



STUDY OF PERCUTANEOUS CHOLECYSTOSTOMY OUTCOMES IN PATIENTS HOSPITALIZED FOR ACUTE CHOLECYSTITIS

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ABSTRACT

Our study aimed to examine outcomes and prognosis of percutaneous cholecystostomy (PC) in patients hospitalized for acute cholecystitis. We compared clinical profiles, length of hospital stays and survival between patients with acute calculus cholecystitis who did (n=15) and did not (n=150) undergo percutaneous cholecystostomy. Those who underwent PC were older and with a poorer clinical profile; and their 30-day and 1-year mortality rates were higher (11% vs. 1.5%, and 22% vs. 6.5%, respectively, $p < 0.001$ for both). In a logistic regression model, PC status was associated with increased 30-day mortality (OR 3.051, 95% CI 0.798-10.354, $p = 0.195$) after adjustment for age, sex, American Society of Anesthesiologists score, disease severity index and cholecystectomy. The most deleterious effect on hospital stay was observed among patients with moderately severe disease. Percutaneous cholecystostomy should be offered only to very high-risk patients. In patients unresponsive to conservative treatment with moderately severe disease, laparoscopic cholecystectomy is the preferred treatment. It can be concluded from our study that percutaneous cholecystostomy in patients with acute calculus cholecystitis is associated with worse prognosis, longer hospitalization periods, and higher 30-day and one-year mortality.

KEYWORDS: Acute cholecystitis, Percutaneous cholecystostomy, Hospitalization, Mortality.

INTRODUCTION

Acute Cholecystitis (AC) is an infectious disorder of the gallbladder, usually caused by gallstones. The pathogenesis is a cystic duct obstruction that causes a dilated gallbladder inflammation and edema of the surrounding tissue. If left untreated, progression of the inflammatory process may lead to ischemia, gangrenous cholecystitis and perforation. The prognosis of AC is generally favorable. Most patients report reduced symptoms within days of initiating treatment.^[1] However, some patients may develop complications despite conservative treatment measures.

Cholecystectomy is the "gold standard" treatment for cholecystitis^[2], even in the acute phase. Ideally, patients with uncomplicated AC undergo laparoscopic cholecystectomy within 72 hours of diagnosis^[3], to reduce length of hospital stay, duration of illness, and complications.^[4-6] However, when surgery is considered "risky", or when conservative treatment fails, percutaneous cholecystostomy (PC) is performed.

PC reduces gallbladder pressure, and in patients with a calculous cholecystitis, is considered a definitive

treatment.^[7] However, in some cases of AC, it is used as "bridge therapy" until cholecystectomy is feasible.^[8] Encouraging reports of effective and safe laparoscopic cholecystectomy, also for severely ill patients with AC^[9-15], have raised questions regarding the performance of PC.

METHODS

The medical records of all patients admitted to Haditha General Hospital for Surgery in Iraq were reviewed during the years 2013-2019 with a diagnosis of acute calculous cholecystitis. Patients were excluded from the analysis if they underwent cholecystectomy during their initial hospitalization, or if gangrenous cholecystitis was radiologically diagnosed. Patients who were hospitalized due to recurrent episodes of cholecystitis, with the first episode prior to 2013 were also excluded.

Data collected included: demographic characteristics (age, sex, marital status), severity of disease (mild, moderate, and severe^[3]), American Society of Anesthesiologists (ASA) score upon admission, admission laboratory test results, comorbidities, duration of hospitalization, date of cholecystectomy, the number

of hospitalizations following initial admission, recurrent hospitalizations due to cholecystitis and the date of death (when relevant). In patients who underwent PC, additional data were collected regarding complications of PC including accidental dislodging of a drain.

Between patients who had and had not undergone PC, length of hospital stay, 30-day and 1-year mortality after AC hospitalization, and the number of recurrent hospitalizations were compared using regression models, adjusted for age, sex, disease severity, and ASA score.

Statistical analysis

The SPSS software version 20 was used for data analysis. Continuous variables were compared between the 2 groups using the t-test. Non-continuous variables were compared using the chi-squared test. To study the effect of PC on the length of hospital stay and 1-year mortality rates, linear and logistic regression models were used, with age; sex, disease severity, and ASA score as covariates.

RESULTS

During the study period, 165 patients were admitted to surgical departments with a diagnosis of AC. Table (1)

Table (1): Comparison of patient demographics and comorbidities according to percutaneous cholecystostomy status.

	All	No n=150	Yes n=15	p- Value
Age (years)	60.4 ± 15.1	58.9 ± 14.3	70.4 ± 10.2	0.002
Age 65 years and over (%)	47.3%	45.7%	81.1%	0.010
Female sex (%)	47.2%	50.1%	49.7%	0.976
Comorbidities				
Diabetes mellitus (%)	31.3%	31.2%	34.7%	0.781
Renal failure (%)	7.1%	6.9%	9.7%	0.688
Ischemic heart-disease (%)	21.3%	21.6%	30.7%	0.421
Cerebrovascular accident (%)	1.4%	1.2%	7.9%	0.046
Cholecystectomy (%)	40.6%	41.5%	43.8%	0.863
Baseline laboratory data				
Hemoglobin (g/dL)	12.8±1.9	13.9 ± 2.1	12.8 ± 1.1	0.002
WBC (per cmm ³)	13.1±3.9	12.8 ± 3.7	14.1 ± 2.1	0.047
Creatinine (mg/dL)	0.95±0.49	0.92 ± 0.49	1.1 ± 0.39	0.045
Urea (mg/dL)	38.1 ± 20.7	35.8 ± 19.8	49.8 ± 21.7	0.010
Sodium (meq/L)	136 ± 3.1	137 ± 3.3	135 ± 3.1	0.025
Albumin (g/dL)	3.3 ± 0.9	3.4 ± 0.7	3.0 ± 0.6	0.034
Total bilirubin (mg/dL)	1.31±1.31	1.29 ± 1.29	1.19 ± 1.2	0.763
Alkaline phosphatase (IU/dL)	111±100	109 ± 98	125 ± 119	0.621

Among patients who were treated with PC, disease severity was greater (mean disease severity index 2.3 ± 0.7 vs. 1.5 ± 0.5, $p < 0.001$) and hospital stay was longer (10.4 ± 9.1 days, vs. 6.1 ± 7.8 days, $p = 0.045$). No differences were observed between patients who did and did not undergo PC, in the number of recurrent hospitalizations. Elective cholecystectomy was performed in less than 50% of patients regardless of their PC status.

showed comorbidities, and blood test results on admission, for the entire cohort and according to PC status. For the entire cohort, the mean age was 60.4±15.1 years; 78 (47.3%) were over age 65 years. During the index admission, 67 patients (40.6%) underwent cholecystectomy. The 30-day mortality rate was 1.8% for the entire cohort. Of the 165 patients, 105 (63.6%) were with mild disease, 50 (30.3%) with moderate disease, and 10 (6.1%) with severe disease. Most patients had ASA grade 2 or 3 (99, 60.0%), a minority had grade 4 or 5 (5, 3.0%). The most prevalent comorbidity was diabetes mellitus (31.3%).

Results in table (1) showed that (9.1%) of patients underwent PC. A higher proportion of patients who did not undergo PC were aged 65 years and older (81.1 vs. 45.7%), and after a cerebrovascular accident (7.9 vs. 1.2%), and their laboratory tests indicated a poorer clinical profile: lower mean values of hemoglobin, sodium, and albumin, and higher mean values of WBC, creatinine and urea.

To examine the association of PC with length of hospital stay (LOS), a general linear model was used, where LOS was the dependent variable, PC and cholecystectomy surgery status were the fixed factors, and age, sex, ASA score and disease severity index were the covariates. The model showed that PC was significantly associated with longer LOS, while cholecystectomy was associated with shorter LOS. In addition, ASA score and disease severity index significantly influenced LOS, while age and patient sex did not. When plotting the estimated marginal

means according to PC and cholecystectomy status, PC was associated with longer LOS among patients who

underwent cholecystectomy, yet no association was observed among those who did not (Figure 1).

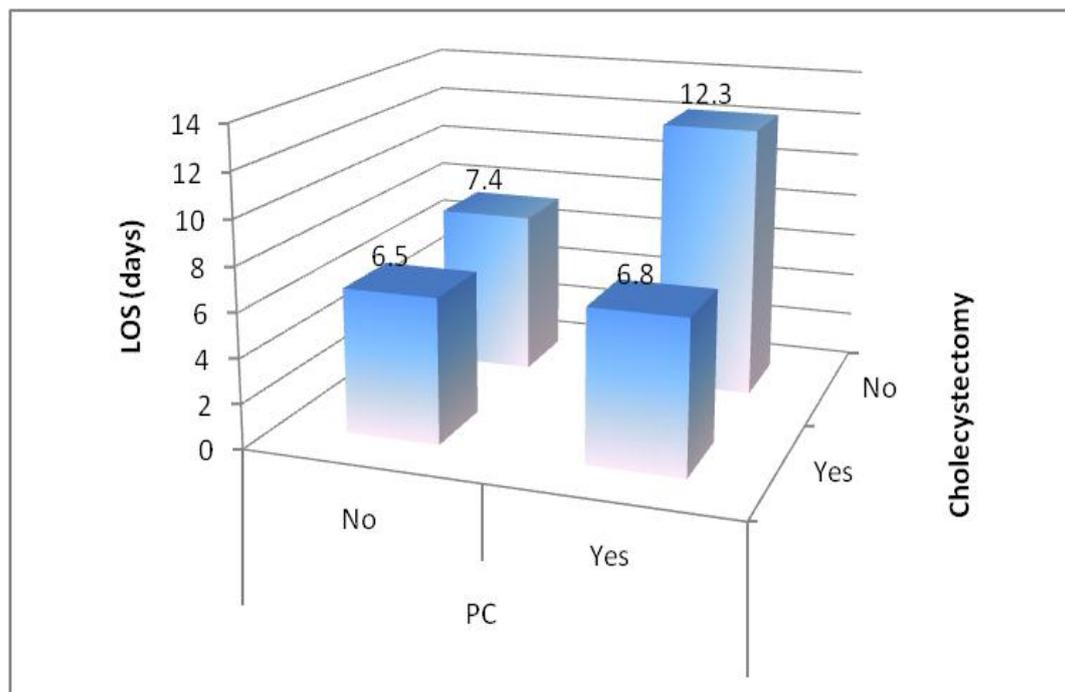


Figure 1: Estimated marginal means for length of hospital stay according to percutaneous cholecystostomy and cholecystectomy status.

Similar models were applied to each disease severity group. Among patients with moderately severe disease, cholecystectomy was associated with a tendency towards shorter LOS (8.8 ± 0.6 vs. 10.5 ± 0.8 days, $p=0.185$) while PC was associated with longer LOS (10.9 ± 0.7 vs. 8.4 ± 0.7 days, $p=0.030$). Among patients with severe disease, PC was associated with reduced LOS only among patients who underwent cholecystectomy (11.9 ± 10.5 vs. 14.8 ± 8.3 days), but this difference was not statistically significant ($p=0.255$).

Thirty-day and 1-year mortality rates were higher in the PC group (11% vs. 1.5%, and 22% vs. 6.5%, respectively, $p<0.001$ for both). A logistic regression model was used to analyze the parameters associated with 30-day mortality; age, sex, ASA score, disease severity index, and cholecystectomy and PC status were the covariates. PC status was associated with increased 30-day mortality (OR 3.051, 95% CI 0.798-10.354, $p=0.195$), as was the ASA score (OR 3.789, 95% CI 1.053-12.018, $p=0.010$). Male sex showed a tendency towards increased mortality (OR 4.856, 95% CI 0.985-25.465, $p=0.185$). Cholecystectomy and more severe disease were not associated with 30-day mortality.

In an analysis of 1-year survival, patients were classified into 4 groups according to PC and cholecystectomy status (procedures, only PC, only cholecystectomy, and neither procedure). A Cox regression model included age, sex, disease severity, ASA scores, and the combined cholecystectomy and PC status as the covariates. The best prognosis was observed among patients who had

cholecystectomy alone (HR 0.164, 95% CI 0.098-0.580, $p=0.010$) followed by patients who did not undergo either procedure or who underwent both procedures; the results were similar for these two groups. Patients who underwent only PC insertion had the worst prognosis, but the difference between this and the other groups did not reach statistical significance. Age was positively associated with increased mortality (HR 1.065, 95% CI 1.035-1.115, $p<0.001$). Disease severity index was marginally significant (HR 1.650, 95% CI 0.987-2.512, $p=0.095$), while patient sex and ASA score were not.

DISCUSSION

Our data suggest that PC insertion is associated with longer LOS and higher 1-year mortality. LOS was longer in patients who underwent PC by about 50%, compared to those who did not undergo PC, after adjustment for age, ASA, and disease severity. In an attempt to minimize biases, we compared between patients with similar disease severity or ASA scores, according to the performance of PC. The results showed longer LOS for PC, even among those with low ASA scores. Our results were documented also by Zehetner *et al.*^[16] who found that, in a matched pair analysis, LOS was longer in the PC than the LC group, despite the shorter procedure time.

Comparing patients who did and did not undergo PC, 30-day mortality was 10 times greater in the PC group than the non-PC group, across all age groups, and 8 times greater in patients aged > 65 years. One-year mortality was 5 times greater in all ages, and 2.5 times greater

among those aged >65 years. Multivariate analysis revealed that PC status itself was associated with a more than 3-fold increase in 30-day mortality rates, after controlling for age, sex, ASA score, and disease severity. In addition, serum creatinine levels at admission, age, and ASA score were the highest predictors of mortality at 30 days and at one-year from initial cholecystitis. Those results are in accordance with Zehetner *et al.*^[16] results, who demonstrated that PC insertion was associated with a higher 30-day mortality rate, though without statistical significance.

We presume that the lack of improvement with conservative treatment was the driving factor in the decision to insert PC in our patients. Even after adjusting for PC, the ASA score was associated with longer LOS and possibly with 30-day mortality. Therefore, it is unclear whether PC is beneficial in patients presenting with mild or moderately severe disease at admission yet unresponsive to conservative treatment. Since LOS is a marker of the time to clinical improvement, it is interesting to note that the most deleterious effect on LOS was observed among patients with moderately severe disease who underwent PC.

Of importance, as in other studies^[9], patients who underwent PC had more severe illness, as assessed by the ASA score, clinical status, and laboratory tests. Therefore, it is hard to distinguish the actual association of the PC drainage procedure with LOS; this is a challenge that could not be resolved in the current study.

This study has a number of limitations. Elective cholecystectomy was performed in fewer than 50% of patients. Interestingly, the performance of this procedure was similar between patients who did and did not undergo PC; this concurs with a previous report.^[17] Several explanations are possible for this finding: patients may have chosen not to return for elective cholecystectomy, or they may have undergone cholecystectomy in a different medical center, from which data could not be collected, leading to a misleadingly low rate of cholecystectomy in our sample. We decided not to examine surgery duration and complications due to the small sample size.

As a retrospective study, the possibility of selection bias is always present, and difficult to assess accurately. Additionally, our sample size was relatively small, which may reduce the accuracy of our regression models. These difficulties may be remedied with a large-sample, prospective, randomized trial of the effects of the PC procedure.

REFERENCES

1. Loozen CS, Oor JE, van Ramshorst B, van Santvoort HC, Boerma D. Conservative treatment of acute cholecystitis: a systemic review and pooled analysis. *Surg Endosc.*, 2017; 31(2): 504-515.
2. Yarmish GM, Smith MP, Rosen MP, Baker ME, Blake MA, Cash BD, et al. ACR Appropriateness Criteria right upper quadrant pain. *J Am Coll Radiol.*, 2014; 11(3): 316-22.
3. Takada T, Strasberg SM, Solomkin JS, Pitt HA, Gomi H, Yoshida M, et al. TG13: Updated Tokyo Guidelines for the management of acute cholangitis and cholecystitis. *J Hepatobiliary Pancr Sci.*, 2013; 20(1): 1-7.
4. Lo CM, Liu CL, Fan ST, Lai EC, Wong J. Prospective randomized study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. *Ann Surg.*, 1998; 227(4): 461-7.
5. Cox MR, Wilson TG, Luck AJ, Jeans PL, Padbury RT, Toouli J. Laparoscopic cholecystectomy for acute inflammation of the gallbladder. *Ann Surg.*, 1993; 218(5): 630-4.
6. Siddiqui T, MacDonald A, Chong PS, Jenkins JT. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a meta-analysis of randomized clinical trials. *Am J Surg.*, 2008; 195(1): 40-7.
7. Silberfein EJ, Zhou W, Kougiass P, El Sayed HF, Huynh TT, Albo D, et al. Percutaneous cholecystostomy for acute cholecystitis in high-risk patients: experience of a surgeon-initiated interventional program. *Am J Surg.*, 2007; 194(5): 672-7.
8. Overby DW, Apeltgren KN, Richardson W, Fanelli R; Society of American Gastrointestinal and Endoscopic Surgeons. SAGES guidelines for the clinical application of laparoscopic biliary tract surgery. *Surg Endosc.*, 2010; 24(10): 2368-86.
9. Kamalapurkar D, Pang TC, Siriwardhane M, Hollands M, Johnston E, Pleass H, et al. Index cholecystectomy in grade II and III acute calculous cholecystitis is feasible and safe. *ANZ J Surg.*, 2015; 85(11): 854-9.
10. Viste A, Jensen D, Angelsen JH, Hoem D. Percutaneous cholecystostomy in acute cholecystitis; a retrospective analysis of a large series of 104 patients. *BMC Surg.*, 2015; 15: 17.
11. Rahnemai-Azar AA, Rahnemai-azar AA, Naghshizadian R, Cohen JH, Naghshizadian I, Gilchrist BF, et al. Minimally invasive management of biliary tract injury following percutaneous nephrolithotomy. *Nephrourol Mon.*, 2014; 6(5): e19943.
12. Wang CH, Wu CY, Yang JC, Lien WC, Wang HP, Liu KL, et al. Long- Term Outcomes of Patients with Acute Cholecystitis after Successful Percutaneous Cholecystostomy Treatment and the Risk Factors for Recurrence: A Decade Experience at a Single Center. *PLoS One.*, 2016; 11(1): e0148017.
13. Hsieh YC, Chen CK, Su CW, Chan CC, Huo TI, Liu CJ, et al. Outcome after percutaneous cholecystostomy for acute cholecystitis: a single-center experience. *J Gastrointest Surg.*, 2012; 16(10): 1860-8.

14. Chang L, Moonka R, Stelzner M. Percutaneous cholecystectomy for acute cholecystitis in veteran patients. *Am J Surg.*, 2000; 180(3): 198-202.
15. Patterson EJ, McLaughlin RF, Mathieson JR, Cooperberg PL, MacFarlane JK. An alternative approach to acute cholecystitis. Percutaneous cholecystectomy and interval laparoscopic cholecystectomy. *Surg Endosc.*, 1996; 10(12): 1185-8.
16. Zehetner J, Degnera E, Olasky J, Mason RA, Drangsholt S, Moazzez A, et al. Percutaneous cholecystostomy versus laparoscopic cholecystectomy in patients with acute cholecystitis and failed conservative management: a matched-pair analysis. *Surg Laparosc Endosc Percutan Tech.*, 2014; 24(6): 523-7.
17. Popowicz A, Lundell L, Gerber P, Gustafsson U, Pieniowski E, Sinabulya H, et al. Cholecystostomy as Bridge to Surgery and as Definitive Treatment or Acute Cholecystectomy in Patients with Acute Cholecystitis. *Gastroenterol Res Pract.*, 2016; 2016: 3672416.