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Original Research Article

Safe laparoscopic cholecystectomy technique and timing for acute cholecystitis: a study in India

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ABSTRACT

Background: Acute cholecystitis patients undergo laparoscopic cholecystectomy (LC) within 72 hours or 6 weeks to 12 weeks after onset is widely considered the optimal timings for LC. However, there has been no clear consensus about it. We aimed to determine safe technique of LC for acute cholecystitis within 72 hours or any time of presentation with no delay in surgery.
Methods: Medical records of 100 patients who underwent standard LC were reviewed retrospectively. Patients were divided into group 1, patients undergoing LC within 72 hours of onset; group 2, between 4 days to 14 days; group3, between 3 weeks to 6 weeks; group 4, more than 6 weeks.
Results: No significant differences existed between groups in conversion rate to open surgery, operation time, blood loss, or postoperative morbidity, and hospital stay. However, total hospital stays in groups 1 and 2 was significantly shorter than that in groups 3 and 4 ($p<0.01$). In addition, the total hospital stay in group 3 was also significantly shorter than that in group 4 ($p<0.01$).
Conclusions: Best timing of LC for acute cholecystitis may be within 72 hours, and there is no need to delay LC in patients presenting after 72 hours and with safe technique of dissecting at infundibulum retrieval of stones and cystic duct stump closure with catgut loop there is no significant difference observed retrospectively.

Keywords: Acute cholecystitis, LC, Operation timing, Technique

INTRODUCTION

Cholecystectomy is the treatment for patient with acute cholecystitis.[1,2] In the early days of LC, acute cholecystitis was a contraindication of LC, and many surgeons have believed that it was a matter of skill, technique and training until now. Thereafter, LC for acute cholecystitis started with the increases in laparoscopic experience and has been performed.[3] In the case of LC after the acute phase, the accepted timing has generally been considered to be 6 weeks to 8 weeks after the onset of symptoms to allow resolution of the acute inflammation of the gallbladder.[4] Recent meta-analyses have demonstrated that compared with delayed-interval LC (performed 6 to 12 weeks later), early urgent LC (performed within 24 to 72 hours of onset or any time of presentation) provides benefit in terms of total hospital stay but not in terms of conversion rates and post operative complications.[5-7]

The guidelines at consensus meeting recommend early LC after admission but do not define delayed-interval LC.[8 10] Many surgeons consider elective or delayed timing of LC to mean all timings after the acute phase (72 to 96 hours), not just 6 weeks to 12 weeks after onset.[11] Indeed, many reports show that elective or delayed LC was almost always performed within 6 weeks. [12,13] However, the elective timing of LC has not been a problem in the clinical management of acute cholecystitis.[12] Recently, Low et al compared delayed

urgent LC (72 hours to 2 weeks) with early urgent LC (within 72 hours) in patients with acute cholecystitis.[14] The results of delayed urgent LC were comparable to those of early LC in terms of conversion rates, operative morbidities, and postoperative hospital stay. They recommend early-interval LC within 2 weeks of onset in patients who cannot undergo early urgent LC. Thus, there has been no clear consensus on the timing of delayed-interval LC for acute cholecystitis. In this study, we retrospectively analyzed data on LC in 100 patients with acute cholecystitis and determined how timing of LC influenced the results.

METHODS

Study type

Retrospective observational study type was used in this research study.

Study period

Study carried out from January 2018 and January 2023.

Study place

The study conducted at Katuri medical college, Chinakodrupadu, Guntur, Andhra Pradesh, India.

Selection criteria

The 426 consecutive patients underwent cholecystectomy in our surgical department, and 103 of them were diagnosed as having acute cholecystitis were included.

Three of these 103 patients underwent open cholecystectomy because of concomitant diseases: pulmonary and heart failure, and a huge incisional hernia intended to be repaired at the same time. The remaining 100 patients comprising 37 women and 63 men, ranging from 20 to 99 years of age (mean age 64±15 years, mean ± standard deviation) underwent LC. Seven of the patients had undergone previous surgery in the upper abdomen (6 gastrostomies and colectomy). Thirty-seven patients (37%) were classified as having an American Society of Anesthesiology (ASA) score of 3 or 4 at the onset of cholecystitis, and 63 patients (63%) had comorbidities possibly hindering emergency operation, including cerebral and cardiac diseases, diabetes mellitus, chronic renal failure, and other disease. In addition, 20 of the patients were on anticoagulation therapy at the onset of cholecystitis.

Diagnosis and assessment of the severity of acute cholecystitis were performed according to the Tokyo guidelines.[15] Briefly, acute cholecystitis was diagnosed not only by clinical manifestation (Murphy's sign, upper abdominal pain, and fever) and laboratory data (elevated C-reactive protein and white blood cell counts) but also by imaging findings of ultrasonography and computed tomography (enlarged gallbladder and thickened gallbladder wall of ≥4 mm). Severity was classified into 3 grades: grade I, mild acute cholecystitis without marked local inflammation of the gallbladder and organ dysfunction; grade II, moderate acute cholecystitis with marked local inflammation of the gallbladder (pericholecystic abscess, hepatic abscess, gangrenous cholecystitis, and biliary peritonitis); and grade III, severe acute cholecystitis with organ dysfunction (cardiovascular, neurological, renal, or hematological dysfunction). Severity in the 100 patients was classified as grade I in 66 patients (66%), grade II in 33 patients (33%), and grade III in 1 patient (1%).

The mean duration from the onset of acute cholecystitis to the LC operation was 25±20 days. The patients were divided into 4 groups according to the timing of LC from the onset of acute cholecystitis: group 1, patients undergoing LC within 72 hours; group 2, patients undergoing LC between 4 days and 14 days of onset; group 3, patients undergoing LC between 3 weeks and 6 weeks of onset; and group 4, patients undergoing LC more than 6 weeks after onset. Clinical features of the patients and perioperative outcomes including conversion rate to open surgery, operation time, blood loss, postoperative morbidity, and lengths of postoperative hospital stay (until patients re-turned home) and total hospital stay were compared in each group.

Operative procedure

The LC surgical procedure used a 3-port technique and standard 4 port technique.[16,17] Briefly, carbon dioxide (CO_2) was used for peritoneal insufflations, and abdominal pressure was maintained between 8 mm Hg and 10mm Hg. A Hasson-type trocar was inserted at the sub-umbilical region for the laparoscope. Operator access ports of 10 mm and 5 mm in diameter were inserted into the epigastrium and the right hypochondrium, respectively. The fundus of the gallbladder was grasped with the forceps inserted via a 5-mm port placed at the right iliac fossa in some cases. If it were difficult to grasp the gallbladder due to inflammation and the thickness of the wall, gallbladder decompression would be performed using an aspiration needle. On the occasion of severe inflammation and adhesion, blunt dissection with a suction device was very useful to keep a clear field and dissect tissues safely. The cystic artery and cystic duct were freed from the surrounding tissue at Calot's triangle, and the critical view of safety established by Strasberg was attempted to be created in each case.[18] But in case difficulty to achieve critical view of safety, gall bladder dissected up to neck and incised stones was retrieved and remaining stump may be ligated with no 1 catgut loop or suture ligation. This is a safe technique in these type of cases A drain was routinely inserted to the foramen of Winslow to assess intraperitoneal bleeding and bile leakage postoperatively, and removed on postoperative day 1. The pathological diagnosis was routinely performed to confirm acute cholecystitis.

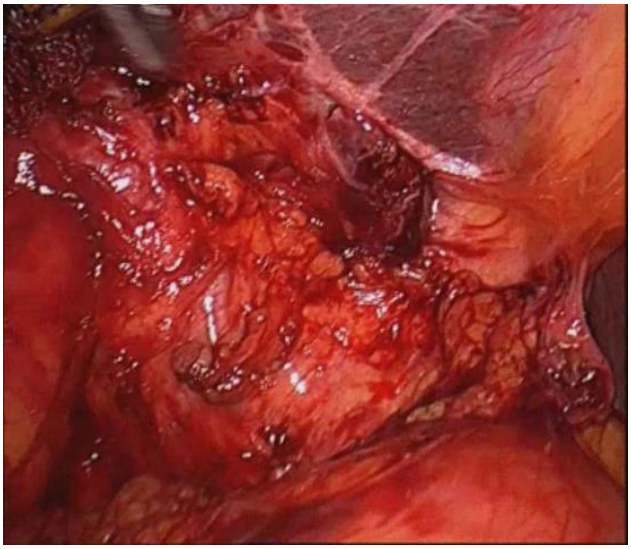

Figure 1: Acute cholecystitis.

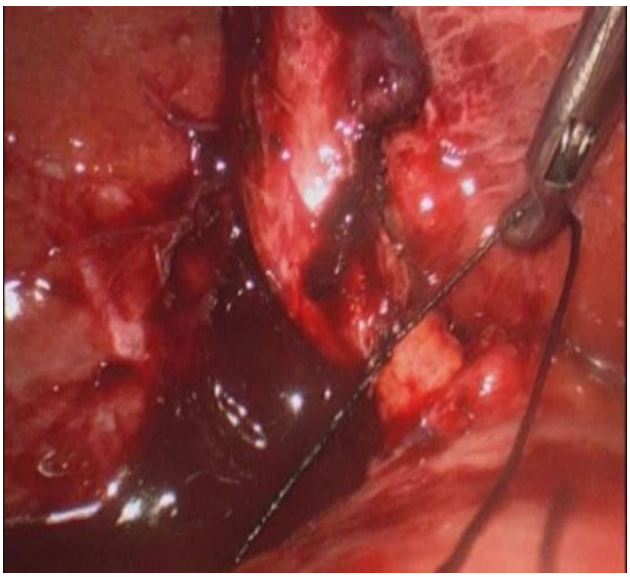

Figure 2: Stump ligating with suture.

Statistical analyses

Data are expressed as mean ± standard deviation. Statistical analyses were performed with one-way analysis of variance with Bonferroni correction, chi-square test, and Fisher's exact test. A value of $p<0.05$ was considered statistically significant. All calculations were performed with SPSS II (SPSS, Chicago, IL, USA)

RESULTS

LC was completed in all but 2 patients who were converted to open surgery due to severe inflammation. The mean LC operation time was 60±37minutes, and estimated blood loss was 50±42 mL, 6 of the patients (6%) undergoing LC experienced postoperative complications: wound infection in 4 patients, bile leakage in 1, abscess formation at the liver bed in 1. A patient who was classified as grade III had the abscess formation post operatively. Four of 66 patients in grade I (6%) and 4 of 33 in grade II (12%) experienced the complications, but there were no significant differences between the 2 groups. PTGBD was not related to the incidences of overall postoperative complications and infectious complications (wound infection and abscess formation), respectively (PTGBD (+) vs. (-): 10% vs. 8%; 8% vs. 5%). One of the 2 patients with postoperative bile leakage and the 2 patients with abscess formation were treated by endoscopic or ultrasonographic and fluoroscopic interventions. The other complications were cured conservatively. The mean postoperative hospital stay was 3.1±2.8 days, and the mean total hospital stay was 6±3 days.

The clinical features of the 100 patients by group according to the timing of LC from the onset of acute cholecystitis are shown in Table 1. Group 1 comprised 11 patients; group 2, 20 patients; group 3, 52 patients; and group 4, 17 patients. The patients in group 1 were statistically significantly younger than those of the other 3 groups. There were significant differences in the number of patients with an ASA score of 3 or 4 between groups 1 and 3 and between groups 1 and 4. There were also significant differences in comorbidities between groups 1 and 4. Significant differences in the number of referrals from another hospital or another department within our hospital were recognized between the 4 groups except between groups 3 and 4. There were no significant differences in the severity of acute cholecystitis between the 4 groups.

Table 1: Clinical features of the patients according to timings from the onset of acute cholecystitis to LC.

Variables	Groups, n (%)			
	1	2	3	4
(Timing from onset to LC)	(≤72 hours)	(4-14 days)	(3-6 weeks)	(>6 weeks)
Open conversion (%)	0 (0)	0 (0)	1(2)	0 (0)
Operation time (min)	120± 50	151± 56	153± 59	150± 52
Blood loss (mL)	27± 59	59± 79	85± 120	79± 142
Postoperative complications (%)	0 (0)	2 (11)	5 (10)	2 (12)
Interventional treatment for complications (%)	5 (45)	1 (5)	1 (2)	2 (12)
Postoperative hospital stays (days)	6.4± 2.4	9.1± 4.4	9.3± 6.7	10.2± 5.4
Total hospital stays (days)	6.4± 2.4	6.4± 2.4	6.4± 2.4	6.4± 2.4

[a]$p<0.01$ vs. group 1. [b]$p<0.01$ vs. grdoup 1. [c]$p<0.01$ vs. group 2

There were no significant differences between the 4 groups in perioperative outcomes of conversion rate to open surgery, operation time, blood loss, postoperative morbidity, interventional treatments including operation for postoperative complications, and postoperative hospital stay (Table 2). However, total hospital stays in groups 1 and 2 was significantly shorter than that in groups 3 and 4 and was also significantly shorter in group 3 than in group 4, indicating that the patients in group 4 experienced the longest total hospital stay of any of the patients in the present study.

Table 2: Perioperative outcomes according to timings from the onset of acute cholecystitis to LC.

Variables	Groups, n (%)			
	1	**2**	**3**	**4**
(Timing from onset to LC)	(≤72 hours)	(4-14 days)	(3-6 weeks)	(>6 weeks)
Number of patients	11	20	52	17
Age (years)	48±15	64±13[a]	66±13[b]	70±16[b]
Sex (female/ male)	5/6	9/11	17/35	6/11
ASA score 3 or 4 (%)	0 (0)	6 (30)	21 (40)[a]	10 (59)[b]
Comorbidities (%)	5 (45)	11 (55)	32 (62)	15 (88)[a]
Other hospital/ department referrals (%)	0 (0)	8 (40)[a]	49 (94)[b,c]	16 (94)[b,c]
Severity of cholecystitis, grade II or III (%)	4 (36)	6 (20)	15 (29)	9 (53)

[a]p<0.05 vs. group 1. [b]p<0.01 vs. group 1. [c]p<0.01 vs. group 2

DISCUSSION

This study demonstrates that the duration between the onset of acute cholecystitis and the performance of LC did not statistically significantly influence almost any perioperative outcome except for that of the total hospital stay. However, our data do not deny benefit to patients with acute cholecystitis treated by early urgent LC (≤72 hours after onset). Although we could find no statistically significant differences between early LC and the other timings of LC, early LC for acute cholecystitis in the patients treated in our institution also showed excellent results including no conversions to open surgery, shorter operation times, no complications, and shorter postoperative hospital stays. The technique of blunt and meticulous dissection incising the neck of gall bladder retrieving the stones and then ligating the stump with no 1 catgut loop (subtotal cholecystectomy) has good results is implicated especially in acute cholecystitis cases. The patients in this study frequently possessed comorbidities and could not undergo early urgent LC. However, only 37% of the patients were classified as having an ASA score of 3 or 4, and 63% had comorbidities.

If doctors in other referring hospitals and in other departments within our own hospital had more knowledge of benefits of early LC performed within 72 hours of onset, or any time since onset we estimate about half of the patients might possibly receive it. Therefore, we believe that the evidence for optimal timing for LC in patients with acute cholecystitis should be announced more widely in India.

In patients with acute cholecystitis who cannot undergo early LC due to their general condition and/or comorbidities, 6 weeks to 12 weeks after the onset of acute cholecystitis has been widely considered to be the optimal timing for delayed-interval LC, 5-7 because acute inflammation and reactive hyperemia of the gallbladder have been considered to be resolved after 6 weeks. However, Low et al 14 showed efficacy of delayed urgent LC (72 hours to 2 weeks) for acute cholecystitis. Popkharitov performed a study of the timing of surgery for acute cholecystitis.[19] Three groups were compared, acute (≤72 hours), intermediate (4 to 7 days), and delayed (≥8 days), and no significant differences could be found in conversion rates (11.4% to 14.3%), complication rates (6.1% to 11.4%), and postoperative hospital stay (2~3 days) between the 3 groups. Condilis et al also investigated the best timing of LC for acute cholecystitis.[20] They compared 3 groups as well: group I, <48 hours; group II, 48 hours to 4 weeks; and group III, 5 weeks to 8 weeks. They showed that in comparison with groups I and III, group II had the worst outcomes in regard to conversion rate (23.5% vs. 3.4%, 7.2%), complication rate (14.7% vs. 2.1%, 6%), and postoperative hospital stay (7.5 days vs. 2 days, 2.5 days), and their results followed the common sense of delayed-interval timing (6 weeks to 12 weeks after onset). However, Lee et al also performed a study of timing of surgery for cholecystitis, again comparing 3 groups: acute (<3 days), intermediate (4 days to 5 weeks), and delayed (>5 weeks).[21] There were no significant differences in conversion rates (11% to 18%) and complication rates (7% to 16%) between the 3 groups. Therefore, they recommended that patients with acute cholecystitis should undergo LC during the same hospital admission.

Although the postoperative hospital stay in this study (6.4 days to 10.2 days) was much longer than those described in the previous reports, because of differences in medical insurance systems and patient's habits, the conversion rate from LC to open surgery (0% to 5%) was lower and postoperative morbidity (0% to 12%) was comparable to those in the previous reports. We suspect that these good results might be a consequence of our surgical skill and experience, which may influence and reduce the differences between the 4 groups.

Limitations

Limitations of study include, some patients with comorbidities, exact time of onset can't be discerned and instead of surgery, drainage was done with catheters.

CONCLUSION

The best time to perform LC for acute cholecystitis may be within 72 hours of onset. In patients who cannot undergo early LC due to their general condition, comorbidities, or both, LC should probably be performed as soon as possible after the patients are well enough to undergo LC with safe technique of dissection and subtotal cholecystectomy after stone retrieval. The results of the present study could not affirm the conventional delayed timing of LC of 6 weeks to 12 weeks.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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