Long-term results of percutaneous cholecystostomy for definitive treatment of acute acalculous cholecystitis : a 10-year single-center experience

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Abstract

Background and study aims : **Conventional use of percutaneous cholecystostomy [PC] is bridging therapy to delayed cholecystectomy for acute cholecystitis in high-surgical risk patients. Primary aim of this report is to evaluate the long-term outcome of PC as a definitive treatment for acute acalculous cholecystitis [AAC].**
Patients and methods : **Seventy-one AAC patients who underwent PC procedure were identified. Fifty-one interventions in 47 patients who were treated only with PC and followed-up after catheter withdrawal were reviewed to evaluate the long-term efficacy of PC as a definitive treatment for AAC.**
Results : **Technical and short-term clinical success rates were 100% and 92%, respectively. In-hospital mortality rate was 9.3%, minor complication rate was 5.3%, major complication rate was 2.7% and procedure related mortality was 0%. Median follow-up after catheter withdrawal was 8 months. Long-term primary clinical success after removal of the catheter was 87.2%. With the repeated PC in 4 of 6 recurrences, clinical success was 95.7%. Presence of bile sludge, perforation or a co-existing disease did not result in a significant difference in recurrence free survival.**
Conclusions : **PC was a safe and easy to perform procedure with high positive clinical response and low long-term recurrence rate. PC without subsequent cholecystectomy may be a favorable treatment for AAC with respect to high surgical risk present in most of the AAC patients.** (Acta gastroenterol. belg., **2018**, 81, **393-397**).

Keywords : Acalculous cholecystitis, Cholecystostomy, percutaneous cholecystostomy, outcome

Introduction

Acute acalculous cholecystitis [AAC] is a condition frequently encountered in patients with underlying serious diseases (1). Early laparoscopic cholecystectomy is the preferred treatment in patients with acute cholecystitis (2-4). However, AAC frequently bears high-surgical risk and there's a high rate of conversion to open cholecystectomy which is associated with higher morbidity and mortality (5,6). Another fact is that inadequate treatment of AAC may result in mild clinical manifestations to rapidly progress to septic shock and death (5). Thus, effective but safer treatment options rather than surgery should be considered for the AAC patients.

Percutaneous cholecystostomy [PC] has become an alternative to early cholecystectomy in critically ill patients with acute cholecystitis (1-3,7,8). Conventionally, PC is used as a bridge therapy to overcome a critical period until the patient becomes suitable for laparoscopic cholecystectomy (1,2). In recent years, some studies have suggested that subsequent cholecystectomy is not necessary for AAC because PC might serve as the definitive treatment (1-4,7-13). However, there are no established guidelines for the indication of PC for the definitive treatment of AAC. Majority of the reports did not distinguish between calculous and acalculous cases in their evaluation and only two studies conducted only with AAC patients had sufficient group sizes (9,10). As far as is known, this study reports the largest single center experience of PC treatment for AAC.

Primary aim of this study was to evaluate the long-term outcome of the PC procedure for the reason that acceptable recurrence-free survival after the procedure might reduce the requirement of subsequent cholecystectomy in these high-risk surgical patients. The safety and short-term clinical success were also evaluated to describe the role of PC as a potential definitive treatment for AAC.

Materials and Methods

The study was conducted in a university teaching hospital and approved by the institutional review board of the university. Medical records of patients who underwent PC treatment for acute cholecystitis from June 2006 to August 2016 were retrospectively reviewed from the archive database in the interventional radiology unit and the hospital records. Patients with increased gallbladder wall thickness and no biliary stones in any of the imaging studies or pathology reports were included in the study group. The treatment of patients with PC and choice of further cholecystectomy was based on attending clinicians' preference.

Technical success, short and long-term clinical success, complications and mortality were evaluated. Technical success was defined as insertion of the catheter that provided drainage of the gallbladder. Short-term

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clinical success was defined as resolution of symptoms and signs, reduction in temperature to below 37.5 °C, and reduction in leukocyte count by at least 25% or to less than 10000/ µl within 3 days. To evaluate the requirement of subsequent cholecystectomy, patients who were successfully treated with PC and followed-up after catheter withdrawal were identified. Patients who died before withdrawal of the catheter, patients who underwent elective cholecystectomy or endoscopic sphincterotomy with the catheter on or within 1 month of catheter withdrawal, and patients who were lost to follow-up within 1 month of catheter withdrawal were excluded. Follow-up for recurrence and elective cholecystectomy were performed by the hospital records and phone calls to patients. Primary disease-free survival was defined as the time interval from the withdrawal of the catheter to the time of AAC recurrence or death. Assisted primary survival was defined as the time interval from the withdrawal of the first catheter until the end point of the study, including recurrences.

After obtaining informed consents, PC procedures were performed under ultrasound guidance using the modified Seldinger technique, preferably via the transhepatic route. Transperitoneal route was used only in patients with hemorrhagic diathesis. All procedures were carried out under local anesthesia; intravenous midazolam and fentanyl citrate were used for sedation and analgesia whenever possible. Bile samples were obtained for cultures in all cases. Locking pigtail drainage catheters (Flexima APDL, Boston Scientific) were placed and put on gravity drainage, flushed daily with sterile saline to avoid occlusion and left in the gallbladder for at least 3 weeks for tract maturation to occur. Routine control cholecystograms were obtained at 3 days and 21 days to evaluate the passage through the cystic duct and common bile duct. Catheters were withdrawn after 3 weeks provided that contrast flow to the duodenum was demonstrated on cholecystograms. In case of obstructed flow to the duodenum, catheters were not withdrawn until a re-evaluation with control cholangiogram in 10 days, endoscopic retrograde cholangiopancreatography or surgery.

A statistics software package (IBM SPSS Statistics, version 22) was used for statistical analysis. Paired t-test was used to compare means. Survival curves for primary disease-free survival and assisted primary survival were generated with Kaplan-Meier survival analysis and were compared with the Log-rank test. Follow-up was censored for lost to follow-up and survival to the end point of the study.

Results

A total of 75 interventions performed in 33 male and 38 female patients were identified. Patients treated were unfavorable for primary cholecystectomy due to high American Society of Anesthesiologists' [ASA] scores, accompanying co-morbidities, hemorrhagic diathesis or old age. Accompanying co-morbidities and ASA scores at referral are shown in Table 1.

Table 1.— **Co-morbidities and *ASA scores of 75 interventions in 71 patients**

Co-morbidities and ASA scores	Number
Diabetes Mellitus	27
Coronary Artery Disease Hospitalized for Myocardial Infarction History of Myocardial Infarction	18 10 8
Sepsis	12
Congestive Heart Failure	10
Malignancy	9
Chronic Renal Disease	7
Pneumonia	6
Dementia	6
Stroke	5
Chronic Obstructive Pulmonary Disease	5
Acute Respiratory Distress Syndrome	4
Disseminated Intravascular Coagulation	3
Pulmonary Thromboembolism	2
Others (Portal Hypertension, Cirrhosis, Pancreatitis, Mesenteric Vascular Occlusion)	4
ASA I	3
ASA II	15
ASA III	38
ASA IV	19

*ASA: American Society of Anesthesiologists.

Transhepatic approach was preferred in 70 cases (93.3%) and transperitoneal approach was used in 5 cases (6.7%) with international normalized ratio level > 2.1. Improvement of signs and symptoms with significant decrease in body temperature, C-reactive protein and leukocyte counts were achieved in 69 of 75 cases (92%) within 3 days ($p<0.001$). Six patients (8%) with sepsis at referral did not benefit from the PC treatment. In-hospital mortality rate was 9.3% (7/75) and median time from the PC procedure to death was 7.5 days (range 1 – 20 days). Contrast passage to the duodenum was observed in 59 of 69 cases with control cholecystograms (85.5%). Management in all patients, clinical outcome and presence of contrast flow on cholecystograms are summarized in Figure 1.

The study group to evaluate the long-term outcome of PC consisted of 51 interventions in 24 male and 23 female patients who ranged in age from 43 to 98 years (median 77 years). Twenty-two cases (43.1 %) had bile sludge within the gallbladder lumen and 9 cases (17.6 %) had perforation. Transhepatic approach was used in 48 (94.1%) and transperitoneal approach was used in 3 cases (5.9%). Median follow-up with the PC was 22 days (range 20 – 34 days). All cases scheduled for follow-up showed contrast flow to the duodenum on the cholecystograms.

Median follow-up after catheter withdrawal was 8 months (range 1-64 months). Forty-one patients (87.2 %) required no further procedures in long-term follow-up. Six patients (12.8 %) had recurrent AAC in 2 to 21 months (median 5.5 months) and were successfully

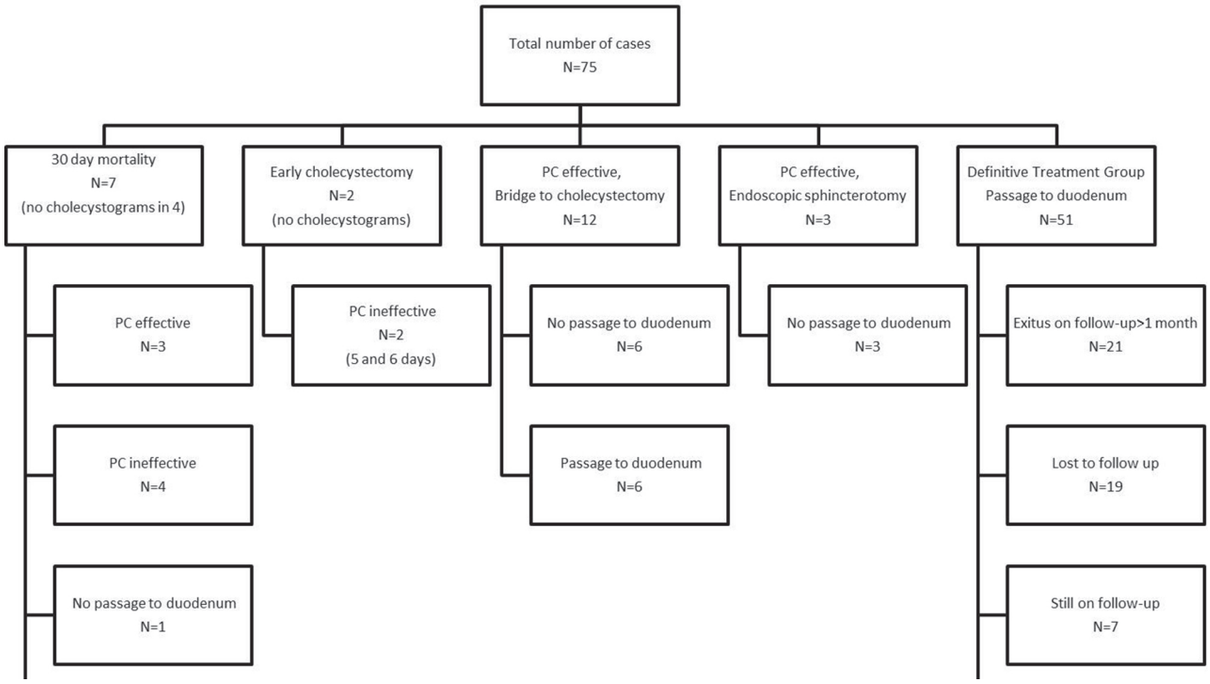

Fig. 1. — Flowchart shows interventions performed, clinical outcome, and cholecystography findings in all cases with acute acalculous cholecystitis.

Table 2. — **Laboratory and culture results**

	Pre-procedure	Post procedure	p
Body temperature (°C)	38.6 ± 0.7 (37 – 39.8)	36.7 ± 0.4 (36.1 – 38.1)	<0.001
C-Reactive protein	179.6 ± 89.1 (51.2 – 429.7)	39.7 ± 36.3 (20-155)	<0.001
Leukocyte count (/µl)	15400 ± 7500 (2900 – 43700)	8400 ± 3600 (1900 – 26300)	<0.001
Culture results			
Escherichia coli	27		
Klebsiella species	11		
Enterococcus species	10		
Pseudomonas aeruginosa	4		
Acinetobacter baumanii	2		
Enterobacter aerogenes	2		
Negative	22		

Values are described as means ± standard deviation, (range)

treated with a repeated PC procedure (n = 4) or laparoscopic cholecystectomy (n = 2). The long-term success rate of AAC as a definitive treatment for AAC was 95.7% (45/47) with repeated procedures. All 4 patients treated with a repeated PC did not experience another recurrence until the end-point of the study. Estimated median primary disease-free survival and median assisted primary survival were 13 ± 2.3 months and 14 ± 2.6 months, respectively (Table 3 and Fig. 2). Presence of bile sludge, perforation, diabetes mellitus, coronary artery disease, congestive heart failure or malignancy had no statistically significant effect on disease-free survival (p>0.05) (Table 3).

No mortality attributable to the PC procedure was observed. Minor complication rate was 5.3% (4 catheter blockages) and major complication rate was 2.7% (2 patients with dementia removed catheters). Catheter blockage was treated with revision of the catheter with a greater size and dislodgement was treated with replacement of the catheter. No procedure related sepsis, bleeding, bile leak, peritonitis or fistula formation was observed.

Discussion

In accordance with most of the recent reports, technical success of the PC procedure was high, and short term complication and in-hospital mortality rates were low with no deaths attributable to the procedure (1,2,4,7,9, 14,15,16). Results of the current study and the recent studies showed that PC was a safe and easy procedure to perform in high-risk surgical patients (1-4,7-10,14). Although local anesthesia was sufficient in the majority of cases, intravenous sedation was preferred whenever possible because lack of patient cooperation was a risk factor for possible technical failure and complications (17).

All the patients without sepsis responded well to the PC procedure, however positive clinical response was much less in patients with sepsis. The choice of treatment in sepsis and shock remains controversial. A previous study by Anderson et al. reported that PC had no advantage but early cholecystectomy improved survival in patients with septic shock (18). In another study of 1725 critically-ill patients with AAC, PC had decreased morbidity and significantly improved perioperative outcomes than surgery (1). It can be

Table 3. — **Estimated survival of the patients after percutaneous cholecystostomy treatment**.

		Sludge		Perforation		All Interventions
		Present (N = 22)	**Absent (N=29)**	**Present (N=9)**	**Absent (N=42)**	**(N=51)**
Estimated Primary Disease Free Survival	**Median (months)**	13.0±4.1	13.0	5.5	13.0±2.2	13.0±2.3
	p	0.606		0.472		
Estimated Assisted Primary Survival	**Median (months)**	13.0±3.2	16±4.6	6.0	14.0±3.8	14.0±2.6
	p	0.628		0,661		
Estimated Primary Disease-Free Cumulative Survival at ((%)	**6 Months**	67.1±10.3	64.9±9.6	50.8±1.8	69.3±7.5	65,9±7.0
	1 Year	50.3±11.4	53.1±10.9	50.8±1.8	52.8±8.6	51.6±7.9
	2 Years	26.1±10.6	45.5±11.7	0	33.6±8.8	33.3±8.4
	5 Years	26.1±10.6	0	0	27.4±4.8	33.3±8.4
Estimated Assisted Primary Cumulative Survival at (%)	**6 Months**	72.9±10.5	72.6±8.9	48.6±22.7	76.0±7.0	72.6±6.8
	1 Year	54.6±12.0	54.4±11.3	48.6±22.7	55.3±8.8	54.4±8.2
	2 Years	28.3±11.5	43.6±13.3	0	34.6±9.2	34.5±8.9
	5 Years	14.2±11.5	0	0	26.0±10.2	25.8±10.0

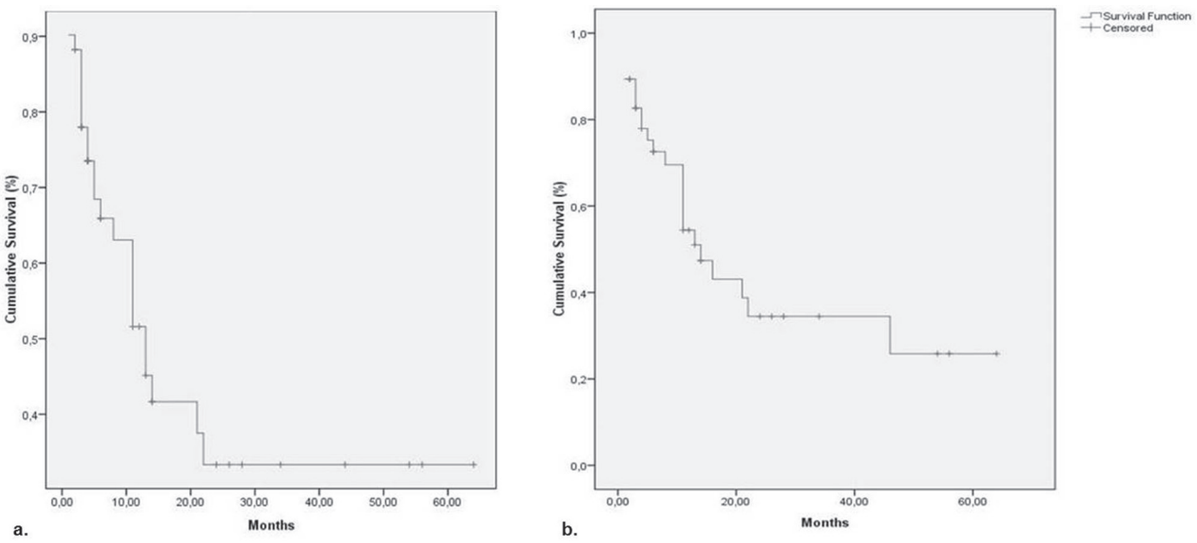

Fig. 2. — Graphs show **(a)** primary disease-free survival and **(b)** assisted primary survival of patients treated with percutaneous cholecystostomy.

recommended that PC should be the treatment of choice in all high-risk surgical cases except septic shock. Laparoscopic cholecystectomy may be preferred in patients with sepsis and low risk of conversion to open cholecystectomy.

A single intervention with PC provided effective definitive treatment in the majority of the patients in the long-term follow-up. With the repeated PC procedures, the rate of patients who did not require subsequent cholecystectomy reached up to 95.7%. These results were similar to the few studies conducted only with the AAC patients (9-11). No significant risk factors for recurrence were identified in this study. Patients with bile sludge, perforation, diabetes mellitus and malignancy had lower but insignificant estimated primary disease-free survival. A method of not withdrawing the catheter until a mature tract formation has established to prevent bile leakage but there are no established guidelines regarding the time interval for catheter withdrawal (2,9,19). Although there are studies that reported early withdrawal with no complications, a study by Hsieh et al. reported that early removal was a risk factor for bile leakage but catheter drainage exceeding 2 weeks was a risk factor for recurrence due to mucosal irritation (3, 20). In the

current study, no bile leakage occurred after 20 days (mean 23.9 days) similar to the study of Boland et al. (19). The routine drainage duration of 3 weeks can be reduced to 2 weeks to decrease the recurrence rate, since it was reported that 2 weeks was sufficient for tract maturation to occur in transhepatic approaches (17).

A previous study favoring transperitoneal approach in majority of the AAC cases reported a catheter dislodgement rate of 25% (10). Besides lower rate of dislodgement, no bile leak and peritonitis was observed in the current study which was in line with previous reports that preferred the transhepatic approach (2,11,12). No apparent bleeding with the transhepatic approach was observed in patients with normal bleeding parameters. The low bleeding rates reported in recent studies and the current study suggests that transhepatic approach should be the choice of PC treatment in patients without bleeding diathesis (7, 9, 10). The risk of dislodgement and leakage are lower, tract maturation is faster and bleeding risk is low with the transhepatic approach (2,7, 9-12,17).

The limitations of this study mainly pertain to its retrospective design and small population size. About 40% of the patients were lost to follow-up in long-term follow-up and AAC recurrence after lost-to follow-up could not be known for sure. Although the study group was small, conduction of the study with only AAC patients is a major strength of this study compared to most studies which did not analyze calculous and acalculous cases as distinct entities. Absence of a group managed with laparoscopic cholecystectomy and lack of adequate number of transperitoneal approaches for comparison were other limitations of the study.

To conclude; PC may be defined as a definitive treatment option for AAC in majority of the high-risk surgical patients. It provided high positive clinical response with low complication rates and high recurrence-free survival. However, further studies are required to establish the role of PC as a definitive treatment for AAC because studies so far are few in number and conducted with small study groups.

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