



Role of Percutaneous Cholecystostomy in the Treatment of Grade-2 Acute Cholecystitis

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Abstract

Aim: Acute cholecystitis (AC) is one of the most common causes of emergency abdominal pain admissions. Its treatment is laparoscopic cholecystectomy. However, the disease's severity, duration, and the patient's general condition may necessitate effective alternative methods such as percutaneous cholecystostomy. This study aimed to analyze the place and importance of percutaneous cholecystostomy in the treatment of AC.

Methods: The records of 122 patients who were interned with an AC diagnosis between January 2018 and July 2021 were retrospectively scanned. The demographic data of the patients, Tokyo grades, laboratory values, imaging findings, and treatments were comparatively analyzed. The patients determined as grade 3 AC were excluded from the study. The data of the patients with grade 1 and grade 2 AC were comparatively analyzed.

Results: Fifty-four of 122 patients were grade 1; 66 of them were diagnosed as grade 2, and 2 of them were grade 3 AC. While 60 patients received only antibiotic treatment, 31 underwent percutaneous cholecystostomy, of whom 22 of them were from the grade 2 group. White blood cell, C-reactive protein, alanine transaminase, aspartate transaminase, Gamma-glutamyltransferase levels of grade 2 patients were statistically significantly higher than grade 1 patients ($p<0.001$; $p<0.001$; $p=0.029$; $p=0.031$; $p=0.043$). There were no significant differences between the groups in the values of alkaline phosphatase, bilirubin, time from admission to surgery, and follow-up time ($p=0.077$, $p=0.908$, $p=0.119$, and $p=0.127$, respectively). Age, mean fever duration, and chronic lung disease rates of grade 2 patients were statistically significantly higher than those of grade 1 patients ($p<0.001$, $p<0.001$, and $p=0.002$, respectively).

Conclusion: Percutaneous cholecystostomy is an effective and the least invasive method for treating grade 2 AC.

Keywords: Acute cholecystitis, treatment choice, percutaneous cholecystostomy

Introduction

Acute cholecystitis (AC) is one of the most common causes of abdominal pain and admission to the emergency department. Its frequency increases with age, and its treatment becomes more difficult with the addition of co-morbid diseases. In the etiology of AC, the most common cause is gallstones. In addition, ischemia, motility disorders, direct chemical trauma, infections, protozoa and parasites, collagen tissue diseases, and allergic reactions can also cause AC. 90-95% of the cases are cholecystitis with stones and 5-10% are without stones (acalculous) (1,2).

Severe symptoms or complications (AC, acute cholangitis, jaundice, and pancreatitis) occur in 1-2% of

patients with asymptomatic gallstones. Mild or moderate symptoms are 1-2% per year (3). The prevalence of complications in AC varies between 1 and 22.7% (4). While the mortality rate in AC is 0.6-13.5% in large and multicenter studies, this rate is higher in postoperative and acalculous cholecystitis patients. Elderly patients (75 years and older) have a higher mortality rate than younger patients. In addition, the presence of a co-morbid disease, such as diabetes, increases the risk of death (5-8).

Although laparoscopic cholecystectomy is the standard treatment in AC, it is not always easy to apply it successfully, particularly in grade 2 AC patients. In addition, the presence of comorbid diseases in the patient makes laparoscopic surgery and even general anesthesia high-risk

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Received: 12.02.2022 **Accepted:** 07.05.2022

procedures. At this point, percutaneous cholecystostomy in selected patients could be an excellent alternative to laparoscopic surgery as it is minimally invasive and could be performed under local anesthesia.

Our study presented our AC treatment approaches and proposed percutaneous cholecystostomy treatment for AC.

Materials and Methods

Compliance with Ethical Standards and Study Design

This study was conducted with the approval of the University of Health Sciences Turkey, Istanbul Haseki Training and Research Hospital Ethics Committee (ref no: 2021/166 date: 17.06.2021). The records of 122 patients admitted to the general surgery department with an AC diagnosis between January 2018 and July 2021 were scanned retrospectively through the hospital's electronic database.

Two patients determined as grade 3 were excluded from the study. The data of 120 patients, 54 with grade 1 AC and 66 with grade 2 AC, were comparatively analyzed.

Gender, age, signs, symptoms, duration of fever, comorbid diseases (diabetes mellitus, hypertension, chronic lung disease, chronic cardiac disease, cerebrovascular disease, chronic renal disease, malignancy, asthma), previous endoscopic retrograde cholangiopancreatography (ERCP), etc., ultrasonography, magnetic resonance imaging, and computed tomography findings needed for emergency surgery, treatment combinations, laboratory blood values [White blood cell (WBC), C-reactive protein (CRP), alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase, Gamma-glutamyltransferase (GGT), bilirubin], surgical timing, and follow-up times were analyzed statistically.

Statistical Analysis

The SPSS 15.0 for Windows program was used for statistical analysis. Descriptive statistics are listed as numbers and percentages of categorical variables. Numerical variables were studied as mean, standard deviation, minimum, maximum, and median. Comparisons of two independent groups were performed using Student's t-test when the numerical variable satisfied the normal distribution condition. When the condition was not met, the Mann-Whitney U test was used. The rates in the groups were compared with the chi-square test. The statistical alpha significance level was deemed as $p < 0.05$.

Results

One hundred and fifty-one patients were admitted to the hospital from the emergency room. Excluding 29 patients who reached a definitive diagnosis other than

AC, 54 of the remaining 122 patients had grade 1 AC, whereas 66 were diagnosed with grade 2 and two with grade 3 acute cholecystitis (Table 1). The number of female patients ($n=30$) in grade 1 and male patients in grade 2 ($n=36$) was higher. Age, mean fever duration, and the rate of chronic lung disease in grade 2 patients were statistically significantly higher than those in the grade 1 patient group ($p < 0.001$ $p < 0.001$ $p = 0.002$). Emergency surgical intervention was performed in 22 cases, of which 13 were from the grade 2 patient group (Table 2). While 60 patients received only antibiotic treatment, 31 patients underwent percutaneous cholecystostomy; 22 of them were in the grade 2 acute cholecystitis group (Table 3). The WBC, CRP, ALT, AST, and GGT levels of grade 2 patients were statistically significantly higher than those of grade 1 patients ($p < 0.001$ $p < 0.001$ $p = 0.029$ $p = 0.031$ $p = 0.043$). No statistically significant difference was found in the mean alkaline phosphatase and bilirubin levels ($p = 0.077$ and $p = 0.908$) (Table 4).

There was no statistically significant difference between grade 1 and 2 patients in post-attack operation time (time from admission to surgery) or follow-up time ($p = 0.119$ $p = 0.127$) (Table 5).

Discussion

Acute cholecystitis is an acute inflammatory disease of the gallbladder that is the most common cause of gallstones. In patients with clinically suspected acute cholecystitis, the diagnosis should be confirmed by radiological imaging methods. Acute cholecystitis can be classified as mild, moderate, or severe in clinical severity. The Tokyo 2018 criteria is the latest revision in treating acute cholecystitis in grade (9).

Grade 2 (moderately acute) cholecystitis is when an extensive disease of the gallbladder without any organ dysfunction makes it difficult to perform cholecystectomy safely. Its treatment is still not standardized. Therefore, grade 2 AC is a situation that requires more invasive procedures. However, the attempt should be made when and under what conditions is related to the patient's timing of admission and the severity of the physical and laboratory examination findings. Nowadays, laparoscopic cholecystectomy is accepted as a safe treatment method for treating acute cholecystitis in the presence of sufficient experience. Laparoscopic cholecystectomy has a lower complication rate, shorter hospital stay, early recovery,

Table 1. The distribution of patients according to grades

		n	%
Grade	1	54	45
	2	66	55
	Total	120	100

		Total	Grade 1	Grade 2	p-value
Gender n (%)	Male	60 (50.0)	24 (44.4)	36 (54.5)	0.271*
	Female	60 (50.0)	30 (55.6)	30 (45.5)	
Age Mean ± SD (Min.-Max.)		55.4±16.2	49.6±14.7	60.0±15.9	<0.001#
		(24-90)	(24-82)	(26-90)	
Findings n (%)	Nausea	11 (9.2)	6 (11.1)	5 (7.6)	0.540*
	Vomiting	15 (12.5)	10 (18.5)	5 (7.6)	0.071*
	Abdominal ache	104 (86.7)	45 (83.3)	59 (89.4)	0.331*
	Diarrhea	1 (0.8)	0 (0.0)	1 (1.5)	1.000*
	Jaundice	2 (1.7)	0 (0.0)	2 (3.0)	0.501*
	Fever	1 (0.8)	0 (0.0)	1 (1.5)	1.000*
Fever duration (Day) Mean ± SD		3.2±2.7	2.2±1.5	4.0±3.2	<0.001^y
Median (Min.-Max.)		2 (1-15)	2 (1-7)	3 (1-15)	
Comorbidities n (%)		78 (74.3)	29 (70.7)	49 (76.6)	0.505*
	Diabetes mellitus	21 (20.0)	7 (17.1)	14 (21.9)	0.548*
	Hypertension	39 (37.1)	11 (26.8)	28 (43.8)	0.088*
	Chronic lung disease	13 (12.4)	0 (0.0)	13 (20.3)	0.002*
	Chronic cardiac disease	3 (2.9)	1 (2.4)	2 (3.1)	1.000*
	Cerebrovascular disease	1 (1.0)	0 (0.0)	1 (1.6)	1.000*
	Chronic renal disease	4 (3.8)	0 (0.0)	4 (6.3)	0.154*
	Malignity	5 (4.8)	2 (4.9)	3 (4.7)	1.000*
	Asthma	2 (1.9)	1 (2.4)	1 (1.6)	1.000*
	Previous ERCP	4 (3.8)	2 (4.9)	2 (3.1)	0.643*
	Others	21 (20.0)	10 (24.4)	11 (17.2)	0.368*
Positive sign in USG n (%)		90 (75.0)	38 (70.4)	52 (78.8)	0.289*
Positive MRI n (%)		16 (13.3)	10 (18.5)	6 (9.1)	0.131*
Positive sign in CT n (%)		106 (88.3)	49 (90.7)	57 (86.4)	0.457*
Acute emergency surgery n (%)		22 (18.3)	9 (16.7)	13 (19.7)	0.670*

*Chi-square test, *Student's t-test, *Mann-Whitney U test: Age, mean fever duration, and rate of chronic lung disease significantly higher in grade 2 patients than the grade 1 patient group
SD: Standard deviation, Min.: Minimum, Max.: Maximum, ERCP: Endoscopic retrograde cholangiopancreatography, USG: Ultrasonography, CT: Computed tomography

and early return to work than open cholecystectomy. Percutaneous transhepatic gallbladder drainage is a treatment method that can be preferred in elderly patients defined as presenting high-risk surgically. However, laparoscopic cholecystectomy is the preferred treatment method in all eligible patients.

The treatment method used more than expected in our series was percutaneous cholecystostomy. Percutaneous cholecystostomy was performed in 31 patients (25.83%), and we think this high rate is related to the coronavirus disease-2019 pandemic, at least in our approach. It is noteworthy that interventional radiology has started to occur in surgical treatments with the developing technology. While open cholecystostomy was rarely used as a bridge treatment on the road to elective surgery in the previous decades, the rate of benefit from percutaneous cholecystostomy increased from 2.5% to 12.2% in the

same clinic between 2011 and 2015 in a retrospective study in which 4311 patients were evaluated in 2016 (10). The rate of percutaneous cholecystostomy continues to increase worldwide, and the most intense application in this regard was published in 2019. Percutaneous cholecystostomy performed in 97 (48.2%) of 201 patients in that study shows a changing trend (11).

Emergency cholecystectomy was seen to be 18.3% in both groups in our study. This rate, which we found in our study to be 16.7% for group 1 and 19.7% for group 2, when compared with rates between 15.7% (England) and 52.7% (USA) in various studies, is consistent with the literature (12).

There was no evidence that the application of emergency cholecystectomy increased complications or shortened the length of hospital stay (13). We obtained similar results for patients who underwent surgery in our

Table 3. Treatment options carried out in regard to grade 1 and 2 patients and their percentages

	Total (120)	Grade 1 (54)	Grade 2 (66)	p*
	n (%)	n (%)	n (%)	
Antibiotics only	60 (50.0)	31 (57.4)	29 (43.9)	0.283
Percutaneous cholecystostomy	1 (0.8)	0 (0.0)	1 (1.5)	
Antibiotics + ERCP	7 (5.8)	5 (9.3)	2 (3.0)	
Antibiotics + surgery (colecystectomy)	5 (4.2)	1 (1.9)	4 (6.1)	
Antibiotics + Percutaneous cholecystostomy	28 (23.4)	9 (16.7)	19 (28.8)	
Antibiotics + Percutaneous cholecystostomy + ERCP	2 (1.7)	0 (0.0)	2 (3.0)	
Surgery (colecystectomy) only	17 (14.2)	8 (14.8)	9 (13.6)	

*Chi-square test
ERCP: Endoscopic retrograde cholangiopancreatography

Table 4. The comparison of laboratory values of grade 1 and 2 patients

Grade	Total			1			2			p*
	Mean ± SD	Min.-Max.	Median	Mean ± SD	Min.-Max.	Median	Mean ± SD	Min.-Max.	Median	
WBC	13.5±5.7	3-34	13	10.9±3.9	3-17	12	15.6±6.0	5-34	15	<0.001
CRP	80.9±94.4	2-357	30.5	33.7±47.1	2-178	12	119.6±105.5	3-357	101	<0.001
ALT	10.5±242.7	3-970	58.5	229.1±268.6	4-969	125	122.5±209.3	3-970	40	0.029
AST	159.6±225.0	9-1200	45	211.4±244.1	14-1031	111	118.0±200.7	9-1200	41.5	0.031
Alkaline phosphatase	182.2±168.6	32-1222	127.5	191.6±178.1	32-1222	141	174.4±161.4	54-927	102.5	0.077
GGT	216.5±221.3	11-1056	141	254.3±222.4	19-784	208	185.6±217.3	11-1056	90.5	0.043
Bilirubin	2.03±1.92	0.2-10.8	1.4	1.94±1.51	0.2-6.4	1,495	2.11±2.21	0.27-10.8	1	0.908

*Mann-Whitney U test: WBC, CRP, ALT, AST, GGT levels of grade 2 patients were statistically significantly higher than grade 1 patients
WBC: White blood cell, CRP: C-reactive protein, ALT: Alanine transaminase, AST: Aspartate transaminase, GGT: Gamma-glutamyltransferase, SD: Standard deviation, Min.-Max.: Minimum-Maximum

Table 5. The comparison of surgery timing and follow-up periods of grade 1 and 2 patients

Grade	Total			1			2			p-value
	Mean ± SD	Min.-Max.	Median	Mean ± SD	Min.-Max.	Median	Mean ± SD	Min.-Max.	Median	
Surgery timing (in weeks)	3.84±3.00	0-12	3	4.53±3.10	0-12	4	3.25±2.84	1-12	2.5	0.119
Follow-up period	5.61±4.80	2-47	4.5	4.98±2.91	2-15	4	6.12±5.88	2-47	5	0.127

SD: Standard deviation, Min.-Max.: Minimum-Maximum

study. We did not find a statistically significant difference in complications between the treatment options used.

In our series, we found that emergency cholecystectomy was performed within the first 3 days of the onset of symptoms. We have seen that we benefit from percutaneous cholecystostomy, ERCP, antibiotic therapy, and their combinations in more delayed patients. The World Emergency Surgery Association reports that early surgery can be performed safely for up to 10 days as a guideline (14).

Study Limitations

There are some limitations to our study. The major limitation is that our study has a retrospective design.

Therefore, we could not detect all of the prognostic factors of the patients included because we conducted the study on patient files. Another limitation is the limited number of patients. Our study wanted to emphasize the use of percutaneous cholecystostomy, especially in patients with grade 2 cholecystitis. Therefore, a prospective study in which treatment modalities are comparatively analyzed in a larger population of only patients with grade 2 acute cholecystitis would be more valuable. Despite these limitations, we believe that our study will contribute to the literature as it provides an idea about the use of percutaneous cholecystostomy in patients with grade 2 acute cholecystitis, where the optimal treatment approach is still sought.

Conclusion

Grade 2 acute cholecystitis is a condition that requires more invasive interventions. However, which attempt should be made when and under what conditions is related to the patient's timing of admission and the severity of the physical examination and laboratory findings in addition to imaging modalities. The least invasive and most effective treatment is percutaneous cholecystostomies performed under antibiotic therapy in grade 2 acute cholecystitis.

Ethics

Ethics Committee Approval: This study was conducted with the approval of the University of Health Sciences Turkey, Istanbul Haseki Training and Research Hospital Ethics Committee (ref no: 2021/166 date: 17.06.2021).

Informed Consent: Retrospective study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Concept: A.K., F.E., Design: H.Ü.G., A.K., Data Collection, or Processing: S.C.O., M.S.D., Analysis, or Interpretation: H.Ü.G., F.E., Literature Search: S.C.O., M.S.D., Writing: A.K., M.S.D., Revision: M.S.D.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declare that this research did not receive any specific grant from the funding agencies.

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