

Percutaneous cholecystostomy for delayed laparoscopic cholecystectomy in patients with acute cholecystitis: analysis of a single-centre experience and literature review

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Abstract

Introduction: Percutaneous cholecystostomy (PC) has been used as a relatively safe and efficient temporising measure in the treatment of acute cholecystitis (AC) in high-risk patients with serious co-morbidity and in elderly patients.

Aim: To assess the effectiveness, possible advantages, and complication of delayed laparoscopic cholecystectomy (LC) following PC in patients with AC.

Material and methods: A total of 52 LC for AC were divided into two groups: the first group consisted of patients who had PC followed by LC (PCLC group, $n = 12$), and the second group consisted of patients who had conservative treatment followed by LC (non-PCLC group, $n = 40$). Eight of these patients were males and four were female. The groups were statistically compared regarding their demographic, comorbidity, hospital stay, conservation, and complication rates. PC was performed via the transhepatic route under ultrasound guidance using local anaesthesia.

Results: Percutaneous cholecystostomy was technically successful in 12 patients with no attributable mortality or major complications. Upon the regression of cholecystitis and the decrease in APACHE-II scores, the PC catheter was unplugged and elective LC was scheduled for after 8 weeks. Ninety-two percent had complete resolution of symptoms within 48 h of intervention while 8% had partial resolution. All of the patients in PCLC and non-PCLC groups recovered well from cholecystectomy.

Conclusions: This study suggests that PCLC would not significantly improve the outcome of LC as assessed by conversion and morbidity rate and hospital stay compared with non-PCLC. Percutaneous cholecystostomy is a valid alternative for patients with acute cholecystitis. And our study shows that the laparoscopic cholecystectomy is a good option in high-risk patients who have been treated by percutaneous cholecystostomy for acute cholecystitis.

Introduction

One of the most frequent emergency admissions to general surgical services is acute cholecystitis (AC). Emergency cholecystectomy, delayed or interval laparoscopic cholecystectomy (LC) after medical treatment for AC is associated with high morbidity and mortality rates in patients with significant comorbidities and high-risk surgery [1, 2]. In patients with AC, percutaneous cholecystostomy (PC) has been advocated by many authors to be preferable to surgery, but no consensus has been reached on the need for subsequent cholecystectomy [1].

Surgical cholecystostomy, introduced by Bobbs, was the only available treatment of AC for more than a century. Percutaneous cholecystostomy was first described in 1921 as a diagnostic test. US-guided cholecystostomy for therapeutic purposes was first reported in 1979 [1]. The first report of PC for the management of acute cholangitis was in 1980. It has been used as a relatively safe and efficient temporising measure in the treatment of acute cholecystitis in high-risk patients with serious co-morbidity and in elderly patients, circumventing the general anaesthesia required for laparoscopic or open cholecystectomy [2, 3].

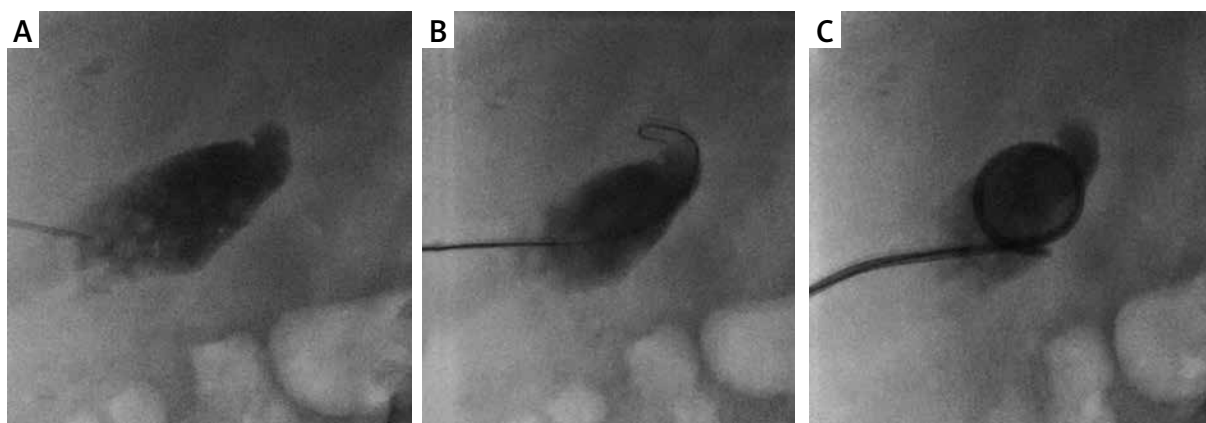


Figure 1. Fluoroscopic images showed contrast injection in the gallbladder and filling defects which were consistent with stones and biliary sludge (A), wire (B), and locking pig tail after placed in the gallbladder (C)

Aim

The purpose of this study was to assess the effectiveness, possible advantages, and complication of delayed LC following PC in patients with AC.

Material and methods

Study group

Between December 2014 and December 2015, 52 patients underwent LC for clinical AC in our hospital. Of these, 12 high-risk patients were treated by percutaneous cholecystostomy for acute cholecystitis before LC.

The review board of our hospital approved the study protocol.

A total of 52 LC for AC were divided into two groups: the first group consisted of patients who had PC followed by LC (PCLC group, $n = 12$), and the second group consisted of patients who had conservative treatment followed by LC (non-PCLC group, $n = 40$). The groups were statistically compared regarding their demographic, comorbidity, hospital stay, American Society of Anaesthesiologists (ASA) classification, conservation, and complication rates.

The diagnosis of acute cholecystitis was established by clinical data (history and physical examination), laboratory data (elevated leukocyte and C-reactive protein), and ultrasonographic findings (a thickened gallbladder wall and presence of concretions or sludge in the gallbladder). All patients were treated according to prospective guidelines, which included initial treatment with antibiotics, bowel rest, intravenous fluids, and analgesics. Antibiotics were used in all patients and included a combination of ampicillin and an aminoglycoside. Metronidazole was added in elderly patients and in diabetics to cover potential anaerobes.

We included 12 consecutive patients treated with PC for acute AC in high-risk patients with serious co-morbidity.

Twelve patients had PC tubes placed. Eight of these patients were males and 4 were female. All patients had AC and calculous cholecystitis. All patients were ASA III/IV.

Technique of percutaneous cholecystostomy

Percutaneous cholecystostomy was performed via the transhepatic route under ultrasound guidance using local anaesthesia. A pigtail catheter, 8 Fr in size, was introduced into the gallbladder using the Seldinger technique (Figures 1, 2). A sample of bile was aspirated and sent for culture. The same specialised interventional radiologist team (VC and OB) performed all procedures.

Operative technique

In the absence of symptoms related to a complication, under general anaesthesia, the four-cannula tech-



Figure 2. External appearance after percutaneous cholecystostomy

nique of LC was attempted in all cases. All of the PCLC group had delayed LC.

Statistical analysis

Student's *t* test or Pearson's χ^2 and Fisher's exact test were used for the comparisons of the two groups. The results were expressed as mean \pm SD. A *p*-value of < 0.05 was regarded as indicating a significant difference.

Results

All patients were considered to be at extremely high anaesthetic or surgical risk because many of these patients had underlying comorbid disease, as shown in Tables I, II. Percutaneous cholecystostomy was technically successful in 12 patients with no attributable mortality or major complications. Median duration of symptoms on presentation was 3.1 days (range: 1–6 days). All patients received antibiotics in addition to PC. Median interval from admission to PC was 2.1 day. Bile aspirated at the time tube placement was culture positive in 8 (67%) patients. *Escherichia coli* were the most frequently cultured pathogen (40%). Three patients developed non-drain-related complications; transient ileus ($n = 1$), atrial fibrillation ($n = 1$), and pneumonia ($n = 1$).

Upon the regression of cholecystitis and the decrease in APACHE II scores, the PC catheter was unplugged and elective LC was scheduled for after 8 weeks. "Ninety-two percent had complete relief of symptoms within 48 h of intervention while 8% had par-

tial relief of symptoms". All of the patients in PCLC and non-PCLC groups recovered well from cholecystectomy. In the non-PCLC group, 13 had early LC and 27 had delayed LC after a median of 73 days (range: 48–96) of admission because of delayed transfer from internal medicine after control of comorbidity. We defined early LC as operation within 72 h of admission and delayed LC as after 72 h of admission. The PCLC group included a large percentage of patients with combined medical disease when compared with the non-PCLC group. Post-LC complications occurred in 3 (25%) and 7 (17.5%) cases (PCLC and non-PCLC, respectively). Complications occurred in wound infection ($n = 1$) and pulmonary problems ($n = 2$) in the PCLC group and wound infections ($n = 2$), pulmonary problems ($n = 3$), and urinary problem ($n = 2$) in the non-PCLC group, but mortality was nil. Median LC time was 108 min (range: 45–115) in the PCLC group. It was longer than those of the non-PCLG early LC group (median: 92 min, range: 35–145) and non-PCLC group delayed LC group (83 min, range: 37–116). The conversion rate of the PCLC group was 16.6%. The mean hospital stay was 10.4 ± 2.3 (range: 4–16) days in the PC groups and 16.3 ± 1.8 (range: 9–23) days in the non-PCLC group ($p = 0.001$) (Table II). No perioperative and postoperative mortality was seen in the PCLC group or the non-PCLC group.

Discussion

Acute cholecystitis is a common disease with an incidence of 1–3% per year in patients with gallstones

Table I. Patients characteristics

No.	Age	Sex	AC aetiology	US finding	Comorbidity	a	b	c	PC unplugged [day]	Timing of LC [day]
1	29	M	Stone	AC	TM + HT	III	1	12	21	68
2	65	M	Stone	AC	DM, CAD	III	3	3	19	63
3	66	M	Stone	AC	CRF, DM, CAD, HT	IV	2	6	21	72
4	76	F	Stone	AC	CAD, CF	III	2	8	20	62
5	39	F	Stone	AC	CAD, DM	III	4	10	21	60
6	61	F	Stone	AC	DM, HT	IV	2	10	24	85
7	77	M	Stone	AC	CAD, MI	III	1	12	19	56
8	54	F	Stone	AC	DM, KY	IV	1	10	20	58
9	61	M	Stone	AC	DM, HT, CAD	IV	2	5	20	66
10	69	M	Stone	AC	COPD	III	2	11	22	70
11	70	M	Stone	AC	DM, HT, COPD	IV	2	20	24	70
12	62	M	Stone	AC	HT	III	3	16	20	63

a – ASA score, b – time from PC placement to LC (day), c – hospital length of stay (day), US – ultrasonography, CRF – chronic renal failure, CAD – coronary artery disease, COPD – chronic obstructive pulmonary disease, HT – hypertension, MI – myocardial infarction, CF – cardiac failure, DM – diabetes mellitus, AC – acute cholecystitis, TM – thalassemia minor, LC – laparoscopic cholecystectomy.

Table II. Clinical data

Parameter	PCLC group (n = 12)	Non-PCLC group (n = 40)	P-value
Age ^a , median (range) [years]	60.8 (29–77)	62.7 (27–82)	0.56
Gender ^b , male/female	8/4	32/8	1.15
BMI ^a , mean ± SD [kg/m ²]	22.7 ±2.2	20.3 ±1.5	1.00
Combined medical disease:	25	31	1.00
Diabetes mellitus	7	12	
Coronary artery disease	6	5	
Hypertension	6	14	
COPD	2	–	
Chronic renal failure	1	–	
Myocardial infarction	1	1	
Cardiac failure	1	–	
Thalassemia minor	1	–	
ASA grades, n (%)			
III ^b	7 (58.3)	17 (42.5)	0.03
IV ^b	5 (41.7)	5 (12.5)	0.04
LC time, median (range) [min]	108 (45–115)	87.5 (35–145)	0.001
Complication, n (%)	3 (25)	7 (17.5)	0.63
Total hospital stay, median [day]	10.4 ±2.3	16.3 ±1.8	0.001
Conversion rate ^b (%)	2/12 (16.6)	2/40 (5)	0.01

^aComparisons by Student's *t* test. ^bASA III and IV comparisons by Pearson χ^2 test, ASA – American Society of Anaesthesiologists, BMI – body mass index, LC – laparoscopic cholecystectomy, SD – standard deviation, COPD – chronic obstructive pulmonary disease.

(10–20%) [1, 2]. Acute cholecystitis carries a risk of complications including empyema, gangrene, perforation, and peritonitis. Cholecystectomy is the treatment of choice either open or laparoscopic. Nevertheless, two persistent issues remain: a high rate of conversion and the management of critically ill patients who are not good candidates for general anaesthesia. Also, the morbidity and mortality associated with emergent cholecystectomy is considerably high in critically ill patients: 55–66% and 14–30%, respectively [3].

Surgical cholecystostomy followed by delayed LC has been proposed for the management of these patients as an alternative treatment [3]. In recent years, ultrasound-guided PC followed by delayed LC has become an alternative to surgical cholecystostomy for AC in patients at high surgical risk [2]. Percutaneous cholecystostomy has been developed as a less invasive procedure compared to open cholecystectomy in critically ill patients with AC. The technical success of PC can be very high in experienced hands, with reported rates of 95–100% [4]. Learning curve of the performing team can decrease

these rates. The 100% technical success in our series is comparable with these rates [2, 4]. Mortality related to PC has a prevalence of 0–3%, whereas minor post-PC complications have been mentioned in 4–18% of cases. Bile leakage is the most common complications which may lead to life-threatening peritonitis [4].

It is a rather uncomplicated procedure with a low complication rate that is reported to range from 3 to 13% [5]. Percutaneous cholecystostomy was technically successful in all patients with no attributable mortality or major complications (such as bleeding, bile leak, sepsis following a pulled catheter, peritonitis, or shock) in this current study. In an effort to extend the benefits of PC and LC, we developed an alternative management approach for high-risk patients with AC. The patients were treated with PC for early decompression of gallbladder, followed by an early LC [6]. Akyürek *et al.* compared early PC followed by early cholecystectomy against medical treatment and delayed cholecystectomy in 70 high-risk patients (ASA grade II–IV), concluding that the PC and early cholecystectomy group benefit-

Table III. Review of the literature

Authors (references)	Year of publication	N	Mean age [years]	Calculous/acalculous	PC success (%)	Mortality (%)	Morbidity (%)	EC (%)
Patel <i>et al.</i> [10]	2000	53	63	39/14	83	17	?	47.2
Granlund <i>et al.</i> [11]	2001	51	71	28/23	90	16	4	2
Hatzidakis <i>et al.</i> [4]	2002	63	79	44/19	86	17.5	?	11
Spira <i>et al.</i> [12]	2002	55	74	?	98	5.5	1.8	4
Byrne <i>et al.</i> [13]	2003	45	63	?	78	22.2	15.6	0
Li <i>et al.</i> [14]	2004	25	81	?	92	20	12	8
Welschbillig-Meunier <i>et al.</i> [15]	2005	65	78	49/16	90	13.8	12.3	3
Ha <i>et al.</i> [16]	2008	65	63	65/0	91	12.3	?	?
Melloul <i>et al.</i> [5]	2010	23	65	11/12	91	13	0	8.7
Kortram <i>et al.</i> [9]	2011	27	83	27/0	92.6	14.8	25.9	14.8
Chung <i>et al.</i> [1]	2012	57	71	0/57	100	0	0	31.0
Sanjay <i>et al.</i> [17]	2013	53	74	33/20	100	7	18	33
Zerem <i>et al.</i> [18]	2014	36	75	32/4	100	2.8	41.7	16.7
Viste <i>et al.</i> [19]	2015	104	73.5	86/18	100	3.8	12.5	18.3
Present study	2015	12	60.8	12/0	100	0	25	100

PC – percutaneous cholecystostomy, EC – elective cholecystectomy.

ed from significantly shorter hospital stay and time to symptomatic improvement. There was no significant difference in postoperative complications between the groups [6]. The 27.3% morbidity rate and no mortality in the current study was comparable with morbidity rates of 3% to 4% and mortality rates of 0.4% to 3.1% in the literature [7]. Three patients developed non-drain-related complications. The safety of PC is well demonstrated in published studies and in our study (Table III).

So far, there are only two published randomised studies related to PC in calculous cholecystitis. Hatzidakis *et al.* found no difference in complications following PC and antibiotics versus conservative treatment only, whereas Akyürek *et al.* concluded that PC and early laparoscopic cholecystectomy was favourable compared to PC and LC later on [4, 6]. In a review including those randomised trials Gurusamy *et al.* concluded that so far there is no hard evidence concerning the benefit of PC in acute cholecystitis [8]. The results following the Dutch “Chocolate study” randomising between PC and LC in severely morbid patients will hopefully solve some of these issues [9].

Conclusions

The results of this study suggest that PCLC would not significantly improve the outcome of LC as assessed

by conversion and morbidity rate and hospital stay compared with non-PCLC. Percutaneous cholecystostomy has a role in the definitive management of high-risk group patients with acute cholecystitis. It is convenient, has a relatively low and acceptable complication rate, and is rapidly effective. Interval laparoscopic cholecystectomy can be safely performed. Percutaneous cholecystostomy is a valid alternative for patients with acute cholecystitis. Our study shows that the laparoscopic cholecystectomy is a good option in high-risk patients who have been treated by percutaneous cholecystostomy for AC.

Conflict of interest

The authors declare no conflict of interest.

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