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COMPARATIVE OUTCOMES OF EARLY VERSUS DELAYED LAPAROSCOPIC CHOLECYSTECTOMY IN ACUTE CHOLECYSTITIS: A PROSPECTIVE STUDY

General Surgery

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ABSTRACT

Background: The optimal timing for laparoscopic cholecystectomy (LC) in acute cholecystitis (AC) remains debated. This study aimed to compare clinical outcomes between Early Laparoscopic Cholecystectomy (ELC) and Delayed Laparoscopic Cholecystectomy (DLC). **Methods:** A prospective comparative study was conducted over two years, including 110 patients with AC. Patients were randomized into two groups: Group A (ELC, n=55) underwent surgery during the initial admission, and Group B (DLC, n=55) underwent surgery 6-8 weeks after conservative management. Outcomes measured included operative time, intraoperative complications (bleeding, bile duct injury), conversion rates, postoperative pain, drain duration, wound infection, and total hospital stay. **Results:** The groups were comparable in age, gender, and clinical history. ELC was associated with a significantly longer operative time (1.30±0.0 vs. 1.0±0.07 hours, p<0.001) and a higher incidence of intraoperative bleeding (70.9% vs. 40.0%, p=0.001). Conversion rates were not significantly different (ELC 9.09% vs. DLC 5.45%). Postoperatively, the ELC group experienced significantly higher pain scores at 12, 24, and 48 hours and longer drain duration (2.05±0.13 vs. 1.01±0.15 days, p<0.001). However, the total hospital stay was significantly shorter in the ELC group (4.09±0.29 vs. 6.95±0.23 days, p<0.001). Wound infection rates were comparable. **Conclusion:** ELC for AC significantly reduces total hospital stay but is associated with longer operative times, increased intraoperative bleeding, and greater postoperative pain in the first 48 hours. While ELC offers resource utilization benefits, the decision should be individualized, weighing these trade-offs against the patient's clinical condition and surgical expertise.

KEYWORDS

Acute Cholecystitis, Laparoscopic Cholecystectomy, Early Surgery, Delayed Surgery, Outcomes

INTRODUCTION

Acute cholecystitis (AC), most commonly resulting from gallstone obstruction of the cystic duct, is a prevalent surgical emergency worldwide [1]. Laparoscopic cholecystectomy (LC) is the established gold-standard treatment due to its benefits of minimal invasiveness, reduced postoperative pain, shorter hospitalization, and better cosmesis [2, 3].

A central controversy in managing AC is the timing of surgical intervention. Early Laparoscopic Cholecystectomy (ELC), typically performed within 72 hours to 7 days of symptom onset, is increasingly favored as it prevents disease progression, eliminates the risk of recurrent biliary events during a waiting period, and reduces overall healthcare costs [4, 5]. Conversely, Delayed Laparoscopic Cholecystectomy (DLC), performed 6-12 weeks after initial conservative management, was historically preferred to allow acute inflammation to subside, theoretically facilitating a safer dissection [6].

International guidelines, such as the Tokyo Guidelines (2018), recommend ELC for Grade I and II AC [7]. However, the perceived technical difficulty and potential for higher complication rates in ELC lead some surgeons to opt for a delayed approach. This prospective study was conducted to compare the clinical outcomes, including operative challenges and postoperative recovery, between ELC and DLC in a North Indian tertiary care setting.

MATERIALS AND METHODS

Study Design And Setting

This prospective comparative study was conducted in the Department of Surgery at Era's Lucknow Medical College & Hospital, Lucknow, India, over two years. Ethical clearance was obtained from the Institutional Ethics Committee (Approval No.: ECR/717/Inst./U.P./2015/RR-21, Date: 01/11/2023), and written informed consent was taken from all participants.

Participants

A total of 110 patients with a clinical and ultrasonographic diagnosis of AC were enrolled. Patients were randomized into two groups of 55 each using a computer-generated random number table.

· Group A (ELC): Underwent surgery during the initial admission.
· Group B (DLC): Underwent initial conservative management (antibiotics, analgesics, IV fluids) followed by elective LC 6-8 weeks later.

Inclusion Criteria:

1. Patients aged >18 years with acute cholecystitis.
2. Patients of either gender.

Exclusion Criteria:

1. Patients with common bile duct stones.
2. Patients with gallstone-induced pancreatitis.

Sample Size Calculation: The sample size was calculated as 55 per group based on a 90% study power, a 95% significance level, and an expected conversion rate of 13.33% in the ELC group versus 0% in the DLC group.

Statistical Analysis

Data were analyzed using SPSS software (version XX). Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. Categorical variables were expressed as numbers and percentages and compared using the Chi-square test. A p-value of <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics

The study population had a mean age of 38.67±11.52 years in Group A and 40.98±13.02 years in Group B (p=0.327), with the majority in the 31-40 years age group. A significant female predominance was observed overall (82.7%), which was consistent across both groups (Group A: 85.5%, Group B: 80.0%, p=0.449). There were no significant differences in the history of previous abdominal pain or previous abdominal surgery between the groups (Table 1).

Table 1: Groupwise distribution of the study population

SN	Group	Intervention Type	No.	%
1	Group A	Early	55	50.0
2	Group B	Delayed	55	50.0
	Total		110	100.0

Group A Group B

Pre-operative Ultrasonography (USG) Findings

Pre-operative USG revealed significant differences. A higher proportion of patients in the ELC group had a thickened gallbladder wall (87.3% vs. 61.8%, p=0.002) and pericholecystic fluid (74.5% vs. 27.3%, p<0.001). In contrast, a distended gallbladder was more common in the DLC group (92.7% vs. 61.8%, p<0.001). The presence of gallstones was comparable (Table 2).

Table 2: Comparison of Age of the patients

SN	Age	Group A		Group B		Chi-Sq	
		No.	%	No.	%	χ^2	'p'
1	21-30 yrs	16	29.1	13	23.6	1.192	0.755
2	31-40 yrs	19	34.5	17	30.9		
3	41-50 yrs	9	16.4	13	23.6		
4	≥51 yrs	11	20.0	12	21.8		
		Mean	SD	Mean	SD	Student's t-test	
		38.67	11.52	40.98	13.02	-0.958	0.327

Intra-operative Outcomes

· Operative Time: The mean operative time was significantly longer in the ELC group (1.30±0.0 hours vs. 1.0±0.07 hours, p<0.001).
· Intra-operative Bleeding: The incidence of intra-operative bleeding was significantly higher in the ELC group (70.9% vs. 40.0%, p=0.001).
· Bile Duct Injury and Perforation: There was one case of bile duct injury in each group. Gallbladder perforation occurred in 4 (7.3%) ELC patients and 2 (3.6%) DLC patients (p=0.401).
· Conversion to Open Surgery: The conversion rate was higher in the ELC group (9.09% vs. 5.45%), but this difference was not statistically significant. The most common reason for conversion in the ELC group was bleeding (Table 3).

Post-operative Outcomes

· Pain Scores: Postoperative pain scores were significantly lower in the DLC group at 12, 24, and 48 hours (p<0.001 for all).

· Drain Duration: The post-surgical drain was removed significantly later in the ELC group (2.05±0.13 days vs. 1.01±0.15 days, p<0.001).
· Wound Infection: The rate of wound infection was lower in the DLC group (3.6% vs. 7.3%), but the difference was not statistically significant (p=0.678).

· Total Hospital Stay: The total hospital stay was significantly shorter in the ELC group (4.09±0.29 days vs. 6.95±0.23 days, p<0.001).

DISCUSSION

This prospective study demonstrates a clear trade-off between ELC and DLC for managing acute cholecystitis. Our findings align with the global trend advocating for ELC, primarily due to the significant reduction in total hospital stay, which has profound implications for patient turnover and healthcare costs [5, 8].

However, this benefit comes at the cost of increased intraoperative challenges. The longer operative time and significantly higher rate of intraoperative bleeding in the ELC group reflect the technical difficulty posed by the acute inflammatory milieu, as evidenced by the higher prevalence of thickened GB walls and pericholecystic fluid on pre-operative USG [9]. This suggests that surgeons opting for ELC must be prepared for a more demanding dissection and potential vascular challenges.

A crucial finding was the significantly higher postoperative pain in the ELC group during the first 48 hours, coupled with a longer drain duration. This indicates that while ELC leads to a quicker overall discharge, the immediate postoperative recovery might be more painful and require more attentive monitoring in the initial days. This patient-centered outcome is an important consideration for pre-operative counseling.

The comparable rates of bile duct injury and wound infection between the groups reinforce that ELC, despite its challenges, can be performed without an increase in major complications, a sentiment echoed by other contemporary studies [10]. The non-significant difference in conversion rates further supports the feasibility of the early approach in experienced hands.

Our study has limitations, including its single-center design and a sample size powered for conversion rates rather than rarer complications like bile duct injury. Larger, multi-centric studies could provide more robust evidence.

CONCLUSION

Early Laparoscopic Cholecystectomy is an effective strategy for managing acute cholecystitis, offering the significant advantage of a reduced total hospital stay. However, it is associated with longer operative times, a higher incidence of intraoperative bleeding, and greater early postoperative pain compared to the delayed approach. The choice of timing should therefore be individualized, considering the patient's clinical condition, the severity of inflammation on imaging, and the surgeon's expertise. ELC should be promoted as the standard of care for low-to-moderate grade cholecystitis, with a clear understanding of its associated technical demands.

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Declarations / Ethical Compliance

Conflict of interest: None declared.

Funding: None.

Ethical approval: Approved by Institutional Ethics Committee, Era's Lucknow Medical College & Hospital, Lucknow.

Informed consent: Written informed consent obtained from all participants.

Table 3: Comparison of gender of the patients

SN	Gender	Group A		Group B		Chi-Sq	
		No.	%	No.	%	χ^2	'p'
1	Female	47	85.5	44	80.0	0.573	0.449
2	Male	8	14.5	11	20.0		

Table 4: Comparison of Clinical Factors

SN	Factors	Group A (n=55)		Group B (n=55)		Chi-sq. test	
		No.	%	No.	%	χ^2	'p'
1	Previous-H/O Abdominal Pain (2 or more Attacks)	10	18.0	12	21.8	0.767	0.381
2	Previous Abdominal Surgery	3	5.45	5	9.09	0.526	0.468

Table 5: Comparison Pre-operative findings on USG

SN	Findings	Group A (n=55)		Group B (n=55)		Chi-sq. test	
		No.	%	No.	%	χ^2	'p'
1	Thickened GB Wall	48	87.3	34	61.8	9.390	0.002
2	Presence of Gallstones	53	97.3	54	98.5	1.760	0.185
3	Distended Gall Bladder	34	61.8	51	92.7	14.960	<0.001
4	Pericholecystic Fluid	41	74.5	15	27.3	24.590	<0.001

Table 6: Comparison of Intra-operative findings

SN	Findings	Group A (n=55)		Group B (n=55)			
		Mean	SD	Mean	SD	't'	'p'
1	Duration of Surgery (hours)	1.30	0.0	1.0	0.07	54.000	<0.001
		No.	%	No.	%	χ^2	'p'
2	Intra-op Bleeding	39	70.9	22	40.0	10.636	0.001
3	GB perforation	4	7.3	2	3.6	0.705	0.401
4	Bile Duct Injury	1	1.8	1	1.8	-	-

Table 7: Comparison of Reasons for Conversion

SN	Reasons	Group A (n=55)		Group B (n=55)		Chi-sq. test	
		No.	%	No.	%	χ^2	'p'
1	Bleeding	3	5.51	1	1.8	1.038	0.308
2	Adhesion	1	1.8	0	0.0	1.009	0.315
3	Difficult Calot's Anatomy	0	0.0	1	1.9	1.028	0.311
4	Bile Duct Injury	1	1.8	1	1.8	-	-

Table 8: Comparison of Post-operative Findings

SN		Group A (n=55)		Group B (n=55)		Student's t-test	
		Mean	SD	Mean	SD	't'	'p'
1	Drain Duration (days)	2.05	0.13	1.01	0.15	-18.776	<0.001
2	Pain at 12 hrs	6.20	0.89	5.73	0.78	2.961	<0.001
3	Pain at 24 hrs	4.02	0.62	3.13	0.64	7.396	<0.001
4	Pain at 48 hrs	2.02	0.14	1.09	0.29	21.495	<0.001
		No.	%	No.	%	χ^2	'p'
7	Wound Infection	4	7.3	2	3.6	0.172	0.678

Table 9: Duration of Hospital Stay

SN		Group A (n=55)		Group B (n=55)		Student's t-test	
		Mean	SD	Mean	SD	't'	'p'
1	Total Hospital Stay (days)	4.09	0.29	6.95	0.23	-21.141	<0.001

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