

## COMPARATIVE STUDY ON EARLY VERSUS INTERVAL LAPAROSCOPIC CHOLECYSTECTOMY IN ACUTE CHOLECYSTITIS WITH LATE PRESENTATION

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### Abstract

**Background:** Cholecystectomy is a common surgical procedure, and laparoscopic cholecystectomy is the standard treatment. Early cholecystectomy is considered safe for acute cholecystitis but is avoided due to potential complications and higher conversion rates to open surgery. This study aimed to compare the efficacy of early and interval laparoscopic cholecystectomy in acute cholecystitis with a late presentation regarding conversion rate, biliary injury, gross contamination, postoperative wound infection, and length of hospital stay. **Materials and Methods:** This prospective study included patients with acute calculus cholecystitis treated at the Department of General Surgery, Madurai Medical College. Fifty patients were randomised: 25 in the early and 25 in the late groups based on inclusion and exclusion criteria. Data were collected prospectively, including patient demographics, operative findings, and intraoperative complications, such as bile duct injury and gross bile contamination. **Result:** The mean age in Group A was  $40.5 \pm 11.6$ , and Group B was  $38.6 \pm 11.4$ . Among the ultrasound findings, the thickened edematous gallbladder was 52% in Group A and 48% in Group B. Distended gallbladder was 64% in Group A and 60% in Group B. Murphys sign was 70% in Group A, and 65% in Group B. There was no significant difference in sex, conversion to open surgery, bile duct injury, or gross contamination between the groups. There was a significant difference in postoperative wound infections between groups ( $p=0.02$ ). **Conclusion:** Early laparoscopic cholecystectomy was associated with a higher rate of postoperative wound infection. Other complications were not significant enough to render this procedure unsafe, although the patient presented later.

## INTRODUCTION

Calculus biliary disease is the most common gallbladder and biliary tract disease, accounting for approximately 10–15% of the population. Between 20 and 40% of patients with gallstones develop gallstone-related complications, with an annual incidence of 1–3%.<sup>[1,2]</sup> Cholecystectomy is one of the most common surgical procedures performed worldwide. The first successful cholecystectomy was believed to have been performed by Carl Langenbuch in 1882, and open cholecystectomy was the primary treatment for gallbladder disease in the early 1990s.<sup>[3,4]</sup> Gallbladder inflammation due to stones obstructing the cystic duct or other factors causing gallbladder inflammation is broadly classified as calculus or calculus cholecystitis. Surgery is the treatment of choice is surgery. Although cholecystitis

is a very common disorder, the usual presentation to a health care centre is rarely in the early phase of the symptoms.<sup>[2,5]</sup>

At this time, the anatomy of Calot's triangle becomes distorted due to adhesions, which makes it difficult to delineate vital structures, such as the hepatic artery or extrahepatic biliary structures. The timing of cholecystectomy remains controversial, although laparoscopic cholecystectomy has been established as the standard treatment for calculus cholecystitis.<sup>[6,7]</sup> There are many attributes to the timing of cholecystectomy. The first and oldest method is elective surgery after an initial dose of antibiotics, which allows acute inflammation to resolve. The second method is delayed cholecystectomy, where cholecystectomy is done in the index admission, and the third method is early cholecystectomy, where surgery is done within 72

hours of symptoms onset.<sup>[8,9]</sup> Several studies were conducted to find the best timing of surgery regarding socioeconomic burden and patients' outcomes, yet it remains a contentious topic.<sup>[4,6,7,9]</sup>

In an RCT with a long-term follow-up of 14 years, approximately 30% of patients treated conservatively developed recurrent gallstone-related complications, and 60% of patients subsequently underwent cholecystectomy.<sup>[10]</sup> Therefore, until new high-quality evidence becomes available, laparoscopic cholecystectomy is considered the recommended treatment for patients who are fit to undergo surgery. However, the timing of laparoscopic cholecystectomy in these patients remains controversial. A Cochrane review published in 2013 concluded that early cholecystectomy for acute cholecystitis seems safe and may shorten the total hospital stay.<sup>[11]</sup> Laparoscopic cholecystectomy in acute cholecystitis is avoided due to concern about the potential hazards of complications, particularly bile duct injury and a higher rate of conversion to open cholecystectomy. Previous studies have shown that the conversion of laparoscopic cholecystectomy to open surgery is approximately 3-7%. However, this rate is higher in acute inflammation, with a conversion rate of almost 30%. Several previous studies have suggested that the conversion rate is lower if the surgery is conducted within 96 hours of symptom onset.<sup>[7,9-11]</sup> However, early cholecystectomy is not always feasible, as the usual presentation to a health care centre is usually not immediately after the onset of symptoms.

This study aimed to compare the efficacy of early and interval laparoscopic cholecystectomy in acute cholecystitis with a late presentation regarding conversion rate, biliary injury, gross contamination, postoperative wound infection, and length of hospital stay.

## MATERIALS AND METHODS

This prospective study was conducted in patients with acute calculus cholecystitis at the Department of General Surgery, Madurai Medical College. This study was approved by the ethics committee of our hospital.

### Inclusion Criteria

Patients over 18 years of age and less than 70 years of age with acute calculus cholecystitis presenting three days after symptom onset and patients who consented to inclusion in the study according to the designated proforma were included.

### Exclusion Criteria

Patients aged < 18 years or > 70 years; any obvious septicaemia; patients treated with steroids, immunosuppressive drugs, or chemotherapy; patients who underwent previous abdominal surgery for various causes; coexisting common bile duct stone; obstructive jaundice; acute acalculous cholecystitis; emphysematous cholecystitis; cholecystitis with perforation; and gangrenous cholecystitis. Patients

with other serious pre-existing cardiovascular, pulmonary, and immunological diseases and choledocholithiasis were excluded.

**Fifty patients were randomised:** 25 in the early and 25 in the late groups based on inclusion and exclusion criteria. After admission to the hospital, necessary details regarding the age, sex, religion, and address of the patients were recorded. The patients were then studied clinically, investigations were performed, and laparoscopic cholecystectomy was performed after proper preoperative preparation. The surgery involved consultant surgeons performing the procedure under general anaesthesia and endotracheal intubation. Ampicillin 1gm was given preoperatively. The pneumoperitoneum was created through a blind puncture and four laparoscopic ports. The adhesions were released, and Calot's triangle was exposed. The gallbladder was emptied, and the cystic pedicle was dissected. The gallbladder was extracted through the epigastric port, and a drain was placed if necessary.

Patients were assessed for intraoperative complications, such as Calot's triangle, bile duct injury, and leaks. After surgery, patients were closely monitored for pulse, blood pressure, and urine output. A broad-spectrum antibiotic was administered, and the nasogastric tubes were removed the next day. Patients were allowed oral intake 48 hours after surgery, and abdominal drains were removed 48 hours later. Complications, such as lung atelectasis, wound infection, and hospital stay duration, were analysed. The sutures were removed 8-10 days after surgery, and some stable patients were discharged early without suture removal.

Data were collected prospectively, including patient demographics, operative findings, and intraoperative complications, such as bile duct injury and gross bile contamination. Postoperative complications included wound infection and the duration of hospital stay. Patients were discharged once if any DT placed was removed, afebrile, or oral nutrition.

After hospital discharge, patients were advised to return for check-ups, with the first check-up occurring after two weeks, followed by monthly visits for three months and six-monthly visits as needed. They were asked about their previous health improvements and new symptoms, and a thorough examination was conducted.

### Statistical Analysis

The collected data were analysed with SPSS statistics software 23.0 version. Percentage analysis was used for categorical variables and means and SD were used for continuous variables. An unpaired sample t-test was used. Chi-square and Fisher's exact tests were used to determine the significance of categorical data. A probability value of 0.05 is considered significant in all statistical tools.

## RESULTS

During the study period, 50 patients were randomised: 25 in the early group and 25 in the late group. The two groups were well-matched regarding age, sex, and clinical and laboratory parameters. Both early and late groups were compared regarding intraoperative and postoperative complications. The mean age in Group A was  $40.5 \pm 11.6$ , and Group B was  $38.6 \pm 11.4$ .

Among the ultrasound findings, the thickened oedematous gallbladder was 52% in Group A and 48% in Group B. Distended gallbladder was 64% in Group A and 60% in Group B. Murphys sign was 70% in Group A, and 65% in Group B [Table 2].

In Group A, there were 76% female and 80% were female. Among the male population, 24% belonged to Group A, and 20% belonged to Group B. There

was no significant difference in sex between groups ( $p=0.63$ ).

In Group A, 36% were converted to open procedures, and 28% in Group B. There was no significant difference between the groups in terms of conversion to open surgery ( $p=0.39$ ).

Bile duct injury accounted for 12% and 8% of patients in groups A and B, respectively. There was no significant difference in bile duct injuries between groups ( $p=0.5$ ).

Among the Early Group, 30% had gross contamination, and 24% had gross contamination in the Interval Group. There was no significant difference in gross contamination between the groups ( $p=0.49$ ).

Among the Early Group, 30% had postoperative wound infection, and 12% had postoperative wound infection in the Interval Group. There was a significant difference in postoperative wound infections between the groups ( $p=0.02$ ) [Table 1].

**Table 1: Clinical data and laboratory findings**

	Early laparoscopic cholecystectomy (A) n= 50	Interval laparoscopic cholecystectomy (B) n= 50
Age (years)	$40.5 \pm 11.6$	$38.6 \pm 11.4$
Sex M: F	01:03	01:04
Duration of acute symptoms (hours)	$72 \pm 6$	$72 \pm 8$
Previous biliary symptoms	6	4
Maximum temperature	$99.7 \pm 0.2$	$99.7 \pm 0.4$
Total leukocyte count (>11,000/ml)	40	37
Total bilirubin (mg%)	$0.6 \pm 0.12$	$0.6 \pm 0.15$
AST	$40.7 \pm 20$	$38.8 \pm 14$
ALT	$35.5 \pm 18$	$26.8 \pm 14$
ALP	$187 \pm 68$	$154 \pm 48$

**Table 2: Ultrasound findings of patients**

	Group A	Group B
Thickened edematous gallbladder	52%	48%
Distended gallbladder	64%	60%
Murphys sign	70%	65%
Pericholecystic fluid	17%	15%

**Table 3: Comparison of various parameters between groups**

		Group A (Early)	Group B (Interval)	P value
Gender	Female	38 (76%)	40 (80%)	0.63
	Male	12 (24%)	10 (20%)	
Conversion to open	No	32 (64%)	36 (72%)	0.39
	Yes	18 (36%)	14 (28%)	
Biliary Injury	No	44 (88%)	46 (92%)	0.5
	Yes	6 (12%)	4 (8%)	
Gross contamination	No	35 (70%)	38 (76%)	0.49
	Yes	15 (30%)	12 (24%)	
Post-op wound infection	No	35 (70%)	44 (88%)	0.02
	Yes	15 (30%)	6 (12%)	

## DISCUSSION

In the initial years of laparoscopic surgery, acute cholecystitis was considered a contraindication to laparoscopic cholecystectomy. However, recently, laparoscopic cholecystectomy has been proven feasible and safe for acute cholecystitis. Various studies have reported higher conversion rates, ranging from 6% to 35%, for early cholecystectomy used to manage acute cholecystitis.<sup>[12]</sup> The higher

conversion rates prevent the advantages of early laparoscopic cholecystectomy. It is therefore argued that if delayed laparoscopic cholecystectomy leads to a technically easier surgery with a lower conversion rate, it may be a better treatment option for acute cholecystitis.<sup>[13]</sup> However, there is an increased risk of gallstone-related morbidity during the waiting period for cholecystectomy and the longer duration of total hospital stay in interval cholecystectomy. The challenge of early cholecystectomy is late presentation to a health care centre.<sup>[14]</sup> Therefore, in

this investigation, early laparoscopic cholecystectomy and interval laparoscopic cholecystectomy were compared in patients presenting with acute calculus cholecystitis following the conventional lapse time of early laparoscopic cholecystectomy, typically performed within 72 hours of symptom onset.

In group A, early laparoscopic cholecystectomy, there was no significant p-value to justify that early cholecystectomy has a chance of conversion to open surgery, bile leak, or gross contamination. The occurrence of postoperative wound infections demonstrated a notable difference between the groups. In Group A, 30% of patients experienced postoperative wound infection, whereas in Group B, only 12% had such infections ( $p = 0.02$ ), indicating a statistically significantly lower incidence in the interval intervention group. The study conducted by Yadav et al. also reported that early surgical intervention can be more prone to complications, such as post-surgical infections, which can be treated with adequate management. However, no significant difference was reported between the complications and type of surgical intervention. In addition, the early surgical intervention demonstrated fewer hospital stays.<sup>[13]</sup>

A similar randomised controlled trial showed that early laparoscopic cholecystectomy consists of a few complications, such as bleeding, adhesions, and bile duct injury. However, this can be attributed to patient-specific clinical conditions. Further comparison revealed that early intervention was associated with shorter surgery duration and shorter hospital.<sup>[15]</sup> In contrast to our study, Mahmood et al. reported no significant difference between early and delayed surgical interventions concerning surgical complications. Early intervention was proven to be cost-effective and reduced hospital admission.<sup>[16]</sup>

A multicentre study conducted by Uysal et al. reported findings similar to ours, in which delayed surgical intervention was significantly associated with complications. Patients who underwent surgical intervention between 1-4 weeks for cholecystitis reported fewer hospital stays and low disease relapse. This signifies that delayed surgical intervention in cases of acute cholecystitis can result in longer hospital duration, higher surgical complications, and ultimately affect patient outcomes. This study also highlights the approach of early laparoscopic cholecystectomy, which has proven effective.<sup>[17]</sup>

In our study, we did not report any significant differences between bile injury, gross contamination, conversion to open surgery, and sex. A meta-analysis also reported similar observations, in which no significant difference was observed in postoperative complications between early and late surgical interventions. However, the meta-analysis revealed that early laparoscopic cholecystectomy could provide less hospital stay (mean difference  $-4.12$  (95% confidence interval  $-5.22$  to  $-3.03$ ) days;  $p < 0.001$ ). A meta-analysis also showed that early surgical intervention in cholecystectomy cases is safe

and effective without increasing the risk of intra- and post-surgical complications. The comparison of mortality rates does not differ between early and late surgical interventions.<sup>18</sup> Early surgical intervention should be considered between 24 hours and seven days to reduce surgical complications and improve patient outcomes.<sup>[19]</sup> Our study highlights the importance of early laparoscopic cholecystectomy for cholecystitis, which can improve clinical conditions for patients with low relapse rates.

## CONCLUSION

In conclusion, although early laparoscopic cholecystectomy has a higher rate of postoperative wound infections, other complications were not significant enough to render this procedure unsafe, even though the patient presented later. Severe complications, such as biliary tract injury, were not significantly different between the early and interval cholecystectomies. Hence, early laparoscopic cholecystectomy is safe even for a patient who presents later after a lapse of three days from the onset of symptoms.

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