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Percutaneous cholecystostomy results of 136 acute cholecystitis patients: A retrospective cohort study

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Ethics Committee Approval
The Ethical Review Committee of University of Health Sciences, Okmeydani Training and Research Hospital approved this study (date: 23.05.2017 and number: 668).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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

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Abstract

Background/Aim: Percutaneous cholecystostomy (PC) is an alternative procedure to surgery in selected patients with acute cholecystitis (AC). This study aimed to review the clinical and surgical results of patients who underwent percutaneous cholecystostomy.
Methods: The records of patients who underwent PC for AC were evaluated for age, gender, comorbidities, survey, catheterization timing, complications, control, removal timing, operation type, interval time, pathology, C-reactive protein (CRP) level and white blood cell count (WBC), ultrasonography (USG) and computed tomography (CT) results.
Results: One hundred and thirty-six AC patients who underwent PC were included in the study. The median age was 73 (32-96) years and 57.3% of the patients were male. Out of the 136, 106 (78%) had an American Society of Anesthesiologists (ASA) classification score of 3 or 4. The median Charlson's comorbidity index (CCI) score was 5 (0-13). The median timing of catheterization was 23 (20-144) hours and length of hospital stay (LOS) was 3 (1-25) days. Dislocation was the most common complication of PC, and 7.4% (n=10) had recurrent AC. The median time until tube removal was 26.5 (1-238) days. Among all, 41.2% (n=56) of the patients underwent interval cholecystectomy, which equates to 76.8% of the those performed laparoscopically. The median time until the operation was 100 (1-264) days. Chronic cholecystitis was the most common pathology of cholecystectomy after PC. Bacterial bile cultures were analyzed in 36 of the patients and showed positive results in 66.7%, with no overall effect on the outcome. Nine patients (6.6%) died.
Conclusion: The importance of PC in AC increased with the Covid19 pandemic. PC was performed especially for old patients with ASA ≥3, and CCI ≥5 due to lower complication and recurrence rates. PC could be the final treatment for selected AC patients. Interval cholecystectomies performed after 8 weeks had a shorter LOS and a lower rate of complication.

Keywords: Acute cholecystitis, Comorbidities, Percutaneous cholecystostomy, Recurrence

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Introduction

Acute cholecystitis (AC) is the inflammation of the gallbladder and mostly occurs due to the obstruction of the cystic duct by gallstones. Five percent of the ACs are acalculous. The prevalence of gallstone is 15-20% in the population, 2% being symptomatic, and 20% of the symptomatic patients present with AC [1, 2]. The most common diagnostic criteria and severity grading for AC is Tokyo Guidelines (TG). AC is divided into mild, moderate, and severe according to TG18 severity grading. Treatment of AC varies from supportive (antibiotic) treatment to cholecystectomy due to severity and/or patients' comorbidities or health conditions [3].

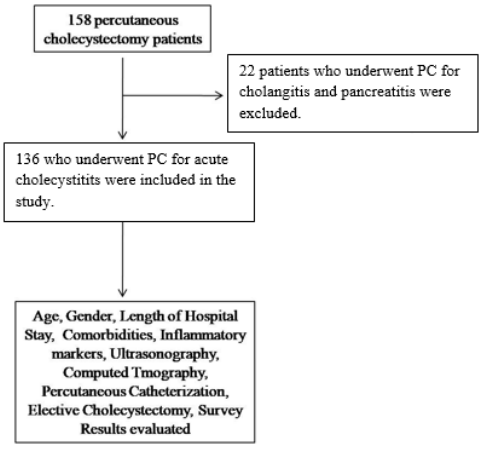
Percutaneous cholecystostomy (PC) is an ultrasonography (USG)-guided, percutaneously performed drainage procedure, which is an alternative to surgery in selected AC patients [4]. PC is indicated in severe cholecystitis (according to TG18), AC patients with American Society of Anesthesia (ASA) classification ≥3 or Charlson's comorbidity index ≥ 6 score, in malignant biliary tract lesions, bile duct stricture dilatation, bile duct fistula output diversion, or biliary tract decompression in cholangitis [5]. PC became more important for AC treatment during the Covid-19 pandemic independent from comorbidities or surgical high risk [6]. There is no literature on the optimal timing for tube placement of PC. However, lower procedure-related bleeding and lower hospital stay were reported with early tube placement (≤24 hours) [7]. Tube removal is suggested 3-6 weeks after placement because of tract maturation. However, the mean tube removal time was reported as 89 days in the literature [8]. Major or minor complication rate varies from 2.4 to 16%, and mortality rate ranges between 0-1.4% [9]. PC can be the final treatment in selected patients with higher surgical risk and/or patent cystic duct at cholecystography with or without cholecystolithotomy, or a bridge treatment for early or elective cholecystectomy [10].

This study aimed to assess the percutaneous cholecystostomy results of 136 acute cholecystitis patients.

Materials and methods

The Ethics Review Committee of University of Health Sciences, Okmeydanı Training and Research Hospital approved this study (Decision no: 668, date: 23.05.2017). The records of the patients who underwent percutaneous cholecystostomy for acute cholecystitis between 01 January 2015 and 01 January 2021 were evaluated retrospectively (Figure 1).

Figure 1: Flowchart showing the patients included in the study



An interventional radiologist performed US-guided PC with the transhepatic approach (Figure 2) and checked it with a cholecystography (Figure 3).

Figure 2: Ultrasound-guided transhepatic percutaneous cholecystostomy images: A: The catheter is on the gallbladder wall, B: The catheter is within the gallbladder.

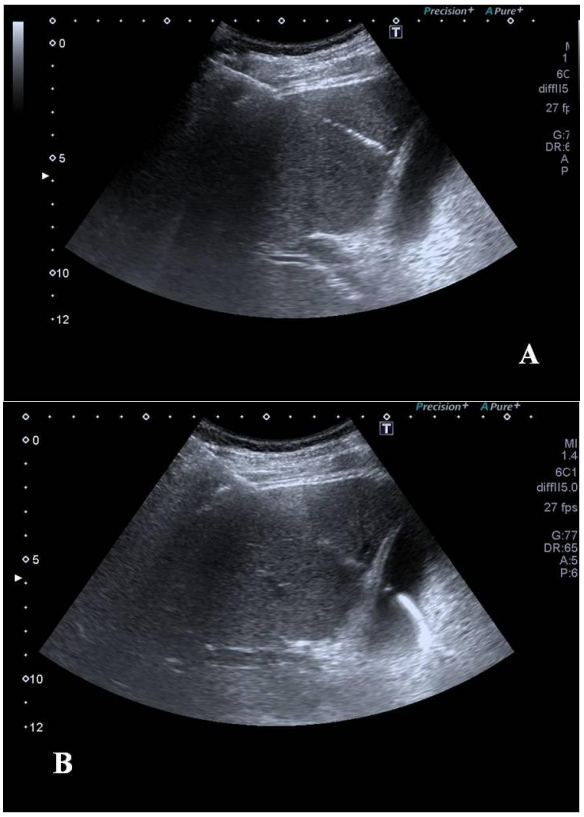
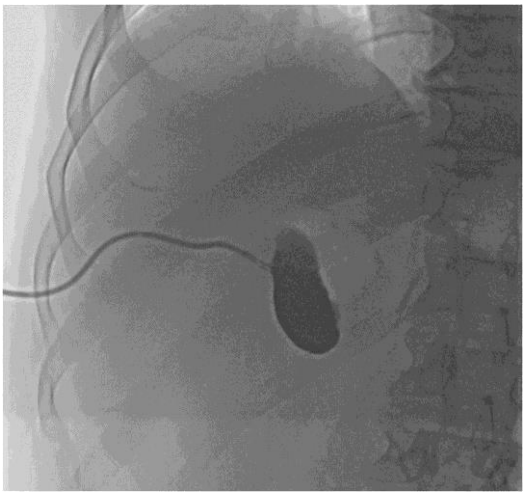


Figure 3: Cholecystography



Patients' age, gender, comorbidities, catheterization timing, length of hospital stay (LOS), endoscopic retrograde cholangiopancreatography (ERCP), CCI, ASA classification score, time until surgery, and survey were noted. Charlson's Comorbidity Index (CCI) was calculated as Charlson et al. [11] described. Baseline, pre-procedural and discharge levels of C-Reactive protein (CRP) (g/dl), white blood cell count (WBC) (10^6/dl), baseline levels of neutrophil percentage (Neu%), neutrophil lymphocyte ratio (NLR), platelet count (PLT) (10^3/dl), international normalization ratio (INR), creatinine (mg/dl) levels were assessed. The size of the gallbladder, wall thickness, contents of gallbladder, and size of major calculi were determined using USG and CT. The size and complications of the catheter, bile culture results, isolated pathogens, imaging for catheter control, time until removal, and catheter removal

indications were considered the catheterization results. Operation type and indications of initial open surgery and conversion to open surgery, time until the operation, postoperative intensive care unit requirement, and postoperative pathology results were evaluated as the cholecystectomy results.

Whether the patient underwent operation was recorded as yes/no, survival was noted as alive or exitus, the size of gallbladder, as hydropic or normal, the contents of the gallbladder, as sludge, the size of the stones as <3 mm, or ≥3 mm, and CT results, as not performed, performed but negative or performed and positive. Catheter complications were noted as none, dysfunction, dislocation, abscess, removed, and recurrence. Whether bile culture was obtained was assessed as no or yes (if yes, negative or positive). Catheters were controlled ultrasonographically or with a cholecystography. Catheter removal indication was grouped as final treatment, during surgery, removal without surgery and exitus. Operation types included laparoscopic, initial open surgery, or conversion to open surgery. Postoperative pathological examination results were grouped as chronic cholecystitis, active chronic cholecystitis, xanthogranulomatous cholecystitis, ulcerous active cholecystitis, ulcerous active follicular cholecystitis, or chronic follicular cholecystitis.

In addition to the comparisons of the PC patients in our dataset according to the mentioned criteria, treatment types of the AC cases from the first wave of the Covid-19 outbreak were compared with those treated during the study period. The first wave of the Covid19 outbreak was defined as the period between 11.03.2020 and 01.07.2020. The number of all AC patients during the evaluated period was 993, 31 of which were treated during the first wave of the Covid-19 pandemic. This being a retrospective study, any potential bias which may be introduced from the fact that the study groups were not randomized should be kept in mind.

Statistical analysis

Statistical analysis performed with SPSS 16.0 (Chicago, SPSS Inc.), The age, LOS, catheterization timing, wall thickness, major calculi size, laboratory results, catheter removal time, and operative time were reported as median (minimum-maximum).

Results

Out of the 158 patients who underwent percutaneous cholecystostomy, 136 patients who had acute cholecystitis were included in the study. The median age was 73 (32-96) years and 57.3% (n=78) were male. The median CCI was 5 (0-13). Only 8% (n=11) of the patients had no comorbidities. The most common comorbidities were hypertension (HT) (50.7%, n=69), diabetes mellitus (DM) (46.3%, n=63), coronary artery disease (CAD) (34.5%, n=47), and chronic obstructive pulmonary disease (24.2%, n=33). The median time until catheterization was 23 (20-144) hours, and the median length of hospital stay was 3 (1-25) days. Fourteen percent (n=19) of the patients underwent ERCP, 41.2% (n=56) underwent cholecystectomy, and 6.6% (n=9) of the patients died (Table 1).

The median of CRP at admission (baseline), before the cholecystostomy and at discharge were 184.02 (0.92-426.72) g/dl, 211.5 (8.75-494.17) g/dl, and 104 (3.3-382), respectively. The median WBC count at admission, before the cholecystostomy and at discharge were 15.35 (3.43-32.2) 10^6/dl, 13.07 (3.3-33.1) 10^6/dl, and 9.14 (2.9-20.5), respectively. The median Neu%, NLR, PLT count, INR and serum creatinine values were 86.2 (61.8-95.8) %, 12.14 (2.1-68.4), 233.5 (86-512) 10^3/dl, 1.16 (0.88-2.58), and 0.93 (0.53-6.71) mg/dl, respectively (Table 2).

One hundred and twelve patients (82.4%) had hydropic gallbladders. The median gallbladder wall thickness was 5 (4-17) mm. Other radiologic findings (USG and CT) are shown in Table 3.

Table 1: Patient demographics (n=136)

Age (years)*	73 (32-96)
Gender	n (%)
Male	78 (57.3%)
Female	58 (42.7%)
Charlson's Comorbidity Index*	5 (0-13)
Comorbidities	n (%)
None	11(8%)
Hypertension	69 (50.7%)
Diabetes	63 (46.3%)
Coronary Arter Disease	47 (34.5%)
Chronic Obstructive Pulmonary Disease	33 (24.2%)
Tumor	13 (9.5%)
Cerebrovascular Disease	12 (8.8%)
Alzheimer	11 (8.1%)
Chronic Renal Failure	10 (7.3%)
Congestive Heart Failure	8 (5.9%)
ASA classification score	n (%)
ASA 1-2	30 (22%)
ASA 3	83 (61%)
ASA 4	23 (17%)
Catheterization timing (hours)*	23 (20-144)
Length of hospital stay (day)*	3 (1-25)
ERCP	n (%)
No	117 (86%)
Yes	19 (14%)
Operation	n (%)
No	80 (58.8%)
Yes	56 (41.2%)
Survey	n (%)
Alive	127 (96.3%)
Exitus	9 (6.6%)

* Median (Minimum-Maximum)

Table 2: Patients' laboratory findings

CRP (g/dl)*	
A	184.02 (0.92-426.72)
BC	211.5 (8.75-494.17)
D	104 (3.3-382)
WBC (10^6/dl)*	
A	15.35 (3.43-32.2)
BC	13.07 (3.3-33.1)
D	9.14 (2.9-20.5)
Neu%*	86.2 (61.8-95.8)
NLR*	12.14 (2.1-68.4)
PLT (10^3/dl)*	233.5 (86-512)
INR*	1.16 (0.88-2.58)
Creatinine (mg/dl)*	0.98 (0.53-6.71)

* Median (Minimum-Maximum) PLT: Platelet, INR: International Normalization Ratio, WBC: White blood cells, Neu%: Neutrophil (%), NLR: Neutrophil lymphocyte ratio, CRP: C-reactive protein, (A) Administration (BC) Before Cholecystostomy (D) Discharge

Table 3: Results of the patients' radiologic findings

Ultrasound Size of gallbladder	n	%
Hydrops	112	82.4
Normal	24	17.6
Wall thickness (mm)*	5 (4-17)	
Contents of gallbladder	n	%
Sludge	21	15.3
Calculi (<3mm)	36	26.5
Calculi (≥3mm)	79	58.2
Size of major calculi (mm)*	13.9 (3-39)	
Computed tomography	n	%
Not Performed	79	58.2
Performed but negative	7	12
Performed and positive	50	88

* Median (Minimum-Maximum)

The most common catheter size was 8F, used in 83% (n=113). Two patients (1.5%) had catheter dysfunction, 2.2% (n=3) had catheter dislocation, and 7.4% (n=10) had recurrence.

Among the thirty-six patients (26.4%) who had their bile cultures obtained, no pathogens were isolated in 33.3% (n=12). Escherichia coli was the most common pathogen isolated

from the bile culture with a rate of 50.0% (n=12), with Klebsiella pneumonia, and Enterobacter cloaca both following with 12.5% (n=3). Only 23.5% (n=32) of the patients had their catheter controlled with a cholecystography. The median catheter removal time was 27 (1-228) days, 41.2% (n=56) of the patients had their catheter removed during surgery, while 22.8% (n=31) had their catheter removed as final treatment (Table 4).

Among 56 patients who were operated, 76.8% (n=43) underwent laparoscopic cholecystectomy, and the operations of 14.3% (n=8) began laparoscopically but were converted to open surgery. Previous upper GIS surgery and ventriculoperitoneal shunt were the indications of initial open surgery, while severe adhesions and organ injury were the indications of conversion to open surgery. The median time until the operation was 100 (1-264) days. Twenty-one operated patients (38.2%) required intensive care. The most common postoperative pathological examination results were xanthogranulomatous cholecystitis in 23.2% (n=13), chronic cholecystitis in 21.4% (n=12), and active chronic cholecystitis in 19.7% (n=11) (Table 5).

Table 4: Results of percutaneous catheterization (n=136)

Size of catheter	n	%
8F	113	83
10F	17	12.5
7F or 9F	6	4.5
Complication of catheter	n	%
None	128	94.1
Dysfunction	2	1.5
Dislocation	3	2.2
Subcutaneous abscess	1	0.7
Remove	2	1.5
Recurrence	10	7.4
Bile culture	n	%
No	100	73.6
Yes	36	26.4
Negative	12	33.3
Positive	24	66.7
Isolated pathogens	n	%
Escherichia coli	12	50.0
Klebsiella pneumoniae	3	12.5
Enterobacter cloacae	3	12.5
Citrobacter freundii	1	4.2
Serratia marcescens	1	4.2
Pseudomonas aureginosa	1	4.2
Enterococcus faecalis	1	4.2
Enterococcus raffinosus	1	4.2
Enterococcus durans	1	4.2
Catheter control imaging	n	%
Ultrasonography	104	76.5
Cholecystography	32	23.5
Catheter Removal Time (day)*	26.5 (1-238)	
Catheter removal indication	n	%
Final treatment	31	22.8
During surgery	56	41.2
Removal without Surgery	42	30.8
Exitus	7	5.2

* Median (Minimum-Maximum)

Table 5: Results of cholecystectomy (n=56)

Operation Type	n	%
Laparoscopic	43	76.8
Open	5	8.9
Previous Upper GIS Surgery	4	80
Ventriculoperitoneal Shunt	1	20
Laparoscopic Conversion Open	8	14.3
Severe Adhesions	7	87.5
Organ Injury	1	12.5
Operation Interval Time (day)*	100 (1-264)	
Postoperative Intensive Care Unit	n	%
No	34	61.8
Yes	21	38.2
Pathology of Gallbladder	n	%
Chronic	12	21.4
Active Chronic	11	19.7
Xanthogranulomatous	13	23.2
Ulcerous Active	7	12.5
Ulcerous Active Follicular	9	16.1
Chronic Follicular	4	7.1

*Median (Minimum-Maximum)

Among the cholecystectomies performed ≤8 weeks, the rate of conversion to open surgery was higher (18.8%), mean LOS was longer (3.8 days), and the rate of perioperative complications was higher (12.5%) (Table 6).

Comparing the treatment types of the patients from the first wave of the Covid-19 pandemic with all AC patients in the study period revealed a lower rate of cholecystectomy and a higher rate of PC during the pandemic period (Table 7).

Table 6: Results of cholecystectomy by interval (n=56)

Interval*	≤8-week, n=16		>8-week, n=40	
	n	%	n	%
Laparoscopic	11	68.8	32	80.0
LCO**	3	18.8	5	12.5
Open	2	12.5	3	7.5
Complication	2	12.5	3	7.5
LOS (day)	3.8		3.1	

*Operation interval time (day), ** Laparoscopic Convert to Open

Table 7: AC treatment type comparison between the first wave of the Covid-19 pandemic and the total evaluated period

	1.1.2015 / 1.1.2021*		11.3.2020 / 1.7.2020**	
	n	%	n	%
AC	993		31	
Treatment Type				
Medical	521	52.4	21	67.7
PC	136	13.7	7	22.6
Cholecystectomy	337	33.9	3	9.7

* All patients, ** First wave of the Covid-19 pandemic

Discussion

Percutaneous cholecystostomy (PC) has a life-saving role for severe AC patients who cannot tolerate surgery. The indications of PC include (1) failure of medical treatment, (2) severe sepsis or intensive care requirement, (3) suspicion of gallbladder necrosis/perforation, (4) suspicion of gallbladder empyema, (5) surgeon's choice, (6) rejecting surgery, and (7) old age [12].

PC can be performed under USG, CT or endoscopic USG (EUS) guidance. The disadvantages of CT and EUS-guided PC are radiation exposure, the need for more experience, and sedation or general anesthesia requirement [13, 14]. In our study, PC was performed by an experienced interventional radiologist with 100% technical and clinical success under USG guidance with the transhepatic approach. The indications of PC in our study were CCI >5, ASA ≥3, and/or old patients who did not respond to medical treatment.

Older age is an important criterion for PC. The mean age of PC patients varies between 54.7-83 years, and it is predominant among males with rates of 52.7-78.3% reported in the literature [12]. Anderson et al. [15] studied 3,961 PC patients and reported the mean age of PC as 72.9 years, older than that of cholecystectomy patients (54.4 years), and the rate of male patients who underwent PC and cholecystectomy as 52.7%, and 38.9%, respectively. We reported the mean age for cholecystectomy as 51.76 years and the rate of males as 53.4% in our previous study [16]. In our current study, the median age was 73 years and 57.3% of the patients were male, both of which were similar to those reported in the literature.

Comorbidities affect not only surgical but also anesthetic morbidity and mortality. In the literature, the comorbidities were evaluated with ASA classification or CCI and only diabetes, coronary arterial disease or tumor were reported [12]. Bakkaloğlu et al. [17], Hiesh et al. [18], and Peters et al. [19] used ASA classification to assess the comorbidities and stated that three quarters of PC patients were ASA 3 and the rest were ASA 4. In our study, the percentage of ASA 3 and 4

patients was 78%. Anderson et al. [15], Bolues et al. [20], and Kawasneh et al. [21] used CCI for evaluating the comorbidities, and reported the mean CCI values as 3.9, 3.2 and 5.5 respectively. DM, HT, and CAD are the most common comorbidities of the elderly. Lin et al. [20] reported the comorbidities of elderly AC patients as HT (54.1%), DM (39.3%), CVD (24.6%) and CAD (22.9%). In our study, the median CCI was 5 (0-13), and the most common comorbidities were HT, DM, and CAD with rates of 50.7%, 46.3%, and 34.5%, respectively.

Ninety-five percent of AC patients had calculous cholecystitis (CC); therefore, PC was most performed for CC. The rates of PC performed for acalculous cholecystitis (ACC) varies from 3.1% to 42.5% in literature [12]. PC without cholecystectomy was reported as the final treatment of ACC in 76.3% [13, 22]. In our study, 15.4% of the PC was performed for ACC, and PC was the final treatment for only 19% (n=4) of those with ACC.

CRP and WBC count were the most used inflammatory biomarkers for AC, and important predictors of severity [16]. WBC increased early and decreased quickly as a response to treatment; however, CRP increased later and decreased slowly. The decreased CRP, WBC and fever were signs of inflammatory response to PC. WBC decreased from 19.97 to 8.37 $10^3/\mu L$, and CRP, from 248.7 to 25 mg/l in 72 hours after PC [23]. In our study, the median WBC decreased from 15.36 to $9.14x10^6$/dl; however, CRP increased before cholecystostomy compared to the level at admission, but decreased at discharge (211.5, 184.02, and 104 g/dl respectively).

Increased wall thickness, and pericholecystic fluid are the most common findings in the radiologic evaluation of AC. USG and/or contrast-enhanced CT were used for imaging in acute gallbladder pathologies. Hydropic gallbladder is an important finding for performing PC and a sign of obstruction of cystic duct. A hydropic gallbladder was reported in 74.2%, and the mean wall thickness was 6 (1.93) mm among patients with AC [24]. In our study, 82.4% of the patients had hydropic gallbladders, and their median wall thickness was 5 (4-17) mm. Also, 12.3% of the CT-performed patients had false negative findings.

Hemorrhage, dislocation, dysfunction, self-removal, or bile leakage are the complications of PC. In the literature, the complication rates of transabdominal and transhepatic PC were 32.3% and 12.1%, respectively [13]. Recurrence rate varied from 18-20.6%, and the mean time until recurrence, from 65 to 660 days. Malignancy, calculous cholecystitis, common bile duct stone, shorter than 44 days of PC duration were the risk factors of recurrence. Thirty-eight percent of the recurrence patients' catheters were functional [25, 26]. The removal time of catheters varied from 2 to 193 days, and there was no correlation between clinical outcomes [27].

In our study, the complication rate was 5.9% (n=8), and the dislocation of catheter was the most common complication, seen in 37.5% (n=3). Ten patients (7.4%) had recurrent AC after PC, which is lower than those reported in the literature. Ninety percent of the recurrent diseases were CC, only 30% (n=3) had their tube removed within the first 44 days following PC, and none had any tumors. The median removal timing of the catheter was 27 (1-228) days.

Bile cultures were obtained from 93.5% of the patients who underwent PC, among which 60.3% came back positive. The most common isolated pathogen was Escherichia coli (28.7%), which was followed by Klebsiella spp, and Enterobacter spp with rates of 17.14% each [28]. In our study, bile cultures could be obtained from 26.4% (n=36) of the patients, and a positive culture result was reported in 66.7% (n=24). Escherichia coli was the most common isolated pathogen with 50% (n=12), followed by Klebsiella pneumoniae and Enterobacter cloacae both at 12.5% (n=3).

Interval or delayed cholecystectomy, cholecystoscopy with lithotripsy, cystic duct stenting or removal after cholecystography would be performed after PC. Cholecystectomy was performed in 30-43% of the PC patients within 30-120 days [10, 29]. Initial open approach (16% vs 3%) or conversion to open surgery (26% vs 13%) were significantly higher in cholecystectomies performed after PC [30]. In the literature, there is no consensus about the favorable timing of interval cholecystectomy after PC. Woodward et al. [31] recommended a waiting period of 4 to 8 weeks after PC, due to increased surgical complication risk before 4 weeks, and after 8 weeks, whereas Altieri et al. [37] suggests that performing an early cholecystectomy (≤ 8 weeks) is associated with a higher risk of complications and longer hospital LOS compared to those performed at >8 weeks.

In our study, 40.4% of the PC patients underwent cholecystectomy within a median of 100 days, and cholecystectomies performed within ≤8 weeks were associated with a higher risk of complications (11.8%, n=17) and a longer LOS (3.8 days). Initial open approach and conversion to open surgery rates were lower than those in the literature, with 9% and 12.8%, respectively.

The most common postoperative pathological findings of the gallbladder among 1960 samples include chronic cholecystitis (67%), follicular cholecystitis (12%), and xanthogranulomatous cholecystitis (0.3%). Xanthogranulomatous cholecystitis is a rare, uncommon variant of chronic cholecystitis. The reported incidence varies from 0.3 to 1.9% in western countries, but increases up to 9% India [32, 33]. In our study, chronic cholecystitis was the most common pathology (41.1%), and the rate of xanthogranulomatous cholecystitis was 23.2%, higher than that reported in the literature.

PC was the final treatment for AC patients whose bile drainage from the gallbladder to the common bile duct was observed with a cholecystography, those not suitable for surgery, patients with malignancy, or acalculous cholecystitis. USG could not show the drainage of bile but revealed dislocation or other complications, such as abscess. The rate of PC performed as the final treatment of AC was varies between 43%-94% in the literature [34]. In our study, only 23.5% of the PCs were controlled with cholecystography, PC was the final treatment of 22.8% AC patients, and 5.2% of the patients' tubes were removed because of death.

In the literature, the thirty-day mortality rate of PC varies between 2.5-16.7%. The higher mortality rate of PC was

related with older age and comorbidities (especially malignancy) more than cholecystectomy [35, 36]. In our study, the mortality rate was 6.6%, similar with the literature.

The importance of PC increased with the Covid-19 pandemic worldwide [6]. Due to the decrease in resources (staff, ICU beds, operating rooms, etc.) because our hospital became a pandemic hospital during this period, AC patients which required cholecystectomy were treated conservatively or with PC more frequently.

Limitations

Its retrospective design and lack of comparison with AC patients who were conservatively or surgically treated were the two main limitations of our study. Additionally, the number of patients who underwent surgery post-PC was relatively low. High-quality prospective randomized trial studies about post-PC management are needed to reach a consensus on the topic.

Conclusion

PC is an important low-recurrence, low-complication alternative procedure to surgery in AC, especially for old patients with multiple comorbidities and high surgical risk. Its significance was revealed even more during the first wave of the Covid-19 where institution resources for surgery were scarcer. USG-guided transhepatic approach is a common and safe technique of PC. Some AC, especially ACC, could be treated with PC. Dislocation is the most common complication of PC. Recurrence of AC is another important problem of PC and may require further treatment such as surgery. Interval or delayed cholecystectomy could be performed after PC in selected patients. Xanthogranulomatous cholecystitis is rare, but it must be kept in mind that it is more common in cholecystectomies performed after PC. Our study suggests interval cholecystectomies performed after 8 weeks results in shorter LOS and lower rates of complication.

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