

# Percutaneous cholecystostomy instead of laparoscopy to treat acute cholecystitis during the COVID-19 pandemic period: single center experience

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## ABSTRACT

**BACKGROUND:** Laparoscopic cholecystectomy (LC) is the accepted standard treatment for acute cholecystitis (AC) in patients eligible for surgery. Percutaneous cholecystostomy (PC) can provide a permanent treatment for high-risk patients for surgery or act as a bridge for later surgical treatment. This study is an evaluation of the use of PC during the current coronavirus 2019 (COVID-19) pandemic at a single hospital.

**METHODS:** Fifty patients with AC were admitted as of the start of the COVID-19 pandemic in Turkey through June 2020. Patients with pancreatitis, cholangitis, and/or incomplete data were excluded from the study. Data of the remaining 36 patients included in the study were recorded and a descriptive statistical analysis was performed. The patients were divided into three groups: PC (n=14), only conservative treatment with antibiotherapy (OC) (n=14), and LC (n=8). The findings were compared with a group of 70 similar patients from the pre-pandemic period.

**RESULTS:** The mean age of the pandemic period patients was 53 years (range: 26–78 years). The female/male ratio was 1.11. PC was preferred in eight (11%) patients in the same period of the previous year, whereas 14 (39%) patients underwent PC in the pandemic period. Four of the 36 pandemic patients were positive for COVID-19, including one member of the PC group. There was one (7.1%) mortality in the pandemic-period PC group due to cardiac arrest. The length of hospital stay between the groups based on the type of treatment was not statistically significant.

**CONCLUSION:** LC is not recommended during the pandemic period; PC can be an effective and safe alternative for the treatment of AC.

**Keywords:** Acute cholecystitis; COVID-19 pandemic; percutaneous cholecystostomy.

## INTRODUCTION

Acute cholecystitis (AC) is one of the most common surgical emergencies. AC has the potential to cause sepsis and death in patients with comorbidities.<sup>[1–3]</sup> The most common cause is gallstones; however, it may also be associated with diabetes, immunosuppression, chronic kidney disease, viral disease, hemoglobinopathies, or vasculitis.<sup>[4]</sup> The optimal treatment for AC is early surgery. The standard procedure is a laparoscopic

cholecystectomy (LC).<sup>[5]</sup> In most patients, antibiotherapy is initiated and underlying diseases are controlled. Although severe sepsis may be present in some patients, surgery may not be possible due to accompanying critical conditions and poor physiological reserve. Alternative treatment options, such as percutaneous cholecystostomy (PC), may be preferred in these patient groups.<sup>[6]</sup>

Cite this article as: Somuncu E, Kara Y, Kızılkaya MC, Bozdağ E, Yıldız ZB, Özkan C, et al. Percutaneous cholecystostomy instead of laparoscopy to treat acute cholecystitis during the COVID-19 pandemic period: A case series experience. *Ulus Travma Acil Cerrahi Derg* 2021;27:89-94.

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*Ulus Travma Acil Cerrahi Derg* 2021;27(1):89-94 DOI: 10.14744/tjes.2020.69804 Submitted: 06.07.2020 Accepted: 13.11.2020 Online: 09.12.2020

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The Intercollegiate General Surgery Guidance on COVID-19 [7] of the United Kingdom has recommended that nonoperative management should be performed when possible during the novel coronavirus disease 2019 (COVID-19) outbreak. Other surgical communities, including the Italian Society of Endoscopic Surgery (SICE), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), and the European Association of Endoscopic Surgery (EAES), have also proposed a patient-centered and hospital-centered approach.<sup>[8-10]</sup> In the article “Recommendations for trauma and emergency general surgery practice during COVID-19” published by Gok et al.,<sup>[11]</sup> from Turkey, it was stated that percutaneous cholecystostomy (PC) is a potential alternative to cholecystectomy and can be used if antibiotic treatment fails. A recent multicentric, international study reported that any surgery in patients with a pre- or perioperative COVID-19 infection resulted in 25% mortality and severe pulmonary complications in 51%. Conservative approaches were recommended as much as possible for many surgical indications. It was also noted that laparoscopic cholecystectomy (LC) in acute cholecystitis was a high-risk procedure for surgical teams during the COVID-19 pandemic.<sup>[12]</sup>

The present study aims to examine the approach used with AC patients in a tertiary hospital during the ongoing pandemic in contrast to the period before the pandemic.

## MATERIALS AND METHODS

In this study, 50 patients with acute calculous cholecystitis were admitted to the general surgery clinic of Kanuni Sultan Suleyman Training and Research Hospital between March 10, 2020 (first recorded COVID-19 case in Turkey publicly announced on March 11) and June 10, 2020. However, 70 patients who were diagnosed with cholecystitis during the same period of 2019 were included in the analysis based on the same criteria. In all, 14 patients with coexisting pancreatitis, cholangitis, or incomplete data were excluded from this research. The study cohort for the pandemic period consisted of 36 patients.

The data of all of the patients were recorded, descriptive statistical analysis was performed, and the results of the two time periods were compared. During the pandemic period, treatment for cholecystitis was based on the surgeon's and patient's preference and was primarily non-surgical. The patients were divided into three subgroups: Group 1 comprised patients who underwent PC (n=14), Group 2, the OC group, received only conservative treatment with antibiotherapy (n=14), and Group 3 comprised those who underwent LC (n=8). The 14 patients in Group 1 were at high surgical risk due to acute or chronic comorbidity. An interventional radiologist performed ultrasound (US)-guided transhepatic PC under local anesthesia with a pigtail catheter. In all groups, oral food intake was regulated according to the patient's clinical condition, and the decision to discharge was evaluated based on food tolerance.

This research was performed according to the principles of the Helsinki Declaration. Written informed consent was provided by all of the participating patients. All 36 patients in the pandemic group had impaired gallbladder wall integrity (intraparenchymal fluid in the gallbladder bed or excess fluid around the gallbladder with gallbladder distension) observed on contrast-enhanced abdominal computed tomography images (CT) or the US performed upon admission. The diagnosis of AC was confirmed based on the clinical examination, biochemical parameters, and both US and CT imaging in all three groups. COVID-19 was confirmed with a thorax CT before hospitalization without waiting for polymerase chain reaction test results.

Among the patients who underwent PC, some required daily, recurrent saline irrigation through the cholecystectomy drainage catheter to remove any gallbladder debris and fluid. Oral food intake was initiated when postprocedural recovery was observed, and solid foods were administered gradually. Patients were discharged following training regarding changing the dressing around the cholecystostomy entry site, evacuation of the cholecystectomy tube, and provided with an oral antibiotic prescription, diet recommendations, and an outpatient appointment. All of the patients were followed up by the same surgeon who performed their procedure in the general surgery outpatient clinic. At an average of three weeks later, they were evaluated by the same surgeon and the radiologist who inserted the catheter. In the PC Group, additional follow-up was recommended for patients with an open cystic duct, and LC was planned for patients with insufficient gallbladder discharge.

The Tokyo guidelines for AC recommend PC in cases not exhibiting recovery on the fifth day despite treatment in surgically high-risk patients (discontinuation of oral intake, intravenous hydration, and intravenous ceftriaxone treatment). According to the guidelines, an interval cholecystectomy is performed four to six weeks after the PC procedure.<sup>[13]</sup> However, we performed an urgent US-guided PC in high-risk patients with AC if the gallbladder was hydropic. Once pandemic conditions permit it, these patients will be called for an interval cholecystectomy.

## Statistical Analysis

The outcomes of the study patients were investigated retrospectively. IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA) was used to perform the data analyses. Descriptive statistics were used for demographic and clinical features. The results were presented as percentages for continuous variables and the number/percentage for categorical variables.

## RESULTS

### Demographic Characteristics of all Patients

The median age of the 36 patients in the pandemic group

was 53 years (range: 26–78 years). Of these, 17 were male and 19 were female. The female/male ratio was 1.1. Four of the 36 patients were positive for COVID-19. One of the COVID-19-positive patients underwent a PC, one patient had an LC, and two patients were treated conservatively with antibiotherapy. There was no mortality or additional pulmonary complications in the follow-up of COVID-19-positive patients.

In the same period of 2019 (March-June), before the pandemic, 70 patients were diagnosed with AC. Twenty-one underwent an emergency cholecystectomy (18 laparoscopic, three open surgery), 41 were treated conservatively with antibiotherapy, and eight underwent a PC. While the median age of the PC patients was 79 years in the earlier period, the median

age of patients in the pandemic period was 68 years. This is a result of a preference for PC in patients with AC during the pandemic in order to protect the surgical team and the patients from COVID-19 infection.

### Comparison of Groups and Evaluation of Results during the Pandemic Period

The median age of patients was 68 years (range: 26–76 years) in the pandemic period PC group, and the female/male ratio was 1/1. The median hospital stay was seven days (range: 2–20 days). Ten patients in the PC group had several comorbidities, as shown in Table 1. In all patients, the symptoms and biochemical parameters improved after the PC. The median hospital stay after the PC procedure was seven days (range: 2–20 days). During the pandemic period, an LC was

**Table 1.** Demographic features of percutaneous cholecystostomy cases

Patient ID	Age	Sex	US/CT/MR	Hospital stay (days)	Additional disease	COVID-19	Catheter removal (days)
1	73	Female	+/+/-	5	CAD, CHF	Negative	35
2*	66	Female	+/+/-	2	AGC	Negative	–
3	76	Female	+/+/+	7	–	Pozitive	15
4	72	Female	+/+/+	6	HT, DM	Negative	24
5	74	Male	+/+/-	3	–	Negative	19
6	70	Female	+/+/-	4	AF	Negative	25
7	47	Male	+/+/-	9	DM, CABG	Negative	25
8	43	Male	+/+/-	20	SP	Negative	23
9	49	Male	+/+/-	7	–	Negative	24
10	71	Female	+/+/-	10	HT, DM	Negative	27
11	45	Male	+/+/-	3	CAD	Negative	11
12	76	Female	+/+/-	7	CH	Negative	20
13	60	Male	+/+/-	14	HT	Negative	10
14	26	Male	+/+/+	7	–	Negative	20

\*Exitus (cardiac arrest). AGC: Advanced gastric cancer; AF: Atrial fibrillation; CABG: Coronary artery bypass grafting; CAD: Coronary artery disease; CH: Congenital hypothyroidism; CHF: Congestive heart failure; CT: Computed tomography; DM: Diabetes mellitus; HT: Hypertension; MR: Magnetic resonance; SP: Cerebral palsy; US: Ultrasound.

**Table 2.** Distribution of acute cholecystitis cases by the group during the COVID-19 pandemic periods

	Groups		
	Percutaneous (n=14) cholecystostomy	Laparoscopic (n=8) cholecystectomy	Only conservative treatment with antibiotherapy (n=14)
Male/female	6/8	4/4	7/7
Median age (years)	68 (26–76)	44 (31–63)	50 (26–78)
Median hospital stay (days)	7 (2–20)	3 (2–16)	4 (2–9)
Median catheter removal (days)	21 (10–35)	–	–
Additional disease	10/14	2/8	5/14
Readmission to hospital	1/14	1/8	0/14
Coronavirus disease 2019 positivity	1/14	1/8	2/14

performed in one patient in the PC group after catheter removal and during the initial admission in the remaining eight patients.

Fourteen patients from the pandemic group were followed up with antibiotherapy alone. All were discharged after clinical and biochemical recovery. The median length of hospital stay in this group was four days (range: 2–9 days) (Table 2).

The median duration of hospital stay was three days (range: 2–16 days) for the LC group. The length of hospital stay was lower in the OC and LC groups when compared with the PC group, but the difference was not statistically significant.

In 18 (50%) members of the pandemic period cohort, the American Society of Anesthesiology (ASA) score was IV or greater, and 11 (60%) patients underwent PC.

One patient in the PC group re-applied to the hospital due to the displacement of the catheter. Apart from this, no other complications were seen in the PC group. Superficial wound infection, which was treated with simple drainage and antibiotherapy, was detected in the four patients in the LC group. None of the patients developed additional morbidity. There was one (7.1%) mortality in the PC group due to cardiac arrest.

## DISCUSSION

Current guidelines state that the definitive treatment for cholecystitis is an LC.<sup>[14–16]</sup> However, for reasons, such as concomitant diseases and sepsis, surgery may not always be appropriate or safe for every patient. PC, which is a potentially life-saving and less invasive treatment option, may be preferred for patients in this category.<sup>[17]</sup> PC can serve as a bridge therapy that allows patients to survive severe disease and stabilize until they have a cholecystectomy.<sup>[4]</sup>

LC continues to be the first-line treatment for AC, even during the COVID-19 pandemic period.<sup>[18]</sup> However, many studies have emphasized that many toxic components in surgical smoke may endanger the health of the surgical team. It has been established that viruses (human papillomavirus, hepatitis B virus, HIV) can be transmitted via blood in this smoke.<sup>[18,19]</sup> Although there is no evidence of the presence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes COVID-19, in surgical smoke, SARS-CoV-2 RNA has recently been detected in the peritoneal cavity.<sup>[20]</sup> Many studies suggest filtering the pneumoperitoneum to remove most viral particles during laparoscopy.<sup>[9,10,21]</sup> We were unable to procure this filter at our hospital.

In Italian, Turkish, and the latest World Society of Emergency Surgery guidelines, it has been stated that percutaneous drainage of the gallbladder may be an alternative treatment after conservative treatment with antibiotics has been unsuccessful

in patients who are not candidates for surgery.<sup>[11,15,16,22]</sup> The optimal timing of PC is controversial. However, when performed within 24 hours from the clinical presentation, it is associated with fewer complications and a shorter hospital stay. As reported by Campanile et al.,<sup>[23]</sup> we also think that the timing of a PC primarily depends on clinical indications. For example, emergency drainage should be considered in a patient with severe sepsis not suitable for surgery. In other patients who are not suitable candidates for surgery, it is common practice to perform a cholecystostomy if there is no improvement within one to three days after starting antibiotic treatment unless sepsis is present.

In the literature, US-guided percutaneous transhepatic gallbladder drainage is considered the first alternative to surgical intervention in surgically high-risk patients with AC. PC also involves placing the catheter into the gallbladder with US guidance. PC is a well-defined, effective method to ensure immediate decompression of the inflamed gallbladder; it can reduce the risk of both inflammation and bile duct injury in patients whose general condition does not permit an emergency cholecystectomy. With a response rate ranging from 56% to 100% in the literature, PC provides early recovery and shortens the hospital stay. The potential early complications are bleeding, vagal reactions, sepsis, biliary peritonitis, pneumothorax, intestinal perforation, secondary infection, and catheter displacement, while late complications can include catheter displacement and recurrent cholecystitis.<sup>[24–29]</sup> In our study, we observed two instances of catheter dislocation in one patient of the PC group during the pandemic period, and catheter replacement was required.

One drawback of a PC is the development of fibrosis between the gallbladder and the liver in most patients.<sup>[30]</sup> This makes performing a cholecystectomy laparoscopically difficult. In a study that presented the results of 245 AC cases that underwent PC, it was reported that only 71 underwent cholecystectomy. Conversion to open surgery was necessary for 13 (21%) of 63 patients who started laparoscopically. Laparoscopy was successfully completed in 50 (79%) patients.<sup>[31]</sup> In many studies, LC has been reported to be a feasible and reliable approach in the treatment of AC. Following the literature, we started all of the cholecystectomies laparoscopically.

Several studies have shown that positive results have been achieved in the short term with a PC.<sup>[17]</sup> However, the long-term effects are controversial because there is conflicting information in the literature about the procedure-related risks. Dimou et al.<sup>[32]</sup> reported that a PC was preferable to cholecystectomy in the treatment of AC since the implementation of the Tokyo guidelines. Unlike our research, they also found that PC was associated with increased re-admission and higher mortality rates.

We have primarily preferred to pursue a PC in cases of AC since the COVID-19 pandemic. Our patients had significant

comorbidities, and generally, ASA scores of IV or more. We have seen that PC can be successful and maybe preferable, not only in critical situations for the patient but also in critical situations for the surgical team.

## Conclusion

PC was recommended and preferred to surgery in the initial treatment of AC, especially in high-risk, critically ill patients before the COVID-19 pandemic. Laparoscopic and endoscopic procedures are not recommended during the pandemic. PC can be an effective and safe alternative to treat AC during the pandemic period.

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Internally peer-reviewed.

**Authorship Contributions:** Concept: E.S., Y.K.; Design: E.S., Y.K.; Supervision: E.S., Y.K.; Resource: E.S., Y.K., M.C.K., E.B., A.Ş.; Materials: E.S., Z.B.Y., C.Ö., R.G., M.O.A.; Data: E.S., Z.B.Y., C.Ö., R.G., M.O.A.; Analysis: E.S., Y.K.; Literature search: E.S., Y.K.; Writing: E.S.; Critical revision: E.S., Y.K., M.A.B., A.K.

**Conflict of Interest:** None declared.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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## ORİJİNAL MAKALE - ÖZET

### COVID-19 salgını döneminde akut kolesistit tedavisinde laparoskopı yerine perkütan kolesistostomi: Tek merkez deneyimi

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**AMAÇ:** Laparoskopik kolesistektomi (LC), cerrahi için uygun hastalarda akut kolesistit (AC) için kabul edilen standart tedavidir. Perkütan kolesistostomi (PC), yüksek riskli hastalar için cerrahi için kalıcı bir tedavi sağlayabilir veya cerrahi tedavi için bir köprü görevi görebilir. PC'yi COVID-19 pandemisinde değerlendirdik.

**GEREÇ VE YÖNTEM:** AC'li 50 hasta COVID-19 salgınının başlangıcından Haziran 2020'ye kadar kabul edildi. Pankreatit, kolanjit ve/veya eksik ve riler çalışmadan çıkarıldı. Kalan 36 hastanın tümü kaydedildi ve tanımlayıcı istatistiksel analiz elde edildi. Hastalar üç gruba ayrıldı: PC (n=14); Sadece antibiyoterapi (OC) (n=14) ve LC (n=8) ile konservatif tedavi.

**BULGULAR:** Ortalama yaş 53 (dağılım: 26–78 yıl) idi. Kadın/erkek oranı 1.11'dir. PC geçen yıl aynı dönemde sekiz (%11) hastada, pandemik dönemde 14 (%39) hastada tercih edildi. Otuz altı hastanın dördü COVID-19 için pozitif ve bunlardan biri PC grubunda idi. PC grubunda kardiyak arrest nedeniyle bir (%7.1) mortalite vardı. Gruplar arasında hastanede kalış süresi istatistiksel olarak anlamlı değildi.

**TARTIŞMA:** Pandemi döneminde LC önerilmemektedir, bu nedenle PC AC tedavisinde etkili ve güvenli bir alternatif olabilir.

**Anahtar sözcükler:** Akut kolesistit; COVID-19 pandemisi; perkütan kolesistostomi.

*Ulus Travma Acil Cerrahi Derg* 2021;27(1):89-94 doi: 10.14744/tjtes.2020.69804