Int Surg 2018;**103:**534–541
DOI: 10.9738/INTSURG-D-16-00076.1

Emergency Cholecystectomy Versus Percutaneous Cholecystostomy for Treatment of Acute Cholecystitis in High-Risk Surgical Patients

Cevher Akarsu[1], Ahmet Cem Dural[1], Aysun Erbahceci Salik[2], Mustafa Gokhan Unsal[1], Osman Kones[1], Ilhan Gok[1], Murat Gonenc[1], Filiz Islim[2], Halil Alis[1]

[1]Department of General Surgery and [2]Department of Interventional Radiology, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Istanbul, Turkey

Our aim is to present our experience with laparoscopic cholecystectomy (LC) and percutaneous cholecystostomy (PC) in high-risk patients with acute cholecystitis (AC). The guidelines for AC are still debatable for high-risk patients. We aimed to emphasize the role of LC as a primary treatment method in patients with severe AC instead of a treatment after PC according to the Tokyo Guidelines (TG). AC patients with high surgical risk [American Society of Anesthesiologists (ASA) III-IV] who were admitted to our department between March 2008 and November 2014 were retrospectively evaluated. Disease severity in all patients was assessed according to the 2007 TG for AC. Patients were either treated by emergency LC (group LC) or PC (group PC). Demographic data, ASA scores, treatment methods, rates of conversion to open surgery, duration of drainage, length of hospital stay, and morbidity and mortality rates were compared among groups. Age, ASA score, and TG07 severity scores in the PC group were significantly higher than that in the LC group ($P < 0.001$, $P < 0.001$, and $P < 0.001$, respectively). Sex distribution ($P = 0.33$), follow-up periods ($P = 0.33$), and morbidity ($P = 0.86$) were similar. In the patients with early surgical intervention, mortality was significantly lower ($P < 0.001$). Length of hospital stay was significantly shorter in the LC group compared with the PC group ($P < 0.001$). In high-risk surgical patients, PC can serve as an alternative treatment method

Corresponding author: Ahmet Cem Dural, MD, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Department of General Surgery, Tevfik Saglam Cad. No: 11, Zuhuratbaba, 34147, Bakirkoy, Istanbul, Turkey.
Tel.: +90 212 414 7171/5410; Fax: +90 212 542 4491; E-mail: cemdural@hotmail.com

because of its efficiency in the prevention of sepsis-related complications due to AC. However, LC still should be an option for severe AC with comparable short-term results.

Key words: Acute cholecystitis – Laparoscopic cholecystectomy – Cholecystostomy

Acute cholecystitis (AC) represents the most common emerging disease in the general surgical practice.[1,2] The general approach is to perform a laparoscopic cholecystectomy (LC) in a young otherwise healthy patient group; conversely, percutaneous cholecystostomy (PC) is the preferred treatment of choice in elderly patients with comorbidities.[3] Early cholecystectomy has become common with the spread of laparoscopic surgery and an increase in experience. The Tokyo consensus studies are the most detailed studies on the management of AC.[4,5] In our study, the patients with AC were classified into 3 subgroups regarding the severity of the disease according to the Tokyo Guidelines (TG) for severe AC 2007 (TG07).[4] For grade I (mild) patients, early LC is the first-line treatment. Because severe (grade III) AC is associated with organ dysfunction, urgent/early drainage was preferred to urgent/early cholecystectomy for severe (grade III) cholecystitis. Similarly, because moderate (grade II) AC is associated with difficulty to perform cholecystectomy due to local inflammation, urgent/early drainage was preferred to early/elective cholecystectomy for moderate (grade II) cholecystitis as well. In our study, we aimed to emphasize the role of LC as a primary treatment method in patients with grade II cholecystitis, instead of a treatment after PC.

Materials and Methods

In our department, the TG07 has been taken as a reference since 2008 for AC cases, and demographic data, American Society of Anesthesiologists (ASA) scores, cholecystitis severities from grade I to III according to TG)7 for AC, durations of stay in hospital, and morbidity and mortality rates of all patients who were admitted to emergency service at our hospital and had been treated according to these guidelines were recorded prospectively.

Data for the patients who were treated with a prediagnosis of AC and were classified as grade I, II, and III according to TG07 between March 2008 and November 2014 were evaluated retrospectively in terms of demographics, disease severity, type of intervention, length of hospital stay, morbidity, and mortality. These patients were classified into 2 groups: the early PC group and the early LC group. The patients without follow-up after PC or LC and the patients with acalculous cholecystitis were excluded from the study (Fig. 1).

Definition of AC and the assessment of disease severity

The patients who were admitted to the emergency department were assessed as AC by diagnostic criteria of TG07 for AC (Table 1) and severity assessment criteria of TG07 for AC. According to the TG07 severity assessment criteria, mild (grade I) is defined as AC in a healthy patient with no organ dysfunction and mild inflammatory changes in the gallbladder.

Moderate (grade II) AC is associated with elevated white blood count (WBC) count ($>18{,}000/mm^3$) and/or a palpable tender mass in the right upper abdominal quadrant and/or duration of complaints of more than 72 hours and/or marked local inflammation (biliary peritonitis, pericholecystic abscess, hepatic abscess, gangrenous cholecystitis, emphysematous cholecystitis).

Severe (grade III) AC is associated with dysfunction of organs/systems such as cardiovascular (hypotension requiring treatment with dopamine 5 μg/kg per minute or any dose of dobutamine), neurologic (decreased level of consciousness), respiratory [partial pressure of arterial oxygen (PaO_2)/fraction of inspired oxygen (FiO_2) ratio < 300], renal (oliguria, creatinine > 2.0 mg/dL), hepatic [prothrombin time (PT)-international normalized ratio (INR) > 1.5], or hematologic (platelet count $< 100{,}000/mm^3$).

Patient selection

The patients diagnosed with AC on admission were categorized by disease severity according to the TG07, and ASA scores were determined by preoperative anesthesiology evaluation. LC was used for patients with ASA I and II scores regardless of TG07 disease severity. PC was preferred for patients with ASA III-IV and TG07 grade II-III (Table 2).

In the PC group, the rate of technical success and duration of drainage were also evaluated. Operative time and conversion to an open procedure in the PC

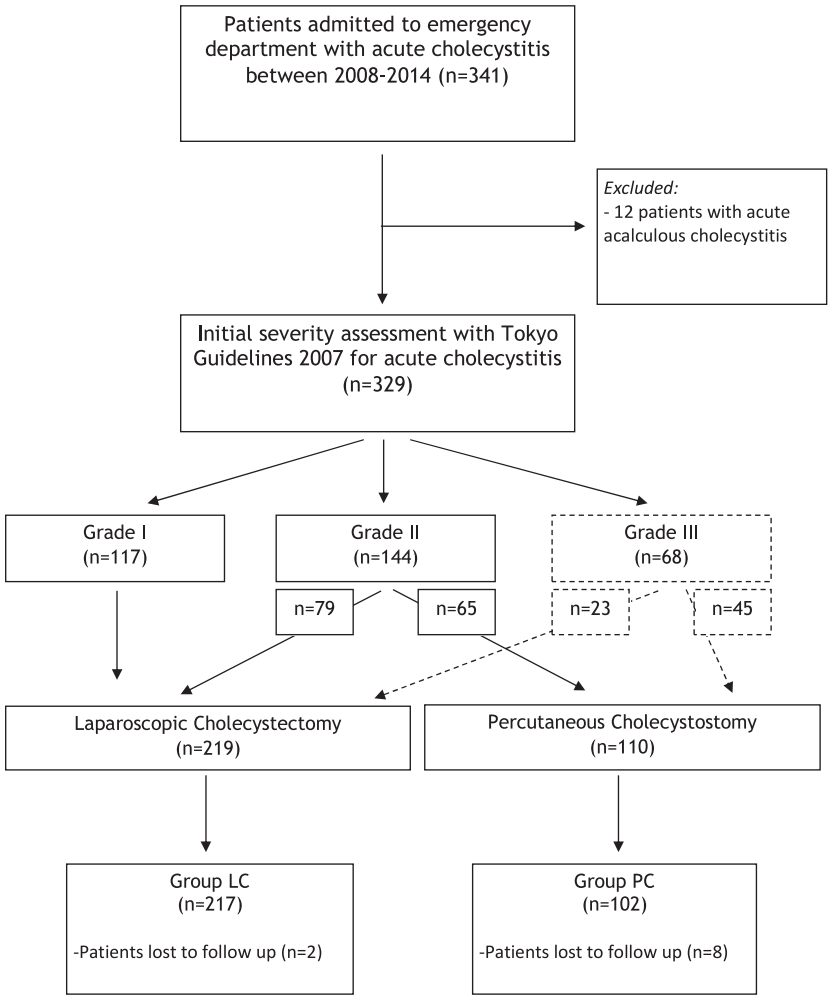

Fig. 1 Patient flow chart.

group with interval cholecystectomy after PC was compared with the LC group.

All patients who were subjected to urgent LC were discharged uneventfully with 7-day standardized analgesic + antibiotic treatment (nonsteroidal anti-inflammatory drugs + first-generation cephalosporin). Patients who were subjected to urgent biliary drainage were recommended for interval

Table 1 Diagnostic criteria of TG07 for AC

Local signs of inflammation	Systemic signs of inflammation	Imaging findings[a]
Murphy's sign	Fever[b]	Sonographic Murphy sign
Right upper quadrant mass/pain/tenderness	Elevated WBC count[b]	Thickened gallbladder wall (>4 mm)
	Elevated CRP[b] (≥3 mg/L)	Enlarged gallbladder (long axis diameter >8 cm, short axis diameter >4 cm)
		Incarcerated gallstone, debris echo, pericholecystic fluid collection
		Sonolucent layer in the gallbladder wall, striated intramural lucencies, and Doppler signals

Definite diagnosis of AC: (1) one item in the first column and one item in the second column are positive and (2) the third column confirms the diagnosis when AC is suspected clinically. CRP, C-reactive protein.

[a]Ultrasound was the selected imaging modality in study patients.

[b]Fever was considered as >37/.3°C, elevated WBCs as $\geq 18 \times 10^3$ mm^3, and elevated CRP as ≥3 mg/L.

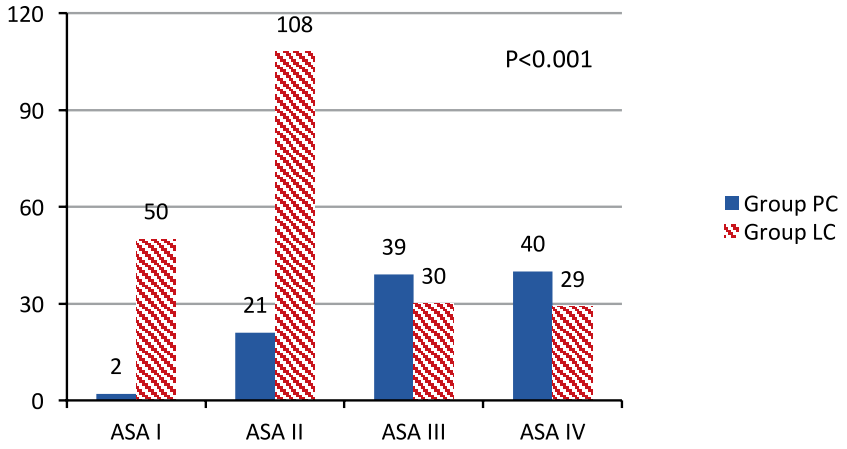

Fig. 2 Distribution of ASA scores between groups PC and LC.

cholecystectomy after a complete clinical recovery by calling for regular controls after the acute period.

Eight patients in the PC group could not be accessed for follow-up, and interval cholecystectomy was performed in 64 patients. In 38 patients who refused interval cholecystectomy, no additional surgical procedure was performed.

Technique of the cholecystostomy

All the procedures were carried out under sonographic guidance through the transhepatic or transperitoneal approach. The Seldinger technique was used for the procedures. After the localization of the gallbladder ultrasonographically, a safe access route was chosen. A transhepatic approach was preferred if possible. After insertion of an 18-gauge needle into the gallbladder, a sample of fluid was collected for microbiological studies. Over a stiff guidewire, 8- to 14-F catheters were placed into the gallbladder, and all of these steps were carried under only sonographic guidance. All of the procedures were performed under standard sterile conditions with local anesthesia and intravenous sedation.

Statistical analysis

All data were electronically documented used an Excel software database (Microsoft Office 2007, Microsoft, Redmond, Washington). Analysis was performed with the statistical package IBM SPSS for Windows, version 22.0 (IBM Corp, Armonk, New York).

Discrete variables were expressed as counts and percentages. Categorical data were analyzed with the χ^2 test. Continuous data are expressed as mean $\pm$ SD, with calculation of the probability value to measure the significance of differences. The Student t test was used for comparisons of parametric continuous variables, and the Mann-Whitney U test was used for other nonparametric quantitative data. $P < 0.05$ was considered statistically significant.

Table 2 Intervention selection chart with using the combination of TG07 severity assessment and ASA scores of patients

TG07 severity grade	ASA 1 (n)	ASA 2 (n)	ASA 3 (n)	ASA 4 (n)
Grade I	28	60	12	25
Grade II	18	42	37[a]	29[a]
Grade III	6	37[a]	10[a]	15[a]

[a]In favor of PC.

Results

In the PC group (n = 102), the mean age was 73.5 years (range, 25–95 years) and the female/male ratio was 1.37. Seventy-nine (77.4%) of the patients were ASA III and IV (Fig. 2). According to TG07, 57 of the patients were grade II, and 45 were grade III (Fig. 3). The duration of the stay in the hospital was 4 days (range, 0–41 days), and the technical success rate of the procedure was 96%. In the PC group, 62.7% of

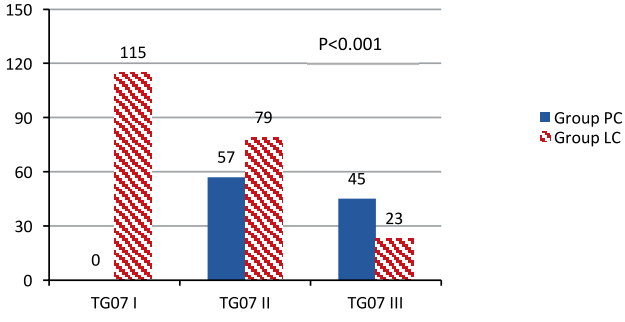

Fig. 3 Grades of the patients according to TG07 in groups PC and LC.

Table 3 Demographic data and features of group PC and group LC

Parameters	Group PC (n = 102)	Group LC (n = 217)	*P* value
Median age (years)	73.5 (25–95)	54 (22–96)	<0.001
Female/male (n)	59/43	113/104	0.033
Median duration of operation (minutes)	80 (45–215)	78 (30–220)	0.7
Conversion to open[a] (n/%)	10/9.8%	10/4.6	0.08
Median length of hospital stay (days)	4 (0–41)	2 (1–29)	<0.001
Morbidity[b] (n/%)	10/9.8%	22/10.1%	0.86
Mortality[c] (n/%)	4/3.9%	0/0%	<0.001

[a]Patients who underwent interval cholecystectomy.

[b]Morbidity rate in the PC group includes patients who underwent PC and also PC + interval cholecystectomy. Morbidity due to interval cholecystostomy was 1.9% (n = 2).

[c]Mortality rate in the PC group includes patients who underwent PC and also PC + interval cholecystectomy. Mortality due to interval cholecystostomy was 1.9% (n = 2).

patients underwent interval cholecystectomy. For those who were underwent interval cholecystectomy after PC, the median interval period was 62 days (range, 28–147 days), and the interval cholecystectomy-related morbidity rate was 1.9% and mortality rate was 1.9%. In the patients subjected to interval cholecystectomy, time of the operation was 80 minutes (range, 45–215 minutes), and the rate of conversion to open procedures was 9.8%. In the PC group, the mean follow-up period was 25.7 months (range, 3–60 months), morbidity was 9.8%, and mortality was 3.9% (Table 3).

In the LC group (n = 217), the mean age was 54 years (range, 28–96 years), and the female/male ratio was 1.08. Seventy-three percent of the patients were ASA I and ASA II (Fig. 3). According to TG07, 115 of the patients were grade I, 79 were grade II, and 23 were grade III (Fig. 3). The rate of conversion to open procedures was 4.6%, rate of partial cholecystectomy was 2.7%, total operative duration was 78 minutes (range, 30–220 minutes), duration of the stay in the hospital was 2 days (range, 1–29 days), the follow-up period was 24 months (range, 2–60 months), and the morbidity rate was 10.1%; no mortality was observed (Table 1). Compared with grade III patients who underwent LC (n = 23), in the PC group, morbidity rate, mortality rate, and length of hospital stay was lower ($P < 0.001$, $P = 0.12$, and $P = 0.33$, respectively).

Age, ASA, score and TG severity score in the PC group were significantly higher than the LC group. The sex distribution, follow-up periods, and morbidity were similar in both groups (Table 1). In early operated patients with lower ASA and lower TG severity score, mortality ($P < 0.001$) was significantly lower. The duration of the stay in the hospital in the LC group was significantly shorter than the PC group ($P < 0.001$; Table 3).

Discussion

There is still not a consensus on every aspect of the management of AC in high-risk surgical patients. The Tokyo consensus studies are the most detailed up-to-date studies on the management of AC.[4,5] The patients with AC are classified into 3 subgroups regarding the severity of the disease both in TG07 and TG13 with minor definition changes in terms of the patient risk assessment and the selection of intervention.[4,5] The proper risk assessment and selection of suitable intervention for patients may reduce the total length of hospital stay.[6] In the concept of the final version of the severity assessment of AC, severe (grade III) AC was defined as that associated with organ dysfunction, moderate (grade II) AC was defined as that associated with difficulty to perform cholecystectomy due to local inflammation, and mild (grade I) AC was defined as that which does not meet the criteria of severe or moderate AC.[4] According to the literature, the distribution of the patients with AC is as follows: 39.3% to 68.5% of the cases were classified as grade I, 25.5% to 59.5% as grade II, and 1.2% to 6% as grade III.[7,8]

For grade I (mild) patients, early LC is the first-line treatment. In patients with high surgical risk, observation (follow-up without cholecystectomy) after improvement with initial medical treatment could be indicated.[4] In our study, 115 patients were grade I, and all of these patients were subjected to early LC.

Grade II (moderate) AC is often accompanied by severe local inflammation. Therefore, surgeons should take the difficulty of cholecystectomy into consideration in selecting a treatment method. Elective cholecystectomy after the improvement of the acute inflammatory process is the first-line

treatment.[4] If a patient does not respond to initial medical treatment, urgent or early gallbladder drainage is required. Early LC could be indicated if advanced laparoscopic techniques are available. Grade II (moderate) AC with serious local complications is an indication for urgent cholecystectomy and drainage.[4] In our study, 136 patients were grade II, and 79 of them were subjected to early LC and 57 to PC ($P = 0.134$). When the patients in the LC group were compared with PC patients, no significant difference was found in terms of morbidity and mortality; however, duration of hospital stay was significantly longer in the PC group ($P < 0.001$).

Grade III (severe) AC is accompanied by organ dysfunction. Appropriate organ support in addition to initial medical treatment is necessary. Urgent or early gallbladder drainage should be performed.[4,5] Elective cholecystectomy may be performed after the improvement of acute illness has been achieved by gallbladder drainage. In our study, 68 patients were grade III, and 23 of them were subjected to early LC and 45 to PC. Although local complication rates in the LC group were higher than PC group, duration of hospital stay was longer in the PC group. No significant difference was found between 2 groups in terms of mortality. Although PC is a more minimal invasive method than LC, the similarity between mortality rates may be related to comorbidities rather than the PC procedure.

In high-risk surgical patients (ASA III and ASA IV), rates of conversion to open surgery and mortality and morbidity associated with cholecystectomy are high due to comorbidities and severity of the disease.[9–15] The cause of the high mortality rates is the tendency of these patients to sepsis.[15] A variety of parameters have been evaluated by several studies, and their effects on the prognosis of the disease after TG07 have been reported.

Different than TG07, TG13 discussed these parameters and concluded that these factors are not effective on the prognosis, and cholecystectomy can be considered in this patient group in which some of the patients are ASA III and ASA IV.[5] Old age is not a poor prognostic criteria itself but is important as it increases the tendency to worsen the clinical course.[4] In this study, it was observed that morbidity and mortality were significantly lower in the patients with low ASA scores ($P < 0.001$).

PC has been identified as an alternative treatment option in high-risk patients with comorbidities. The morbidity and mortality rates have been reported as 10% and 2%, respectively.[16–18] PC is suggested in grade II and grade III AC in TG07 and TG13. In patients with acalculous cholecystitis, cholecystectomy is usually not essential following PC. This is due to the fact that patients with acalculous cholecystitis do not have recurrent cholecystitis after catheterization. Findings from studies by Sugiyama[19] and Van Steenbergen[20] showed that 33% and 25% of the patients with calculous cholecystitis did not have recurrent disease. In the study of Lebigot *et al*,[21] 90% of the patients were followed for 12 months, and delayed cholecystectomy was performed in only 1 (6.25%) patient. In our study, a total of 110 patients with grade II and grade III were subjected to PC. Thirty-seven percent of these patients were followed up without applying another treatment after withdrawing the drain. The PC relieves both the septic symptoms and pain of the patient, thus allowing the surgeon more time for evaluation and treatment of the comorbidities in high-risk patients.[15] The success rate of PC in intensive care unit patients with right upper quadrant pain has been reported to be very high.[22] There are studies that reported that symptoms in the 60% of the patients with indemonstrable sepsis resolved dramatically due to PC.[18,22] The management of the patients after PC is still controversial in the surgical community. We think that this is one of the most important drawbacks of the PC. The most important limitation of PC is that it requires ambulatory drain follow-up after a longer length of stay in hospital, and it cannot eliminate the surgical requirement completely.

In our study, LC was applied to 23 of grade III patients with AC. These patients did not undergo PC due to technical reasons, complication during PC, or the unavailability of interventional radiology. In this subgroup of LC, the morbidity rate was significantly lower than the PC group ($P < 0.001$). Also, the mortality rate and length of hospital stay were lower but were not significant ($P = 0.12$ and $P = 0.33$, respectively).

The TGs have some limitations. When classifying the patients according to local and systemic findings based on the presentation of AC, comorbidities [for example, diabetes mellitus (DM)] and ASA scores were not taken into consideration. TG severity assessment is mostly accurate evaluation for the prognosis of disease, but it can be combined with an ASA scoring system before decision making of the intervention method. In this study, the patients with ASA III-IV comorbidity and grade II-III disease severity underwent PC, and the majority of the patients with ASA I-II and grade I-II underwent LC (Table 2). The patients who had a sum of ASA and

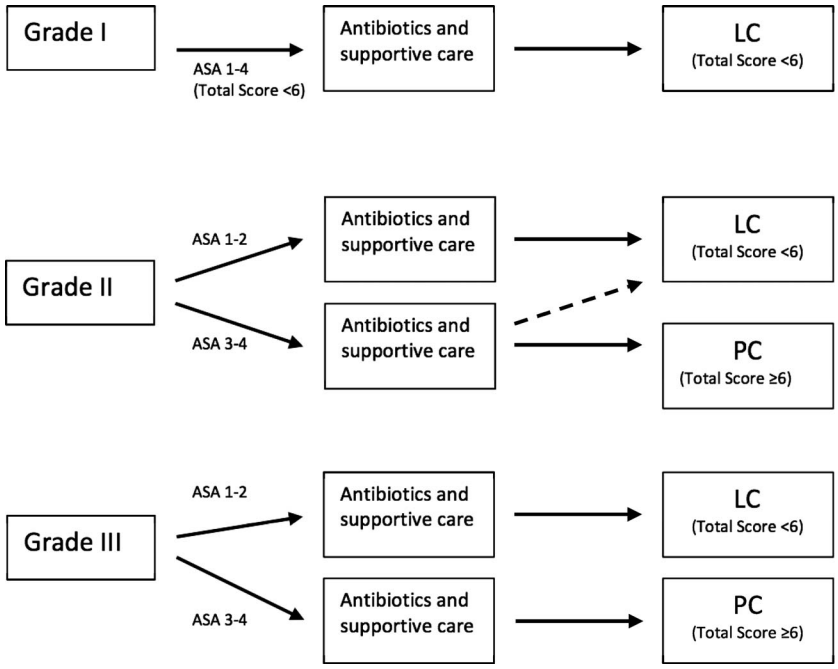

Fig. 4 Proposal of decision algorithm for intervention selection in AC according to the sum of ASA scoring and TG disease severity grade (total score), with a cutoff value 6.

TG disease severity higher than 6 underwent PC (88.8%), and those with a disease severity lower than 6 underwent LC (80%). We think that, as a basic and fast evaluation, the sum of ASA and TG disease severity grade might be useful, and the total score of 6 might be a cutoff value for decision making (Fig. 4).

The interval cholecystectomy after PC is recommended in TG; the timing for its application was not stated. There are many studies in the literature stating that there is no need for cholecystectomy in some of the patients in whom PC is used. In the present study, PC alone was sufficient in 37.3% of the patients.

Conclusions

In high-risk surgical patients, the high mortality, morbidity, and conversion to open surgery rates of the LC should be considered. LC should be performed in patients with grade I and grade II AC according to TG.

PC is a safe and an effective treatment option for patients who are not suitable for surgery. PC should be especially be performed in patients who are classified as grade III AC according to the TG. PC without elective cholecystectomy may be performed only in a special group of patients. The revised TG13 suggests that in experienced centers, patients with grade II AC might be suitable for early LC. TG13 supports our findings, especially for patients with grade II AC. After completion of the current study, our department has subsequently revised the emergency management protocol for AC and patient severity assessment. However, studies with larger patient groups are needed to determine the future of this perspective.

Acknowledgments

The authors thank Dr Alexis Kofi Okoh for English language editing assistance. The authors have no financial conflicts of interest to disclose.

References

1. Johnson H Jr, Cooper B. The value of HIDA scans in the initial evaluation of patients for cholecystitis. *J Natl Med Assoc* 1995; **87**(1):27–32
2. Strasberg SM. Acute calculous cholecystitis. *N Engl J Med* 2008; **358**(26):2804–2811
3. Kortram K, van Ramshorst B, Bollen TL, Besselink MG, Gouma DJ, Karsten T *et al*. Acute cholecystitis in high risk surgical patients: percutaneous cholecystostomy versus laparoscopic cholecystectomy (CHOCOLATE trial): study protocol for a randomized controlled trial. *Trials* 2012;**13**:1–7
4. Hirota M, Takada T, Kawarada Y, Nimura Y, Miura F, Hirata K *et al*. Diagnostic criteria and severity assessment of acute cholecystitis: Tokyo Guidelines. *J Hepatobiliary Pancreat Surg* 2007;**14**(1):78–82

5. Yokoe M, Takada T, Strasberg SM, Solomkin JS, Mayumi T, Gomi H *et al*. TG13 diagnostic criteria and severity grading of acute cholecystitis (with videos). *J Hepatobiliary Pancreat Sci* 2013;**20**(1):35–46
6. Lee SW, Yang SS, Chang CS, Yeh HJ. Impact of the Tokyo guidelines on the management of patients with acute calculous cholecystitis. *J Gastroenterol Hepatol* 2009;**24**(12):1857–1861
7. Asai K, Watanabe M, Kusachi S, Tanaka H, Matsukiyo H, Osawa A *et al*. Bacteriological analysis of bile in acute cholecystitis according to the Tokyo guidelines. *J Hepatobiliary Pancreat Sci* 2012;**19**(4):476–486
8. Lee SW, Chang CS, Lee TY, Tung CF, Peng YC. The role of the Tokyo guidelines in the diagnosis of acute calculous cholecystitis. *J Hepatobiliary Pancreat Sci* 2010;**17**(6):879–884
9. List WF, Kröll W, Filzwieser G. Perioperative risk in critically ill surgical patients *Anaesthesist* 1985;**34**(11):612–618
10. Roslyn JJ, Binns GS, Hughes EF, Saunders-Kirkwood K, Zinner MJ, Cates JA. Open cholecystectomy. A contemporary analysis of 42,474 patients. *Ann Surg* 1993;**218**(2):129–137
11. Spira RM, Nissan A, Zamir O, Cohen T, Fields SI, Freund HR. Percutaneous transhepatic cholecystostomy and delayed laparoscopic cholecystectomy in critically ill patients with acute calculus cholecystitis. *Am J Surg* 2002;**183**(1):62–66
12. Yi NJ, Han HS, Min SK. The safety of a laparoscopic cholecystectomy in acute cholecystitis in high-risk patients older than sixty with stratification based on ASA score. *Minim Invasive Ther Allied Technol* 2006;**15**(3):159–164
13. Eldar S, Eitan A, Bickel A, Sabo E, Cohen A, Abrahamson J *et al*. The impact of patient delay and physician delay on the outcome of laparoscopic cholecystectomy for acute cholecystitis. *Am J Surg* 1999;**178**(4):303–307
14. Pessaux P, Tuech JJ, Rouge C, Duplessis R, Cervi C, Arnaud JP. Laparoscopic cholecystectomy in acute cholecystitis. A prospective comparative study in patients with acute vs. chronic cholecystitis. *Surg Endosc* 2000;**14**(4):358–361
15. Yun SS, Hwang DW, Kim SW, Park SH, Park SJ, Lee DS *et al*. Better treatment strategies for patients with acute cholecystitis and American Society of Anesthesiologists Classification 3 or greater. *Yonsei Med J* 2010;**51**(4):540–545
16. Chopra S, Dodd GD 3rd, Mumbower AL, Chintapalli KN, Schwesinger WH, Sirinek KR *et al*. Treatment of acute cholecystitis in non-critically ill patients at high surgical risk: comparison of clinical outcomes after gallbladder aspiration and after percutaneous cholecystostomy. *Am J Roentgenol* 2001; **176**(4):1025–1031
17. McGahan JP, Lindfors KK. Percutaneous cholecystostomy: an alternative to surgical cholecystostomy for acute cholecystitis? *Radiology* 1989;**173**(2):481–485
18. England RE, McDermott VG, Smith TP, Suhocki PV, Payne CS, Newman GE. Percutaneous cholecystostomy: who responds? *Am J Roentgenol* 1997;**168**(5):1247–1251
19. Sugiyama M, Tokuhara M, Atomi Y. Is percutaneous cholecystostomy the optimal treatment for acute cholecystitis in the very elderly? *World J Surg* 1998;**22**(5):459–463
20. Van Steenbergen W, Ponette E, Marchal G, Pelemans W, Aerts R, Fevery J *et al*. Percutaneous transhepatic cholecystostomy for acute complicated cholecystitis in elderly patients. *Am J Gastroenterol* 1990;**85**(10):1363–1369
21. Lebigot J, Aube C, Vuillemin E, Anglade E, Adam B, Caron C. Percutaneous cholecystostomy in non-surgical patients. *J Radiol* 2000;**81**(11):1627–1632
22. Boland GW, Lee MJ, Leung J, Mueller PR. Percutaneous cholecystostomy in critically ill patients: early response and final outcome in 82 patients. *Am J Roentgenol* 1994;**163**(2):339–342