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Treatment of perforated acute cholecystitis with percutaneous cholecystostomy

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Abstract

Acute cholecystitis is a common disease treated with laparoscopic cholecystectomy as a standard procedure. Perforated cholecystitis is a complication of acute cholecystitis and patients with comorbidities who have a high risk for the operation may also be treated with percutaneous cholecystostomy. The procedure may also be applied for the selected patients with perforated cholecystitis who have a delayed admission to the health institution or who are irresponsive to antibiotherapy. The aim of the present study is to investigate the clinical outcomes and data of the acute cholecystitis patients who underwent percutaneous cholecystostomy. Twentyfour patients who underwent percutaneous cholecystostomy with the diagnosis of perforated acute calculous cholecystitis between October 2012 and February 2020 were included in the study. Diagnosis of acute cholecystitis was made based on the Tokyo Criteria. Patient data were reached through a retrospective screening. Of the total of 24 patients, 70.8% were males. Mean age was 63.3±12.9 years and mean duration of hospital stay was 13.0±9.4 days. All patients were grade 2 according to Tokyo 2018 severity stratification. Mean duration of catheter stay was 37.7±25.3 days. Fifteen patients (62.5%) underwent cholecystectomy. Ratio of complications was 16.7% and catheter dislocation (n=2) was the most common complication. Mean duration of follow-up was 1 year. No patients developed acute cholecystitis on follow-ups, one patient developed acute cholangitis. Mortality rate was calculated for 60 days and no mortality was detected. High risk patients with comorbid conditions may be safely treated with percutaneous cholecystostomy as perforated cholecystitis increases mortality and morbidity in patients with acute cholecystitis.

Keywords: Percutaneous cholecystostomy, perforation, acute cholecystitis

Introduction

Acute cholecystitis is the most common complication of gallstones and treated with laparoscopic cholecystectomy as the standard procedure [1]. Gallbladder perforation develops in about 2-11% of acute cholecystitis cases. Perforation is common in 5th and 6th decades, and most common in fundus part [2]. Acute cholecystitis is a challenging clinical condition when it leads to perforation due to increasing morbidity and mortality rates. In perforated cholecystitis, morbidity was detected as 57.7% and mortality as 9.5%. Although emergency cholecystectomy is required for treatment, high risk patients with localized perforation may also be treated with percutaneous cholecystostomy (PC) [3]. PC may be performed in selected Grade 2-3 patients [1,4]. Making the diagnosis of perforated cholecystitis is difficult and diagnosis is usually made in per-operative period. Type 2 perforations may usually be diagnosed with imaging methods. Perforation may develop 2 days or weeks after the commencement of acute cholecystitis (5). As per-operative severe sepsis is an important factor that influences post-operative mortality, sepsis is controlled with PC and a transition is enabled before surgery [3,6]. For this purpose, patients with Type 2 perforation are recommended cholecystectomy after sepsis is controlled with PC [2].

Materials and Methods

Data of the patients who were admitted to Haydarpaşa Numune Research and Training Hospital and underwent "percutaneous cholecystostomy" between October 2012 and February 2020 were screened retrospectively after local ethics committee approval had been obtained (Number: HNEAK-KAEK 2021/KK/179). A total of 24 acute calculous cholecystitis cases were detected based on clinical and imaging findings. The patients who were diagnosed with acute calculous cholecystitis and treated with percutaneous cholecystostomy based on Tokyo 2018 criteria were included in the study. Cases accompanied by biliary malignancies were excluded.

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Routine ultrasonography was performed in all, and computed tomography (CT) and magnetic resonance imaging (MRI) were performed when needed according to clinical course of the patient. The PC procedure was applied under local anesthesia with Seldinger technique by the interventional radiologist. The drainage material obtained under sterile conditions were sent for culture for all patients. In the clinical follow-up, each patient was hospitalized, oral food intake was stooped and empirical intra-venous anti-microbial treatment and fluid replacement were administered. The diagnosis for discharge was based on the regression of clinical and laboratory findings. White blood cell count and C-reactive protein (CRP) values at the time of admission were recorded. The complaints of the patients and when the complaints started, co-morbid conditions, procedure-related complications, duration of hospital stay, American Society of Anesthesiologists (ASA) scores, the quality of the drainage material and whether there was microbial growing, the growing and resistant micro-organisms, intra-venous antibiotics used, whether percutaneous trans-hepatic cholangiography was performed, the insertion type of the percutaneous drainage tube (PDT), whether the patient experienced gallbladder and biliary tract-related complications and whether the patient underwent cholecystectomy were recorded.

Statistical Analysis

SPSS (Statistical Package for the Social Sciences) 23.0 package program was used for statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements as mean and standard deviation (median and minimum-maximum where necessary). Chi-square test was used to analyze categorical expressions. Mann-Whitney U test was used for binary variables for parameters that did not show normal distribution. Statistical significance level was taken as 0.05 in all tests.

Results

Of the patients, 70.8% were males and there were 24 patients in total. Mean duration of hospital stay was 13.0±9.4 days. Mean age of the patients was 63.3±12.9 years. All patients had abdominal pain, most commonly in the right upper quadrant (66.7%). Ratio of comorbid conditions was 83.3% (n=20). Almost all of the patients with comorbid conditions had more than one disorders. According to Tokyo Severity Grading System, all patients had Grade 2 disease. ASA score distribution was as follows: 41.7% ASA 3, 41.7% ASA 4 and 16.7% ASA 2. While 4 patients with ASA 2 score were hospitalized and underwent conservative acute cholecystitis treatment due to delayed admission, they underwent PC as clinical findings did not regress and perforation was detected. Mean duration of IV antibiotic treatment prior to PC was 4.33±3.91 days. PC was applied via trans-hepatic route in 58.3% patients and via trans-peritoneal route in the remaining. Technically, PC was 100% successful and no complications developed at the time of the procedure. Mean duration of catheter stay was 37.7±25.3 days. General characteristics and comorbid conditions of the patients are presented in Table 1 and Table 2.

All patients were performed routine ultrasonography at the time of hospitalization and control ultrasonography was performed in 13 patients following PK. Abdominal tomography was performed in 13 (54.2%) patients and magnetic resonance cholangio-pancreatography in 7 (29.3%) patients who required additional imaging. Percutaneous trans-hepatic cholangiography was performed in 16.7% patients and one of them was treated with endoscopic retrograde cholangio-pancreatography (ERCP) due to the presence of stone in the common bile duct. The material obtained at the time of the procedure was bilious in 54.2% of the patients and purulent in the remaining patients. Ratio of growing in the culture was 33.3% (n=8). Resistant microorganisms were detected in 6 of these patients and antibiotic treatment was switched based on the clinical course. Echerichia coli was the most commonly growing microorganism (37.5%). Ceftriaxone+ metronidazole combination was the most commonly used intra-venous antibiotics (45.8%). Distribution of the micro-organisms growing in culture is presented in Table 3.

In follow-ups, 62.5% (n=15) of the patients underwent cholecystectomy. The mean duration from PC to cholecystectomy was 78.0±43.3 days. In 8 patients, the procedure was started with open cholecystectomy and choledocotomy+ T-tube drainage was applied in addition to cholecystectomy in one patient. Two patients who were started with open cholecystectomy had recurrent incision scars in the abdomen. While the remaining 3 patients were treated with laparoscopic cholecystectomy, the surgeons switched to open cholecystectomy due to Callot triangle dissection difficulty in 4 patients who were started with laparoscopic cholecystectomy. In 16.7% of the patients, PC-related complications developed with the most common catheter dislocation (n=2). While minimal hemorrhage developed during the procedure in one patient, minimal bile leakage developed near PDC in one patient. Catheters of the patients who had catheter dislocation and bile leakage were revised. In one patient, per-operative duodenum injury developed during cholecystectomy and primary repair was performed. Ratio of post-cholecystectomy complications was 8.3% and while wound site infection developed in one patient, bile leakage was treated with sphincterotomy via ERCP and follow-up with drainage tube. No patients developed recurrent acute cholecystitis in follow-ups. Acute cholangitis developed after removal of drainage catheter in one patient and this episode was treated through hospitalization and followed by cholecystectomy. No mortality developed in two-months follow-up.

Duration of hospital stay was significantly longer in patients who had growing in culture antibiogram. In patients whose drainage material was purulent, culture growing was more significant (Table 4). Besides, CRP and white blood cell count of the patients who had culture growing and purulent drainage material were not higher as compared to others.

Table 1. Distribution of general characteristics

	Mean ± SD	Min–Max
ALT (U/L)	45.4±39.3	29.5 (8-180)
AST (U/L)	39.6±38.5	28.5 (14-177)
GGT (U/L)	122.0±113.3	69 (10-381)
ALP (U/L)	118.0±67.4	115 (19-226)
Total bilirubin(mg/dL)	1.29±1.13	1.08 (0.38-5.3)
Direct bilirubin(mg/dL)	0.75±0.91	0.45 (0.19-4.01)
WBC (cells/µl)	13838.2±4298.8	14195 (1987-20980)
CRP (mg/dL)	18.63±9.21	19.8 (1.1-33.6)

WBC: White blood cell, CRP: c-reactive protein, ALT: alanine transaminase, AST: aspartate transaminase, ALP Alkaline Phosphatase, GGT Gamma Glutamyl Transferase

Table 2. Comorbidities

	n	%
Yes	20	83.3
Hypertension	11	45.8
Diabetes mellitus	6	25.0
Coronary artery disease	3	12.5
Congestive heart failure	2	8.3
Chronic renal failure	4	16.7
Cerebral vascular accident	2	8.3
Chronic obstructive respiratory disease	2	8.3
Others	12	50.0

Table 3. Isolated microorganisms from bile cultures

	n	%
Escherichia coli	3	37.5
Klebsiella pnömoni	1	12.5
Enterobacter cloacea	2	25.0
Citrobacter braakii	1	12.5
Enterobacter spp	1	12.5

Table 4. The relationship between the growth in the culture antibiogram and the parameters

	Reproduction in bile culture		p
	No	**Yes**	
Length of hospital stay(days) (median)	7.5 (5-17)	17 (6-44)	0.008
Characteristic of fluid coming during percutaneous cholecystostomy			
Purulent	11 (68.8)	2 (25)	0.043
Others	5 (31.2)	6 (75)	

Discussion

Consistently with our findings, in the literature, perforated cholecystitis is more common in the elderly male patient population than in females [5]. The gallbladder perforations of the patients included in the study were Type 2 perforations according to the Neimeier classification [7]. Perforated cholecystitis cases are the acute cholecystitis group that need more additional imaging. When perforated cholecystitis patients were compared with non-perforated acute cholecystitis patients; peri-operative surgical dissection is difficult, the risk of bile duct injury is higher, switching to open cholecystectomy, and mortality and morbidity rates are higher [8].

A routine culture antibiogram is recommended for patients who develop gallbladder perforation. When peri-cholecystic abscess or gallbladder perforation occurs; it is recommended to start antibiotic therapy, to continue antibiotic therapy until the patient does not have signs of fever and abdominal pain and the leukocyte count returns to normal. Ampicillin-sulbactam is one of the agents frequently used in intra-abdominal infections. However, its routine use is not recommended due to strains producing extended-spectrum beta-lactamases (ESBL). Few studies have been conducted on antimicrobial agents used in acute cholecystitis. Our growth rates in culture and the most common microorganism were compatible with those in the literature [9]. As the patients who have culture growing have longer duration of hospital stay, these patients should be closely followed-up; proper antibiotherapy management and changes in antibiotherapy should be done timely in patients who are resistant to the agent used and whose clinical findings do not regress.

In the study of Bundy et al. reporting the long-term outcomes of 324 patients, 22 patients with perforated cholecystitis were investigated and they were found to be successfully treated with PC. However, in that study, perforated cholecystitis group was not evaluated in detail [10].

Elective cholecystectomy is recommended 4-8 weeks after PC [11]. However, in the study of Altieri et al., performing cholecystectomy 8 weeks before PC was reported to be related with higher general complications. In that study, time of cholecystectomy was 38 days in early patient group and 203 days in the late group. There was no difference between early and late cholecystectomy groups with regard to bile duct injury. Duration of PDC stay and whether the patients developed episodes on follow-ups were not reported [12]. In our study, mean duration from PC to cholecystectomy was consistent with no of the groups of that study. However, our complication rate was reasonable in follow-ups after cholecystectomy and PC. We consider that studies that include larger number of patients, investigating the time of PDC removal and frequency of recurrent acute cholecystitis are required for estimating the timing of cholecystectomy after PC.

In our series, ratio of starting with open cholecystectomy is high. However, Type 2 perforations are frequently related with subacute cholecystitis and Callot triangle dissection is difficult [13]. Particularly Grade 2 cholecystitis is related with increasing intra-operative difficulty [14].

In a series of 103 patients including Grade 2 patients, early cholecystectomy and delayed cholecystectomy after PC were compared. In the early cholecystectomy group, duration of post-operative abdominal drainage and duration of hospital stay were longer, amount of intra-operative hemorrhage, ratio of switching to open cholecystectomy, ratio of gallbladder perforation and the risk of peri-operative injury were found to be higher. Patients were successfully treated with delayed cholecystectomy after PC. PC was recommended for the patients with comorbid conditions in order to reduce post-operative complications [14]. Similarly, we also consider that Type 2 gallbladder perforations may be safely treated with PC at the first stage.

Dikshit et al. recommend follow-up with PC without cholecystectomy in Type 2 gallbladder perforation group [15]. In the study of Marziali et al., acute cholecystitis treatment with PC was reported to be effective and safe in elderly patients with high surgical risk, even it may be a permanent treatment without cholecystectomy and similarly with our study, likelihood of experiencing acute cholecystitis after PC is relatively low [16].

After the sepsis of our patient group was controlled with PC, the group with less comorbidity and relatively acceptable surgical risk underwent cholecystectomy in their follow-up and the group with the highest surgical risk was followed up for one year without performing cholecystectomy, as PC was the permanent treatment.

No recurrence of acute cholecystitis was observed in all patient groups.

Small number of patients and retrospective design of the study are the limitations of our study. Assessment of PC in larger number of acute calculous cholecystitis patients with perforated gallbladder would be more useful for evaluating the treatment protocols and effectiveness.

Conclusion

Permanent treatment by PC may be achieved without performing cholecystectomy in perforated acute cholecystitis patients with multiple comorbid conditions and very high surgical risk. In the group that cholecystectomy was planned, PC may be safely performed for controlling sepsis before cholecystectomy.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
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Ethical approval
Ethics committee approval was obtained with the number HNEAK-KAEK 2021/KK/179.

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