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Significance of Elective Laparoscopic Cholecystectomy for Acute Cholecystitis at Tokyo Medical University Ibaraki Medical Center

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ABSTRACT

Aim: Tokyo guidelines 2018 (TG18) recommend early laparoscopic cholecystectomy (LC) for acute cholecystitis (AC). However, there is a serious shortage of surgeons and anesthesiologists at regional core hospitals, so they cannot adequately respond to the requirement of emergency operations. We retrospectively analyzed patients with AC who underwent LC at our department.
Methods: A total of 127 patients with AC who underwent LC between January 2006 and April 2019 were divided into an elective surgery group (interval LC group: Int G, 72 hours or more after visit) and an early surgery group (early LC group: EG, less than 72 hours after visit). We performed univariate and multivariate analyses using preoperative factors (blood test findings, imaging findings, previous surgery, preoperative drainage, and cholecystitis severity), surgical factors (bleeding volume, operation time, and laparotomy shift) and post-operative factors (hospitalization period and complications).
Results: Of the 127 patients, 51 were women and 76 were men with a median age of 64.8 years. A total of 55 patients were in Int G, and 72 were in EG. Multivariate analysis revealed that Int G patients had several post-endoscopic sphincterotomy (EST) complications including grade II or III cases, low albumin levels, increased blood loss, and extended hospital stays.
Conclusion: Our hospital tends to perform elective LC for patients with grades II and III with common bile duct stones, and it is necessary to reconsider the indications for such patients.
Key words: Acute cholecystitis, Interval surgery, Laparoscopic cholecystectomy, Regional core hospitals, Tokyo guidelines 2018

INTRODUCTION

For the treatment of acute cholecystitis (AC), the Tokyo guidelines 2013 (TG13) recommend early (within 72 hours after visit) laparoscopic cholecystectomy (LC), regardless of the onset time (1). Furthermore, the Tokyo guidelines 2018 (TG18) state that even if the severity of AC is grade III, early LC may be performed under certain conditions (2).

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Conversely, the shortage of surgeons and anesthesiologists has become a crucial problem in Japan in recent years. In particular, regional core hospitals have been unable to sufficiently respond to the requirement of emergency and unscheduled operations; hence, there is a need to review the system. Japan is facing a super-aged society, in which many people have comorbidities, such as cerebrovascular disease and ischemic heart disease, and the number of AC patients taking anticoagulants and antiplatelet drugs is increasing.

MATERIALS AND METHODS

A total of 127 patients who underwent LC for AC in our department between January 2006 and April 2019 were included in the study. We divided patients with AC who underwent LC in our department into two groups: an elective surgery group (interval LC: Int G, > 72 h) and an early surgery group (early LC group: EG, < 72 h). We considered these patients retrospectively in such that clinical and operative factors were evaluated, and clinical factors were compared between the two groups. Clinical factors included age, sex, body mass index, diabetes mellitus (yes/no), previous upper abdominal surgery (yes/no), length of hospital stay, serum levels of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, γ-glutamyltransferase, C-reactive protein (CRP), albumin (Alb), white blood cell (WBC) count, platelet count, neutrophil ratio, lymphocyte ratio, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio (PLR), and CRP-to-albumin ratio (CAR). Operative factors included emergency or interval operation, operating time, and amount of bleeding. We also analyzed preoperative magnetic resonance cholangiopancreatography (MRCP) findings, such as detection of cystic ducts (yes/no) and gallbladder (GB) (yes/no), previous biliary tract drainage, percutaneous transhepatic gallbladder drainage (PTGBD), and endoscopic retrograde biliary drainage or endoscopic nasobiliary drainage. The definitive diagnosis of AC and classification of severity were performed according to TG18. AC included grades I–III. Patients who were also evaluated at follow-up were included in the study (2).

This study was approved by the Research and Ethics Committee of Tokyo Medical University, Ibaraki Medical Center (study approval no. 16-35).

Surgical procedure

LC was performed using the standard 4-port or 3-port 2-handed technique in the American position. Dissection of Calot's triangle and the hepatocystic triangle of the GB from the liver bed was accomplished using monopolar electrocautery. The critical view of safety (CVS) technique was performed to expose the GB, which is a valuable method to safely perform total cholecystectomies. If an operation could not be performed owing to difficulty in CVS identification, severe inflammation, or bleeding, open surgery was selected. Information of all patients was obtained from the patients' surgical records.

Statistics

Statistical significance was determined using univariate analyses, and multivariate analyses were performed using the Mann-Whitney U-test and Fisher's exact test. A p-value of less than 0.05 indicated a statistically significant difference between the groups. SPSS Statistics ver. 26 software (IBM Corp., Armonk, NY, USA 10504) was used for statistical analyses.

RESULTS

EG was performed in 60 patients (47.2%) comprising 25 women and 35 men. The median age was 62.6 years (21.3–87.0 years), median surgery time was 133 minutes (55–329 minutes), and the median postoperative hospital stay was 5 days (3–27 days). In the EG, postoperative ileus was one case of post-operative complications of Clavien-Dindo (CD) classification grade II or higher, and no intraoperative bile duct damage was observed (3). There were five patients with conversion as their cases were difficult to identify with CVS.

There were 67 patients in Int G (52.8%), comprising 26 women and 41 men, with a median age of 64.8 years (23.5–85.2 years). The median operative time was 155 minutes (40–323 minutes), median post-operative hospital stay was 6 days (3–37 days), and 11 complications with a CD classification of grade III or higher. In this group, seven patients had surgical site infection (SSI) (one patient had deep SSI and six patients had superficial SSI), two patients had post-operative ileus, and two patients had postoperative infection, and there were no patients with intraoperative bile duct damage. There were 11 patients with conversion, of which six had severe adhesions, four cases were difficult to identify with CVS, and one was bleeding.

Bivariate analysis

Preoperative characteristics

Patients with grade I or II (p = 0.0001), PTGBD (p = 0.0001), and EST (p = 0.0001) tended to be more common (*table 1*). Patients with Int G showed significantly higher CRP at admission (p = 0.02), lower CAR (p = 0.02), and lower Alb (p = 0.0001) (*table 1*).

Operative and postoperative factors

Patients with Int G tended to have significantly more bleeding (p = 0.04), longer postoperative hospital stays (p = 0.0001), and more postoperative complications (p = 0.004) (*table 2*).

DISCUSSION

AC is a common disease caused by gallstones. In TG13, AC is classified into three groups according to its severity, and the treatment policy recommends early LC within 72 hours after onset (1). However, subsequent studies have shown that it is often difficult to accurately measure the time after onset, and there is a problem with the definition of "within 72 hours after onset" (4). Therefore, in TG18, this was revised from "within 72 hours from the onset of AC" to "operate early within 72 hours after judging that the patient is capable of undergoing surgery," and it was clearly shown that surgery should be performed early after hospitalization (2). The results of randomized controlled trials and meta-analyses revealed that patients who underwent early surgery had fewer complications and shorter overall hospital stays and operation times (5-7).

Conversely, early LC is suggested for grade III patients, who are recommended to undergo GB drainage in TG13, considering the patient's comorbidities, general condition, and surgical risk factors (8-10). Cao et al. reported that early LC had low rates of mortality and complications, and early LC was considered effective for grade III patients (11-20). Our retrospective study also showed that patients who underwent early LC tended to have less bleeding and shorter hospital stays. As with previous reports, early LC treatment resulted in higher efficacy. However, in our hospital, there was a strong tendency to choose standby LC for patients with common bile duct stones and PTGBD. As a result, there are many cases where AC patients are directly admitted to the internal medicine

Table 1 - Characteristics of the patients before surgery

	EG (n = 60)	Int G (n = 67)	p-value
Age (years)	62.6 (21.3–87.0)	64.8 (23.5–85.2)	0.35*
Sex (F/M)	25/35	26/41	0.86*
BMI	25.3 (24.2–26.5)	24.9 (23.7–26.1)	0.32*
DM (Y/N)	11/49	18/49	0.29†
PAS (Y/N)	1/59	0/67	0.47†
AST (IU/L)	24.7 (18.9–30.5)	25.9 (20.1–31.7)	0.57*
ALT (IU/L)	25.7 (18.7–32.7)	34.7 (20.6–48.9)	0.37*
γGTP (IU/L)	49.1 (32.1–66.1)	86.8 (48.1–125.4)	0.47*
ALP (IU/mL)	261 (237–285)	300 (239–361)	0.97*
Alb (g/dL)	4.23 (4.10–4.34)	3.88 (3.75–4.01)	0.0001*
CRP (mg/dL)	0.85 (0.26–1.44)	1.90 (0.99–2.82)	0.016*
WBC (/μL)	6,457 (5,660–7,253)	6,524 (5871–7178)	0.95*
Neutro. (%)	59.4 (55.9–62.9)	62.6 (59.2–66.0)	0.32*
Lymph (%)	31.0 (27.6–34.4)	27.4 (24.4–30.4)	0.30*
PLt (10^3/μL)	220 (199–241)	252 (228–275)	0.06*
NLR	2.58 (1.82–3.34)	3.04 (2.34–3.73)	0.31*
PLR	0.14 (0.11–0.17)	0.19 (0.14–0.24)	0.142*
CAR	0.22 (0.06-0.39)	0.54 (0.27-0.80)	0.016*
PBTD (Y/N)	0/59	42/24	0.0001†
ECDL (Y/N)	4/56	27/40	0.0001†
Cystic duct (Y/N)&	48/12	58/8	0.17†
GB (Y/N)&	49/10	54/12	0.52†
Conversion (Y/N)	5/55	11/56	0.19†

Values are shown as medians and interquartile ranges.

*Mann-Whitney U-test; †Fisher exact test; &preoperative MRCP findings

BMI: body mass index, CRP: C-reactive protein, AST: aspartate transaminase, ALT: alanine aminotransferase, γGTP: γ-glutamyl transpeptidase, ALP: alkaline phosphatase, Alb: Albumin, WBC: white blood cells, Neutro: neutrophils, Lymph: lymphocytes, PLt: platelets, NLR: neutrophil-to-lymphocyte ratio, PLR: platelet-to-lymphocyte ratio, CAR: CRP-to-Alb ratio, PBTD: previous biliary tract drainage, GB: gallbladder, PAS: pervious upper abdominal surgery, AC: acute cholecystitis, DM:diabetes mellitus, ECDL： endoscopic choledocholithotomy

Table 2 - Procedure outcomes

	EG (n = 60)	Int G (n = 67)	p-value
Operating time (min)	151 (131–170)	158 (139–176)	0.11*
Blood loss (g)	54 (20.2–87.6)	130 (54.4–206)	0.043*
LHS (days)	6 (5–7)	8(7–9)	0.0001*

Data are shown as medians and interquartile ranges.
* Mann-Whitney U-test
LHS: length of hospital stays

ward and undergo EST and/or bile duct drainage. In particular, in some grade I and II patients taking antithrombotic drugs, PTGBD was preceded and standby LC was performed. Older patients taking antithrombotic drugs for cerebrovascular disease or ischemic heart disease are given priority for medical treatment, and there were some cases that led to elective surgery. In the future, a clear treatment protocol should be created, such as that regarding the timing of one-time early LC after drainage for emergency ENBD and the scoring of a patient's condition, to determine whether LC is possible. Educating physicians about early LC is necessary to implement this protocol.

In Japan, the shortage of surgeons and anesthesiologists has become a social problem since 2011, and the situation is particularly serious in regional core hospitals. Our present study also indicated that for many patients who had undergone elective surgery, securing sufficient personnel for early surgery had been difficult, and hence, elective surgery had to be selected. This indicates that physicians and anesthesiologists must be educated about early surgical intervention based on TG18, and an early surgery system should be established, along with increasing the number of surgeons. TG18 does not specify a treatment policy for whether early LC should be considered, considering the population ratio, size of the hospital, the number of surgical staff, the number of anesthesiologists, and so on.

CONCLUSION

Our results demonstrate that early surgery for AC results in minimal bleeding and may reduce the length of a patient's hospital stay. Aggressive early surgery for grade I and II patients, as recommended by TG18, was found to be effective.

Conflict of interest statement

We have no conflicts of interest to declare.

Statement of ethics

This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all participants included in the study. This study was approved by the research and ethics committee of Tokyo Medical University (approval no.: T2020-0183).

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Author contributions

R. U. and M. S. designed the study. R. U. and M.S. analyzed the results. R. U. and M. S. wrote the manuscript. All authors reviewed the manuscript.

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