cholecystitis) with no patients with grade 1 cholecystitis (mild cholecystitis). The imaging modalities and the technique of PC (transhepatic versus transabdominal) are summarized in Table 1.

Table 1 Patient demographics and pre-operative investigations

Age – median (range):	74 years (14–93 years)
Gender (male/female):	1.5:1
ASA grade – number of patients (%):	
Grade I	1 (1.9%))
Grade II	3 (5.7%)
Grade III	18 (33.9%)
Grade IV	31 (58.5%)
Median duration symptoms(range):	1 (1–35) day(s)
Median duration from admission to PC (range): 3 (1–15) day(s)	
Laboratory investigations – median (range):	
WCC	14.33 (3.3–27.2) × 10^9/l
CRP	188.35 (5–489) mg/l
Bilirubin	20.35 (3–75 mg/dl
ALP	180.07 (53–1160) u/l
ALT	52.22 (7–402) u/l
Radiological investigations – number of patients (%)	
Ultrasonography (US)	18 (33.9%)
CT scan	15 (28.3%)
US+CT scan	20 (37.7%)
PC technique	
Transhepatic:	38 (71.6%)
Transabdominal:	15 (28.4%)
Imaging modality for PC	
Ultrasound guided PC	43 (82%)
CT guided PC	10 (18%)
Microbiology	
Sterile	19 (35.8%)
Escherichia coli	18
Klebsiella pneumoniae	7
Mixed growth	5
Enterococcus	3
Streptococcus milleri	1

PC, percutaneous cholecystostomy ; ASA, American Society of Anesthesiologists; WCC, white cell count; CRP, C-reactive protein; ALP, alkaline phosphatase ALT, alanine aminotransferase.

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Clinical outcomes

Twelve patients required intensive care unit (ICU) admission for organ failure and sepsis for optimization after PC. The median ICU stay was 6 days (range 4–11). The median hospital stay was 15.5 days (range 7–120). Seven patients (13%) developed procedure-related complications including bile leaks (n = 5), haemorrhage (n = 1) and a duodenal fistula (n = 1). All bile leaks were noted with transabdominal access (5, transabdominal versus 0, transhepatic, P = 0.001). Four bile leaks were managed with percutaneous radiological drainage of the collection. One patient underwent a laparotomy wash out and a cholecystectomy to control the leak. One patient, who was ASA grade IV, developed a significant haemorrhage from the gallbladder bed after the PC; however, declined any blood product transfusion and died from hypotensive shock. One choledochoduodenal fistula was noted on follow-up cholangiogram which was managed conservatively.

Six patients with deranged liver function tests were found to have CBD stones on magnetic resonance cholangiopancreatography (MRCP) and underwent an ERCP and retrieval of the stones. Amongst 13 patients who were admitted with grade 3 cholecystitis, 12 died on the same admission.

The median time to removal of the PC catheter was 43 days (range: 28–114). The patients who underwent an index cholecystectomy had the drain removed at surgery. There was one instance of catheter dislodgement resulting in bile leak requiring an emergency laparotomy and a cholecystectomy and the patient subsequently died from sepsis and multiorgan failure. One patient had the catheter left for 114 days as he was lost to follow-up until he represented to the hospital with an unrelated medical problem at which point it was removed. There were no instances of the need to leave the PC catheter *in situ* because of obstruction at the cystic duct. The median overall follow-up was 910 days (range 53 days–9.3 years).

Surgical treatment

Thirty-four per cent (18/53) of patients eventually had a cholecystectomy. The surgical outcomes are summarized in Fig. 1. Amongst the 18 patients who underwent surgery, 4 patients were ASA I and II in whom a PC was planned as a bridging procedure. In the remaining patients, a PC was used as a palliation for control of sepsis; however, 14 patients became suitable for a cholecystectomy after improvement in their overall condition. The overall mortality during follow-up was 45% (n = 24/53). Amongst these, 12/24 (50%) died on the index admission from sepsis (n = 11) and haemorrhage (n = 1); and a further 8/24 (33.3%) died within the first year and the remaining > 1 year (n = 4). The cause of death in the 12 patients during the follow-up were pneumonia (n = 3), a myocardial infarction (n = 2), stroke (n = 2), an intracranial bleed (n = 1), pancreatic cancer (n = 1), a ruptured abdominal aortic aneurysm (n = 1), lung cancer (n = 1) and recurrent sarcoma (n = 1).

Readmission

During follow-up, 13/53 (22%) of patients were readmitted with recurrence of symptoms. The median time to representation was 151 days (63–510). Seven patients with readmission required a repeat PC and the remaining patients were managed with antibiotic therapy with no further episodes during follow-up (Fig. 1). All of these patients had the PC catheter removed at 6 weeks. 6/7 (92%) patients with readmission on PC catheter cholangiogram at 6 weeks were noted to have a single large stone occluding the cystic duct and 1/7 patient had multiple stones with an associated CBD stone requiring ERCP and clearance of the duct. In all these patients, the PC catheter was removed after the drain output was minimal and non-bilious. No further readmissions were noted during follow up. There were no procedure-related complications.

Calculus versus acalculous cholecystitis

A subgroup analysis was performed comparing calculus and acalculous cholecystitis regarding the need for high dependency care and readmissions. 5/20 patients in the acalculous group required HDU/ICU admission compared with 7/33 (P = 0.74). There were 4 (4/20, 20%) readmissions in the acalculous group compared with 8 (8/33, 24%) in the calculus group (P = 1.00).

Discussion

The incidence of gallstone disease increases with the age.[10] The management of acute cholecystitis in the elderly and critically ill patients can be challenging as a result of high mortality and morbidity.[11] PC can be an emergency lifesaving procedure in these patients to resolve the acute phase with minimal intervention. Once the patient recovers adequately, further management can be either surgery or conservative management depending on the patients' co-morbid disease. In the present study, the indications for PC were two-fold. First, as a bridging procedure in low-risk patients (ASA grade I and II) who were severely septic, thus allowing them to recover before a cholecystectomy could be performed.[12] Second, as a definitive procedure in high-risk patients (ASA grade III and IV). In the present study, only a small fraction of patients were suitable for definitive surgery either on the index admission or at a later stage with a high conversion rate to an open procedure. In the present series, PC was used as a bridging procedure in a 14-year-old patient with severe cholecystitis and sepsis (ASA I) and three patients with ASA II who were considered high risk for general anaesthesia owing to associated pneumonia.

The procedure-related morbidity for PC is between 8–44% (Table 2). The majority of complications are related to failure to place the catheter, catheter displacement, bile duct injury and intracholecystic haemorrhage.[13] In the literature, both the transabdominal and transhepatic route have been described; however, the transhepatic route appears to be the more favoured route.[12,14,15] In the present series, the most common procedural-related morbidity was bile leak, requiring radiological intervention and the placement of an abdominal drain to control the leak

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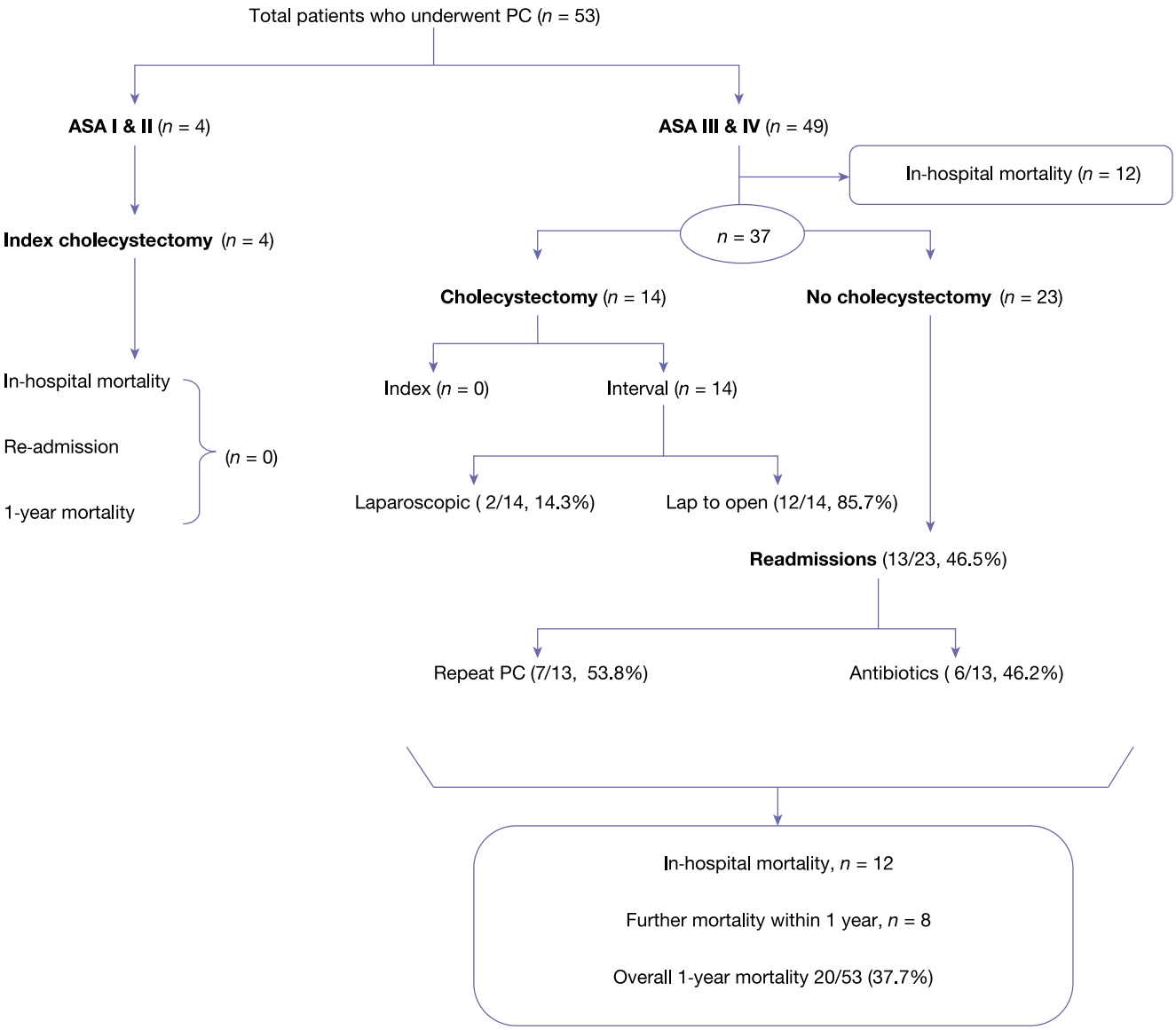

Figure 1 Overall outcomes after a percutaneous cholecystostomy (PC)

and this was more common with the transabdominal route. Based on this, we currently reserve the transabdominal route when the gall bladder is grossly distended and adherent to the abdominal wall, or when unfavourable anatomy renders transhepatic access very difficult.

The majority of the patients undergoing PC are generally unfit for a cholecystectomy at initial presentation. Yun *et al.* reviewed a series of 44 patients of which 34 patients underwent PC as a bridging procedure and a subsequent cholecystectomy and the rest as palliation for control of sepsis.[12] On the contrary, other studies have used PC as the definitive treatment for high-risk patients unsuitable for surgery.[7,29] In the present study, 18 patients (33%) underwent a cholecystectomy. Four patients underwent PC as a bridging procedure and underwent a cholecystectomy on the index admission. Although in the remaining 14 patients the PC was employed initially as a definitive treatment, during follow-up they were deemed fit for a cholecystectomy and underwent surgery albeit with a higher conversion rate.

The timing of removal of the PC catheter is a contentious issue. The average time period reported in the literature is 4–6 weeks[7,12] although some authors elected to remove the catheters on the index admission after resolution of the sepsis.[29] Our policy was to leave the drain for 6 weeks to ensure resolution of inflammation and to prevent bile leak after removal and a patent cystic and bile duct after transcatheter cholangiography. The readmission rate with recurrent cholecystitis in the present study was 22%.

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Table 2 Mortality and morbidity after a percutaneous cholecystostomy for acute cholecystitis in publications from 1995–2011

Author (Year)	Patient group	Number	30-day mortality (%)	Morbidity/ complications(%)	Outcome: cholecystectomy – number (%)
Vingan (1995)[16]	Various	34	7 (21%)	2 (6%)	–
Allmendinger (1995)[17]	Pregnant	2	–	–	–
Lo (1995)[18]	Various	48	14 (24%)[b]	7 (12%)	–
Melin (1995)[19]	Various	22	9 (41%)[a]	4 (18%)	–
Avrahami (1995)[20]	Various	10	(0%)	1 (10%)	–
Sheridan (1995)[21]	Burns patients	5	1 (20%)	(0%)	–
Hultman (1996)[22]	ICU patients	33	17 (52%)[a]	2 (6%)	–
Famulari (1996)[23]	Various	26	–	1 (4%)	–
Patterson (1996)[24]	Various	50	9 (18%)	2 (4%)	–
Van Overhagen (1996)[25]	Various	33	2 (6%)	6 (18%)	–
Hamy (1997)[26]	Various	41	5 (12%)[a]	1 (2%)	–
Boggi (1999)[27]	Various	11	(0%)	2 (18%)	–
Chang (2000)[28]	Veterans	24	6 (25%)	4 (17%)	–
Li (2004)[14]	Various	25	5 (20%)	3 (12%)	8 (32%)
Chok (2010)[15]	Various	23	5 (22%)[c]	1 (4%)	8 (35%)
Yun (2010)[12]	Various	44	6 (14%)[c]	–	31 (70%)
Gumus (2011)[7]	Haemodialysis	14	3 (21%)	–	–
Melloul (2011)[29]	ICU patients	23	3 (13%)	2 (8.7%)	–
Kim (2011)[30]	Various	63	11 (17%)[c]	6 (10%)	–
present study[d]	Various	53	?? (18%)[d]	7	18 (33%)

[a]Mortality defined as mortality until hospital discharge.
[b]Mortality defined as mortality within 60 days after tube placement.
[c]Mortality defined as mortality until the end of the follow-up period.
[d]Current study: mortality defined as mortality until hospital discharge.

This is slightly higher than the readmission rates described in the literature which range from 8% to 10%.[14,29] More than half the patients who were readmitted in the present series required a repeat PC insertion. Single large stones occluding the drainage of the cystic duct appeared to the most common cause. Although no further interventions were needed apart from PC intervention, several other interventional modalities were described in the literature such as percutaneous cystic duct stent insertion[31] and fluoroscopy guided gallstone removal[30] to prevent recurrent attacks.

A third of patients in the current series presented with acalculus cholecystitis. Although acalculus cholecystitis is historically more common in patients in severe comorbid disease,[32] there was no significant difference noted in the need for high-dependency care and readmissions between calculus and acalculus cholecystitis in the present series. In addition, although there is suggestion of gallbladder wall ischaemia and necrosis in patients with acalculus cholecystitis necessitating an open cholecystostomy,[32] more recent evidence and the data from the present series suggests a PC is safe with good post procedure outcomes and with advancing radiological techniques is increasingly becoming the technique of choice over an open procedure (Table 2). This is further reflected in the paucity of publications related to an open cholecystostomy in the recent past.

In conclusion, the present series has shown that a PC is a viable option for patients with acute cholecystitis when an immediate cholecystectomy is found to be unsafe. The procedure-related morbidity is acceptable and a third of patients subsequently undergo a cholecystectomy albeit with a higher conversion rate. A third of patients are readmitted with recurrent symptoms which are manageable with a repeat PC. The in-hospital mortality and the 1-year mortality were high reflecting the comorbid status of the population.

Conflicts of interest

None declared.

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