Optimal timing of laparoscopic cholecystectomy after conservative therapy for acute cholecystitis

Yuta Enami (enami@med.showa-u.ac.jp)
Showa University Northern Yokohama Hospital
Takeshi Aoki
Showa University
Kodai Tomioka
Showa University
Tomoki Hakozaki
Showa University
Takahito Hirai
Showa University
Hideki Shibata
Showa University
Kazuhiko Saito
Showa University
Shodai Nagaishi
Showa University
Yojiro Takano
Showa University Northern Yokohama Hospital
Junichi Seki
Showa University Northern Yokohama Hospital
Shoji Shimada
Showa University Northern Yokohama Hospital
Kenta Nakahara
Showa University Northern Yokohama Hospital
Yusuke Takehara
Showa University Northern Yokohama Hospital
Shumpei Mukai
Showa University Northern Yokohama Hospital
Naruhiko Sawada
Showa University Northern Yokohama Hospital
Fumio Ishida
Showa University Northern Yokohama Hospital
Shin-ei Kudo

Showa University Northern Yokohama Hospital

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Abstract

Background: Tokyo Guidelines 2018 recommend early surgery for acute cholecystitis. However, some elective surgery cases depend on complications or facility conditions. In this study, we retrospectively analyzed the cases of elective surgery.

Methods: This study included 345 patients who underwent laparoscopic cholecystectomy (LC) at our hospital between January 2019 and December 2020. Eighty-three patients underwent LC four days or more after conservative treatment. The elective LC cases were divided into two groups: Early group (4-90 days after onset, n=36) and Delayed group (91+ days after onset, n=31). Percutaneous transhepatic gallbladder drainage cases (n=16) were excluded.

Results: The operative times were significantly shorter in the Delayed group (91.2 min, p=0.0108) than the Early group (117 min). However, the amount of blood loss was not significantly different between the two groups. Furthermore, the length of hospital stay was shorter in the Delayed group (3.4 days, p=0.0436) than in the Early group (5.9 days).

There were no significant differences in the incidence of complications or the rate of conversion; however, the rates of these two factors were reduced in the Delay group compared to the Early group.

Conclusions: If it has become challenging to perform urgent/early LC within three days, due to prior conservative treatment for acute cholecystitis, the operative time and length of hospital stay could be reduced by delaying LC for more than 90 days after the onset. In addition, postoperative complications would not occur, and the conversion rate may be reduced to a low level.

Introduction

Cholecystitis is one of the more common diseases. Laparoscopic cholecystectomy (LC) is a common treatment for benign gallbladder disease. Laparoscopic cholecystectomy was first performed in 1987 (1) and has become widely used worldwide (2). At the time, it was generally considered that conservative treatment would be administrated first for acute cholecystitis to prevent complications associated with inflammation, and then LC would be performed 6–8 weeks after the onset (3).

However, recent meta-analyses have reported that early LC for acute cholecystitis results in shorter hospital stays and no significant difference in complications compared to delayed LC (4–6)

More than 38,000 cholecystectomy procedures have been performed annually in Japan (7). According to Tokyo Guidelines 2018 (8), early surgery (within three days) is recommended for acute cholecystitis, even if the inflammation is severe.

However, depending on the patient's complications or the condition of the facility, it may be necessary to carry out selective LC for four days or more. In addition, many patients come to the hospital for LC after undergoing conservative treatment at another hospital.

There are very few reports on the optimal time of LC for patients undergoing conservative treatment without percutaneous transhepatic gallbladder drainage (PTGBD), although there are some reports on the optimal time for elective surgery for acute cholecystitis after PTGBD (9–13).

This study, retrospectively examines the cases in which surgery was performed four days or more after the conservative treatment for acute cholecystitis.

Materials And Methods

A retrospective study was completed for patients who underwent LC at Showa University Northern Yokohama Hospital from January 2019 to December 2020. A total of 345 LCs were performed. Thirty-seven patients underwent urgent LC within three days due to acute cholecystitis, and 83 cases who underwent LC four days or more days after conservative treatment were included. The elective LC cases were divided into two groups: the Early group (4–90 days after onset, n = 36) and the Delayed group (= > 91 days after onset, n = 31). PTGBD cases (n = 16) were excluded (Fig. 1).

Patient characteristics included sex, age, height, body weight, and body mass index (BMI). Preoperative data included laboratory data, American society of anesthetists-physical status (ASA), and previous abdominal surgery. Operative factors included total operative time and estimated amount of blood loss. Operative outcomes included conversion rate, hospital stay, and postoperative complications were compared with two groups retrospectively. For standardization purposes, complications were classified according to the Clavien–Dindo classification system (14, 15). Patients of Clavien–Dindo Grade 3 or higher were deemed to have a complication. All LCs were performed for symptomatic gallstone disease or cholecystitis. We excluded LCs for suspicious malignant diseases or operations with PTGBD.

Indications for LC were for all patients with benign gallbladder disease. All LCs were performed using the conventional 4-port technique in the supine position under general anesthesia and followed the technique previously reported (16). Multiple surgeons performed the procedures. A transumbilical vertical incision was made for a 12mm trocar using the open technique in the umbilicus to achieve carbon dioxide insufflation. Intraoperative cholangiography was not performed routinely.

The data analysis was performed using JMP®Pro 14 (SAS Institute Inc., Cary, NC, USA). For comparisons between the groups, the Fisher's exact tests were used for categorical variables, and the Student's *t*-test or Welch's *t*-test was used for quantitative variables. The results were expressed as the mean ± standard deviation. Probability *p* values were considered statistically significant at the < 0.05 level.

The Committee on Ethics of Showa University Medical School and IRB (Institutional Review Board) reviewed and approved the study protocols (The approval code: No. 19H064), and the opt-out method to obtain patient consent was utilized at our institution in this study.

Results

No significant differences in the patient characteristics, including sex, age, height, body weight and BMI were found between the two groups (Table 1). Whereas preoperative data showed a significant increase in white blood cell count ($p = 0.0005$) and C-reactive protein (CRP) value ($p = 0.0073$) in the Early group (Table 2). However, there were no significant differences in other values, including platelet, total bilirubin, aspartate aminotransferase (AST), alanine aminotransferase (ALT), and prothrombin time (PT). Table 3 showed preoperative factors, including ASA score and previous abdominal surgery; however, there were no significant between the two groups. The operative time was significantly shorter in the Delay group (91.2 min, $p = 0.0108$) (Table 4).

Moreover, blood loss was less in the Delay group, although this did not reach significance (6.4 g, $p = 0.1653$) (Table 4). Furthermore, the length of hospital stay was significantly shorter in the Delay group (3.4 days, $p = 0.0436$) than the Early group (5.9 days). There were no significant differences in the incidence of complications or the rate of conversion; however, the rates of these two factors were reduced in the Delay group compared to the Early group (Table 5). No postoperative complications were seen in the Delay group, however, in the Early group, three patients exhibited complications such as intestinal injury, ileus, bleeding, and bile leakage, and the last two were seen in the same patient (Table 6).

Next, the univariate analysis and the multivariate analysis were performed for conversion. In the univariate analysis, WBC ($p = 0.0263$), and the value of CRP ($p = 0.0016$) were significant risk factors for conversion (Table 7); moreover, only the value of CRP was an independent risk factor in multivariate analysis significantly ($p = 0.0065$) (Table 8).

Moreover, the multivariate analysis was also performed for postoperative complications. However, there were no significant independent risk factors in multivariate analysis.

Discussion

Regarding the optimal timing of cholecystectomy, there have been some reports about patients after percutaneous transhepatic gallbladder drainage (PTGBD) (9–13), but there are very few reports on the optimal timing of surgery for cases after hospitalization and conservative treatment.

However, this study does not deny the benefit of conducting urgent cholecystectomy within 72 hours for acute cholecystitis. Instead, we examined the second-best timing of cholecystectomy for patients who had missed the best opportunity for surgery due to preoperative condition, complications, or re-hospitalization from other hospitals.

Ohta et al (17) reported that cholecystectomy for acute cholecystitis should be performed as soon as possible. They concluded that there were no significant differences in the conversion rate, operation time, blood loss, postoperative morbidity, or hospital stay length. These four groups were within 72 hours, within 4 days-2 weeks, 3–6 weeks, and 6 + weeks.

Therefore, we conducted our study simply in two groups, 4–89 days and 90 + days, focusing on the timing of surgery after conservative treatment, including readmission.

There were no significant differences in patient age, gender, height, body weight, or BMI, but preoperative data showed that the WBC and the value of CRP were significantly higher in the Early group, and the inflammatory response remained when the laparoscopic cholecystectomy was performed. Whereas there were no significant differences in total bilirubin, AST, ALT, PT, or preoperative liver function. Moreover, there were no significant differences in preoperative conditions or complications.

However, regarding surgical factors, our data showed that the operative time was significantly longer in the Early group. Furthermore, there was no significant difference in the amount of bleeding, but it was shown that it tended to be higher in the Early group. These seemed to indicate the difficulty of surgery in early cases where inflammation remained. These seemed to be the same tendency in the literature of cases in which PTGBD was inserted (12, 18). Furthermore, the conversion rate, length of hospital stay, and postoperative complications, tended to be more in the early group, especially the length of hospital stay was significantly longer. Similarly, these also seemed to indicate the difficulty of surgery in early cases where inflammation remains. In addition, as the progression of fibrosis made an adequate layer disappear, it could make LC more difficult after severe cholecystitis (19).

Some previous reports indicated that early surgery for acute cholecystitis shortened the length of hospital stay (20–22). However, our data revealed that the length of hospital stay was reduced in the Delay group. That could be because, in our data, almost all patients were readmitted, including from other hospitals. Therefore, the calculation of hospital stay was the same as for the first hospitalization, and the inflammation could be sufficiently relieved.

For postoperative complications, multivariate analysis did not extract independent risk factors. However, its analysis extracted high levels of CRP as independent risk factors for conversion. This fact could indicate that in early cases where the inflammatory reaction persists or prolongs, the difficulty of adhesion detachment and the risk of bleeding increases, resulting in a conversion.

In patients with cholecystitis who had undergone conservative treatment and missed the opportunity for cholecystectomy within three days, it is recommended that laparoscopic cholecystectomy is performed after 90 days or more.

The limitations of our study are sample size, that the analysis was limited to a single institution, and that the study had a retrospective design. Further analysis and more patients are needed to confirm our conclusion.

Conclusions

If it has become challenging to perform urgent/early LC within three days, due to prior conservative treatment for acute cholecystitis, the operative time and length of hospital stay could be reduced by delaying LC for more than 90 days after the onset. In addition, postoperative complications would not occur, and the conversion rate could be reduced to a low level.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Moreover, the Committee on Ethics of Showa University Medical School and IRB (Institutional Review Board) reviewed and approved the study protocols (The approval code: No. 19H064). As a retrospective cohort study, the Committee on Ethics of Showa University Medical School and IRB directed that the opt-out method to obtain patient consent was utilized at our institution in this study and waived the need for informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The data used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no competing interests.

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Author’s contributions

Y.E. wrote the main manuscript text and prepared the figure and tables. Y.E., K.T., T.Ha., T.Hi., H.S., K.S., S.N., Y.T., J.S., S.S., K.N., Y.T., and S.M. performed surgery and analyzed the data. T.A., N.S., F.I., and S.K. planned and supervised the work. All authors have revised the manuscript.

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Tables

Tables 1 to 8 are available in the Supplementary Files section

Figures

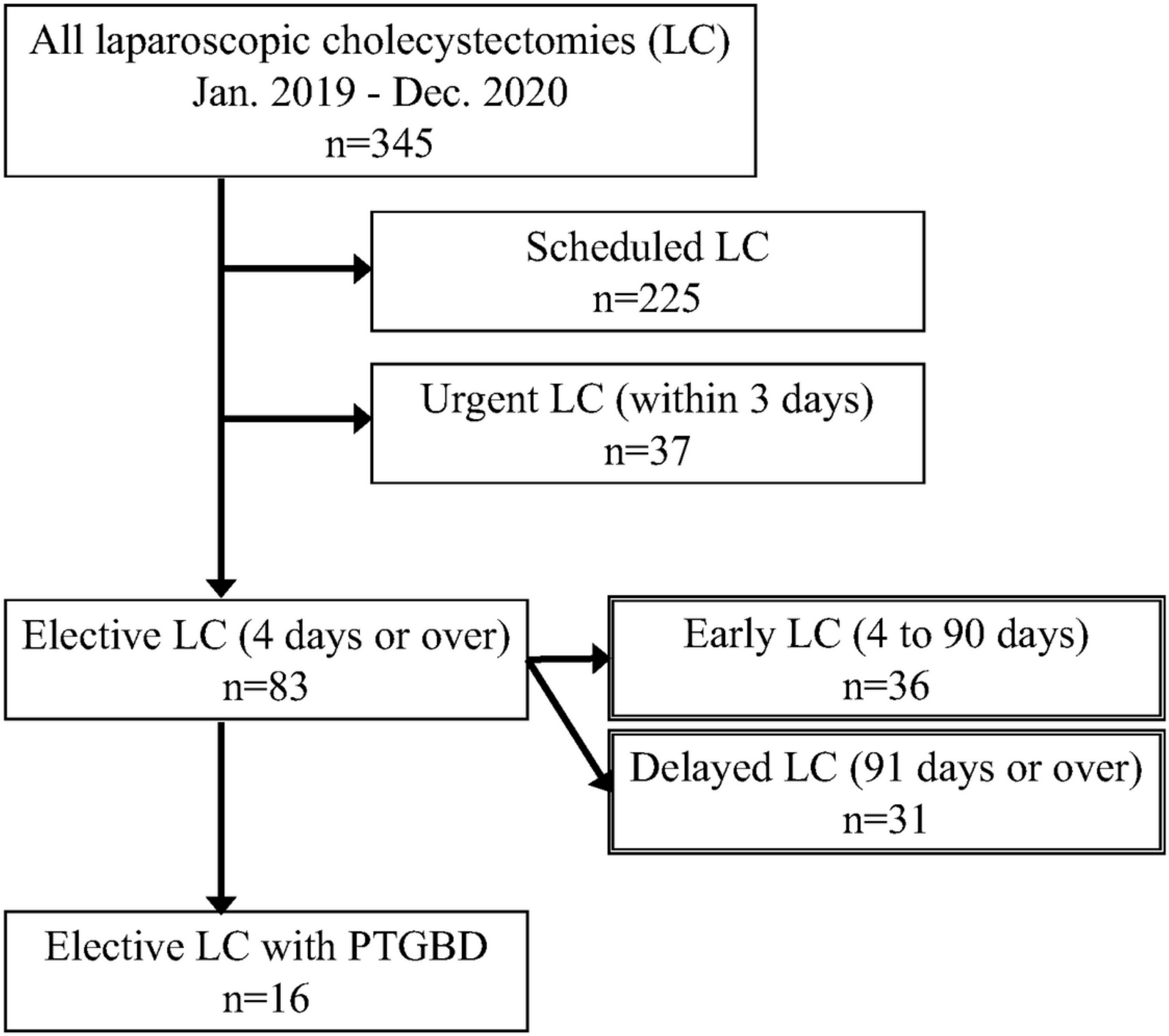

Figure 1

Flow chart of this study.

PTGBD, percutaneous transhepatic gallbladder drainage

Supplementary Files

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- TablesforTimingBMC1.xlsx