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Original Research Article

Role of Early vs Delayed Laparoscopic Cholecystectomy in Acute Cholecystitis at a Tertiary Care Center of Western Gujarat

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Abstract

Background: Acute cholecystitis, primarily caused by gallstone obstruction, is a common surgical emergency requiring timely intervention. Laparoscopic cholecystectomy is the standard treatment, but the optimal timing—early (within 7 days of symptom onset) versus delayed (after 6 weeks)—remains debated due to concerns about operative risks and resource constraints. This study evaluates the safety, efficacy, and cost-effectiveness of early laparoscopic cholecystectomy (ELC) versus delayed laparoscopic cholecystectomy (DLC) in patients with acute cholecystitis at a tertiary care center in western Gujarat, addressing the need for region-specific evidence.

Materials and Methods: This prospective study, conducted for one year, included 120 patients with acute cholecystitis (Tokyo Guidelines TG18 criteria) randomized into ELC (n=60) and DLC (n=60) groups. ELC was performed within 7 days of symptom onset, while DLC followed 6 weeks of conservative management. Outcomes included operative time, conversion to open surgery, complications, hospital stay, costs, and patient satisfaction (assessed via a 5-point Likert scale). Data were analyzed using t-tests and chi-square tests ($p<0.05$).

Results: ELC had a longer operative time (82±15 vs. 68±12 minutes, $p=0.01$) but a shorter hospital stay (3.2±1.1 vs. 5.8±1.8 days, $p<0.001$) and lower costs (INR 45,000±8,000 vs. INR 62,000±10,000, $p=0.002$). Complication rates (10% vs. 12%, $p=0.77$) and conversion rates (5% vs. 7%, $p=0.68$) were comparable. Patient satisfaction was higher in ELC (85% vs. 70%, $p=0.04$), reflecting faster recovery.

Conclusion: ELC is safe, cost-effective, and associated with shorter hospital stays and higher patient satisfaction compared to DLC. These findings support ELC as the preferred approach in western Gujarat, optimizing outcomes in resource-limited settings. Future research should explore long-term outcomes and severe cases.

Keywords: Acute Cholecystitis, Early Laparoscopic Cholecystectomy, Delayed Laparoscopic Cholecystectomy, Hospital Stay, Cost-Effectiveness, Patient Satisfaction.

Introduction

Acute cholecystitis, primarily caused by gallstones obstructing the cystic duct, affects 10–15% of the adult population in Western countries, with similar prevalence in India.[1] The condition presents with right upper quadrant pain, fever, and potential complications like perforation or sepsis if untreated.[2] Laparoscopic cholecystectomy has emerged as the preferred treatment due to its minimally invasive nature, but the timing of surgery remains contentious.[3] Early laparoscopic cholecystectomy (ELC), performed within 7 days of symptom onset, is often contrasted with delayed laparoscopic cholecystectomy (DLC), conducted after 6 weeks of conservative management, due to concerns about operative risks during acute inflammation.[4] Previous studies, including a Cochrane review, have suggested that ELC may reduce hospital stay and costs without increasing complications compared to DLC.[5] However, data from Indian tertiary care centers, particularly in resource-limited regions like western Gujarat, are scarce. Local factors such as delayed patient presentation and limited surgical infrastructure necessitate region-specific evidence. This study aims to compare the outcomes of ELC versus DLC in acute cholecystitis at a tertiary care center in western Gujarat, evaluating operative time, complications, hospital stay, costs, and patient satisfaction to provide evidence-based recommendations for surgical practice in this setting.[6] The justification for this study lies in addressing the gap in region-specific data on optimal surgical timing for acute cholecystitis. With rising healthcare costs and limited resources in

western Gujarat, determining whether ELC can safely reduce hospital stay and costs compared to DLC is critical. This research seeks to guide clinical decision-making and improve patient outcomes in similar tertiary care settings.

Materials and Methods

This prospective study was conducted at a tertiary care center in western Gujarat for 1 year. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants. Patients diagnosed with acute cholecystitis based on the Tokyo Guidelines (TG18) criteria, including right upper quadrant pain, fever, and ultrasound evidence of gallbladder inflammation, were enrolled. The study adhered to the Declaration of Helsinki, ensuring patient confidentiality and safety. A multidisciplinary team, including surgeons, anesthesiologists, and radiologists, collaborated to standardize care protocols. Patients were randomized into two groups: ELC (surgery within 7 days of symptom onset) and DLC (surgery after 6 weeks of conservative management with antibiotics and analgesics).

Eligible participants were adults aged 18–70 years with confirmed acute cholecystitis (mild or moderate per TG18) presenting within 7 days of symptom onset. Inclusion criteria required ultrasound confirmation of gallstones or sludge with gallbladder wall thickening (>4 mm) or pericholecystic fluid. Patients with severe cholecystitis (TG18 grade III), comorbidities precluding surgery (e.g., severe cardiopulmonary disease), pregnancy, or prior upper abdominal surgery were excluded. Those requiring emergency open cholecystectomy due to perforation or gangrene were also excluded to maintain study homogeneity. A total of 120 patients were randomized (60 per group) using computer-generated random numbers to ensure balanced allocation.

Data collected included operative time, conversion to open surgery, postoperative complications (e.g., wound infection, bile leak), length of hospital stay, total hospital costs, and patient satisfaction (assessed via a 5-point Likert scale at 30-day follow-up). Continuous variables (e.g., operative time, hospital stay) were expressed as means with standard deviations and compared using the independent t-test. Categorical variables (e.g., complication rates, conversion rates) were analyzed using the chi-square test. Statistical significance was set at $p<0.05$. Data were analyzed using SPSS version 25.0. Power calculation indicated that 60 patients per group provided 80% power to detect a 2-day difference in hospital stay ($\alpha=0.05$). Missing data were handled using listwise deletion, and intention-to-treat analysis was applied.

Results

The study enrolled 120 patients, with 60 in the ELC group and 60 in the DLC group. Baseline characteristics (age, sex, BMI, and severity of cholecystitis) were comparable between groups ($p>0.05$). The mean age was 45.3 years (ELC) and 46.8 years (DLC), with 60% females in both groups. All patients underwent laparoscopic cholecystectomy, with outcomes summarized in the following tables and descriptions.

Table 1: Operative Outcomes

Parameter	ELC (n=60)	DLC (n=60)	p-value
Operative time (min)	82 ± 15	68 ± 12	0.01
Conversion to open (%)	5% (3/60)	7% (4/60)	0.68

Table 2: Postoperative Complications

Complication	ELC (n=60)	DLC (n=60)	p-value
Wound infection (%)	6.7% (4/60)	8.3% (5/60)	0.73
Bile leak (%)	3.3% (2/60)	3.3% (2/60)	1.00
Total complications (%)	10% (6/60)	12% (7/60)	0.77

Table 3: Hospital Stay and Costs

Parameter	ELC (n=60)	DLC (n=60)	p-value
Hospital stay (days)	3.2 ± 1.1	5.8 ± 1.8	<0.001
Total cost (INR)	45,000 ± 8,000	62,000 ± 10,000	0.002

Table 4: Patient Satisfaction

Satisfaction Level	ELC (n=60)	DLC (n=60)	p-value
Highly satisfied (%)	85% (51/60)	70% (42/60)	0.04
Moderately satisfied (%)	10% (6/60)	20% (12/60)	0.13
Dissatisfied (%)	5% (3/60)	10% (6/60)	0.30

ELC required a longer operative time (mean 82 minutes vs. 68 minutes, p=0.01), likely due to acute inflammation complicating dissection. Conversion to open surgery occurred in 3 patients in the ELC group (due to adhesions) and 4 in the DLC group (due to fibrosis), with no significant difference (p=0.68). Postoperative complications were similar, with wound infections in 4 ELC and 5 DLC patients, and bile leaks in 2 patients per group. The ELC group had a significantly shorter hospital stay (3.2 days vs. 5.8 days, p<0.001) and lower costs (INR 45,000 vs. INR 62,000, p=0.002). Patient satisfaction was higher in the ELC group, with 85% reporting high satisfaction compared to 70% in the DLC group (p=0.04), reflecting quicker recovery and fewer hospital visits.

Discussion

Acute cholecystitis poses a significant burden on healthcare systems, particularly in regions like western Gujarat, where delayed presentation is common due to socioeconomic factors. This study demonstrates that ELC is a feasible and effective approach, offering shorter hospital stays, lower costs, and higher patient satisfaction compared to DLC, without compromising safety. These findings align with global evidence supporting early intervention, but they are particularly relevant in resource-constrained settings where economic benefits are critical.[7]

The longer operative time in the ELC group (82 minutes vs. 68 minutes) reflects the technical challenges of operating during acute inflammation. A similar Indian study by Gupta et al. (2022)[8] reported a mean operative time of 85 minutes for ELC versus 70 minutes for DLC, attributing the difference to edematous tissues. Internationally, a meta-analysis by Wu et al. (2015) [7] found a mean difference of 11.12 minutes in favor of DLC, consistent with our results. Despite the longer duration, ELC did not increase complications, suggesting that experienced surgeons can manage these challenges effectively.

The conversion rate to open surgery was low and comparable between groups (5% in ELC vs. 7% in DLC). An Indian study by Yadav et al. (2009)[9] reported similar rates (6% for ELC vs. 8% for DLC), noting that adhesions in ELC and fibrosis in DLC were primary reasons. A Cochrane review by Gurusamy et al. (2013)[10] also found no significant difference in conversion rates, supporting the safety of ELC even in acute settings. These findings suggest that concerns about higher conversion risks in ELC may be overstated.

Complication rates were similar between groups, with wound infections and bile leaks occurring at low rates. A study by Sharma et al. (2018) [11] in India reported comparable complication rates (9% for ELC vs. 11% for DLC), emphasizing the safety of early surgery. Internationally, Wu et al. (2015) [7] noted a lower wound infection risk in ELC (relative risk 0.65), though our study found no significant difference. The absence of increased bile duct injuries in ELC aligns with global data, reinforcing its safety profile. The significantly shorter hospital stay in the ELC group (3.2 days vs. 5.8 days) is a key finding, mirroring results from a study by Patel et al. (2021)12 in India, which reported 3.5 days for ELC versus 6.2 days for DLC. A systematic review by Gibson et al. (2022)13 confirmed a mean reduction of 3.38 days in ELC, consistent with our data. This reduction is particularly impactful in western Gujarat, where hospital bed availability is limited.

Lower costs in the ELC group (INR 45,000 vs. INR 62,000) highlight its economic advantage. An Indian study by Kolla et al. (2020) [14] reported similar cost savings, attributing them to reduced hospital stay and fewer outpatient visits in ELC. Wu et al. (2015) [7] also noted lower hospital costs in ELC, making it a cost-effective option in resource-limited settings. This is crucial for patients in western Gujarat, where financial constraints often delay treatment.Higher satisfaction in the ELC group (85% vs. 70%) reflects quicker recovery and fewer hospital visits. A study by Verma et al. (2013) [15] in India found similar trends, with 80% of ELC patients reporting high satisfaction. Internationally, Wu et al. (2015) [7] reported improved quality of life in ELC patients, supporting our findings. This underscores the patient-centered benefits of ELC, particularly in regions with limited access to follow-up care.

This study has limitations, including a relatively small sample size and exclusion of severe cholecystitis cases, which may limit generalizability. The single-center design may not reflect outcomes in smaller hospitals with less experienced surgical teams. Additionally, long-term outcomes beyond 30 days were not assessed, warranting further research.

Conclusion

This study demonstrates that early laparoscopic cholecystectomy (ELC) within 7 days of symptom onset is a safe, effective, and cost-efficient approach for managing acute cholecystitis at a tertiary care center in western Gujarat. Compared to delayed laparoscopic cholecystectomy (DLC), ELC significantly reduces hospital stay (3.2 vs. 5.8 days) and costs (INR 45,000 vs. INR 62,000), while achieving higher patient satisfaction (85% vs. 70%).

Despite longer operative times, ELC does not increase complication or conversion rates, aligning with global and Indian evidence favoring early

intervention. These findings are particularly relevant in resource-constrained settings, where shorter hospital stays and lower costs can alleviate healthcare burdens. Adopting ELC as the standard approach can optimize clinical outcomes, reduce economic strain, and improve patient experiences. Future studies should explore long-term outcomes and the feasibility of ELC in severe cholecystitis to further refine surgical protocols in similar settings.

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