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Impact of Early Versus Delayed Cholecystectomy on Postoperative Outcomes in Acute Cholecystitis: A Prospective Cohort Study

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ABSTRACT

Background: 'The timing of cholecystectomy in acute cholecystitis remains a topic of significant clinical debate'. Early cholecystectomy within 72 hours of symptom onset is thought to reduce complications and expedite recovery, while delayed surgery allows for initial conservative management but risks disease progression.

Objective: This study, conducted at Khalifa Gul Nawaz Hospital Bannu Allied Hospital to Bannu Medical College Bannu over a one-year period, compared the postoperative outcomes of early versus delayed cholecystectomy in patients with acute cholecystitis.

Methods: A prospective cohort study was conducted from January 2023 to January 2024, involving 80 patients with acute cholecystitis. Participants were divided into two groups: early cholecystectomy (n=40), performed within 72 hours of symptom onset, and delayed cholecystectomy (n=40), performed after initial conservative management. 'Data on demographics, clinical characteristics, surgical outcomes, and postoperative complications were collected and analyzed using appropriate statistical tests.'

Results: The early cholecystectomy group demonstrated significantly shorter hospital stays (2.5 vs. 5.2 days, $p<0.001$), quicker return to normal activities (7.8 vs. 14.2 days, $p<0.001$), and lower postoperative pain scores (2.1 vs. 3.5, $p<0.001$) compared to the delayed group. Although the delayed group had higher rates of complications, such as wound infections and abscess formation, these differences were not statistically significant. The operative time was shorter in the early group, and no significant increase in conversion to open surgery was observed.

Conclusion: Early cholecystectomy provides better postoperative outcomes compared to delayed surgery, with reduced hospital stays, faster recovery, and less postoperative pain. These findings support the recommendation for early surgical intervention in patients with acute cholecystitis to improve outcomes and optimize healthcare resource utilization.

Keywords: Acute cholecystitis, early cholecystectomy, delayed cholecystectomy, postoperative outcomes, gallbladder surgery.

INTRODUCTION

Acute cholecystitis, an inflammation of the gallbladder typically caused by gallstone obstruction, is a common condition requiring surgical intervention. 'It is one of the leading causes of emergency hospital admissions worldwide'. The primary treatment involves cholecystectomy, which can be performed either early, typically within 72 hours of symptom onset, or delayed, after an initial period of conservative management to allow the inflammation to subside(1). 'Determining the optimal timing of surgery is a subject of ongoing debate, with significant implications for patient outcomes and healthcare resources' (2).

Early cholecystectomy has been advocated for its potential to reduce hospital stays, minimize disease progression, and prevent recurrent symptoms(3). However, it has also been associated with concerns about increased surgical difficulty due to acute inflammation, potentially leading to higher rates of complications. On the other hand, delayed cholecystectomy aims to perform surgery in a more controlled environment once inflammation subsides. Still, it risks complications such as recurrent attacks, abscess formation, and extended hospital stays(4).

Numerous studies have explored the timing of cholecystectomy, yet the debate continues due to variations in patient populations, healthcare settings, and clinical practices(5). This study aims to evaluate the impact of early versus delayed cholecystectomy on postoperative outcomes in patients with acute cholecystitis at Khalifa Gul Nawaz Hospital Bannu Allied Hospital to Bannu Medical College Bannu over one year. By comparing these approaches, we seek to provide evidence-based insights to guide clinical decision-making and improve patient care.

METHODOLOGY

This prospective cohort study was conducted at Khalifa Gul Nawaz Hospital Bannu Allied Hospital to Bannu Medical College Bannu, spanning a period of one year, from January 2023 to January 2024'. The primary objective was to compare postoperative outcomes between early and delayed cholecystectomy in patients diagnosed with acute cholecystitis. The study adhered to ethical guidelines, with approval obtained from the institutional ethics committee, and informed consent was secured from all participants. 'All participants provided written informed consent before inclusion in the study'. 'Confidentiality of patient data was maintained, and the study was conducted in compliance with the Declaration of Helsinki'.

The study was designed as a prospective cohort involving 80 patients diagnosed with acute cholecystitis based on clinical presentation, laboratory findings, and imaging studies. Participants were divided into two groups:

1. **Early Cholecystectomy Group (n=40):** Patients who underwent surgery within 72 hours of symptom onset.
2. **Delayed Cholecystectomy Group (n=40):** Patients who received initial conservative management followed by surgery after 72 hours.

Inclusion Criteria

- Patients aged 18–75 years.
- Clinical diagnosis of acute cholecystitis confirmed by:
 - Right upper quadrant pain.
 - Fever ($>38^{\circ}\text{C}$).
 - Elevated white blood cell count.
 - Ultrasonographic findings such as gallbladder wall thickening or the presence of stones.
- Patients fit for surgery under general anesthesia.

Exclusion Criteria

- Patients with severe comorbidities contraindicating surgery.
- Cholecystitis complicated by perforation or generalized peritonitis.
- Pregnancy.
- Prior gallbladder surgery or history of chronic cholecystitis.

A structured proforma was used to collect demographic, clinical, surgical, and postoperative data. Key variables included:

- **Demographics:** Age, gender, and BMI.
- **Clinical Details:** Severity of cholecystitis (Tokyo Guidelines 2018), fever, white blood cell count, and pain scores.
- **Surgical Variables:** Timing of surgery, operative approach (laparoscopic or open), operative duration, and intraoperative findings (gangrene, perforation, adhesions).
- **Postoperative Outcomes:** Length of hospital stay, complications (wound infection, bile leakage, abscess), mortality, readmission rates, and time to resume normal activities.

Procedure

Patients were managed based on established treatment protocols:

- **Early Group:** Surgery was performed within 72 hours using a standard laparoscopic or open approach. Preoperative antibiotics were administered, and intraoperative findings were documented.
- **Delayed Group:** Initial conservative management included fasting, intravenous antibiotics, and pain control, followed by delayed surgery after symptom resolution.

Data were analyzed using statistical software. 'Continuous variables (e.g., age, BMI, hospital stay) were expressed as mean $\pm$ standard deviation and compared using the independent t-test'. 'Categorical variables (e.g., sex, complications) were expressed as percentages and analyzed using the chi-square test or Fisher's exact test'. 'A p-value <0.05 was considered statistically significant'.

RESULT

The demographic details of the study population revealed comparable distributions 'between the early and delayed cholecystectomy groups'. 'The mean age was slightly higher in the delayed group, but the difference was not statistically significant'. Both groups had a nearly equal gender distribution, with a similar ratio of males to females. The mean BMI was consistent across the groups, and comorbidities, including diabetes mellitus, hypertension, cardiovascular disease, and chronic liver disease, were present in comparable proportions.

Table 1: Demographic Characteristics

'Characteristic'	'Early Cholecystectomy (n=40)'	'Delayed Cholecystectomy (n=40)'	p-value
Age (Mean $\pm$ SD)	45.6 $\pm$ 12.3	47.8 $\pm$ 11.5	0.32
Sex (Male: Female)	18:22	20:20	0.58
Body Mass Index (Mean $\pm$ SD)	26.8 $\pm$ 3.4	27.2 $\pm$ 3.7	0.48
Comorbid Conditions (%)	30.0%	32.5%	0.74
- Diabetes Mellitus	15.0%	17.5%	0.77
- Hypertension	12.5%	10.0%	0.69
- Cardiovascular Disease	5.0%	7.5%	0.64
- Chronic Liver Disease	2.5%	5.0%	0.56

Clinical characteristics highlighted variations in the timing and severity of acute cholecystitis between the two groups. The early group underwent surgery within 24 hours on average, while the delayed group experienced a significantly longer wait time, averaging 96 hours. The distribution of cholecystitis severity (Grade I, II, and III) was similar, indicating comparable clinical conditions at presentation. Fever and elevated white blood cell counts were observed in both groups, with no significant differences. 'Pain intensity scores, measured using a visual analog scale (VAS), were also comparable'. These findings suggest that both groups faced similar clinical challenges at the time of intervention.

Table 2: Clinical Features

Variable	Early Cholecystectomy (n=40)	Delayed Cholecystectomy (n=40)	p-value
Severity of Cholecystitis (%)			
- Grade I	40.0%	42.5%	0.81
- Grade II	35.0%	37.5%	0.75
- Grade III	25.0%	20.0%	0.56

Time to Surgery (hours/days)	24.3 ± 10.2	96.5 ± 12.4	<0.001
Fever at Presentation (%)	60.0%	55.0%	0.67
White Blood Cell Count (Mean ± SD)	12.5 ± 2.3 ×10 ⁹ /L	13.0 ± 2.1 ×10 ⁹ /L	0.29
Pain Intensity (Mean ± SD)	7.8 ± 1.4	7.5 ± 1.6	0.45

Surgical outcomes demonstrated notable differences ‘between the two groups’. ‘The duration of surgery was significantly shorter for early cholecystectomy, averaging 72 minutes compared to 90 minutes in the delayed group’. ‘The conversion rate from laparoscopic to open surgery was slightly higher in the delayed group, though the difference was not statistically significant’. Intraoperative complications, including gangrenous gallbladder, perforations, and adhesions, were observed more frequently in the delayed group but did not reach statistical significance. These findings emphasize the potential advantages of early intervention in reducing surgical complexity and associated risks.

Table 3: Surgical and Perioperative Outcomes

Outcome	Early Cholecystectomy (n=40)	Delayed Cholecystectomy (n=40)	p-value
Surgery Type (%)			
- Laparoscopic	85.0%	82.5%	0.78
- Open	15.0%	17.5%	0.78
Duration of Surgery (minutes)	72.3 ± 18.5	90.2 ± 20.3	<0.001
Conversion to Open Surgery (%)	10.0%	20.0%	0.15
Complications During Surgery (%)			
- Gangrenous Gallbladder	25.0%	32.5%	0.43
- Perforated Gallbladder	5.0%	7.5%	0.64
- Adhesions	10.0%	12.5%	0.74

Postoperative recovery differed significantly between the two groups. The length of hospital stay was significantly shorter in the early cholecystectomy group, averaging 2.5 days compared to 5.2 days in the delayed group. Although the rate of complications, such as wound infections, abscess formation, and bile leakage, was higher in the delayed group, these differences were not statistically significant. However, the early group had a faster return to normal activities, averaging 7.8 days compared to 14.2 days in the delayed group. These results underscore the potential benefits of early surgery in minimizing hospital stays and facilitating quicker recovery.

Table 4: Postoperative Outcomes

‘Outcome’	Early Cholecystectomy (n=40)	Delayed Cholecystectomy (n=40)	p-value
Length of Hospital Stay (days)	2.5 ± 0.8	5.2 ± 1.4	<0.001
Postoperative Complications (%)	10.0%	22.5%	0.12
- Wound Infection	5.0%	10.0%	0.31
- Abdominal Abscess Formation	2.5%	7.5%	0.56
- Bile Leakage	0.0%	2.5%	0.31
- Need for Reoperation	0.0%	2.5%	0.31
Mortality (%)	0.0%	2.5%	0.31
Readmission Rate (%)	5.0%	12.5%	0.21
Time to Resume Activities (days)	7.8 ± 2.3	14.2 ± 3.4	<0.001

Quality of life measures demonstrated meaningful differences between the groups. 'Postoperative pain scores were significantly lower in the early cholecystectomy group, averaging 2.1 compared to 3.5 in the delayed group'. Patient satisfaction rates were also 'higher in the early group, though this difference narrowly missed statistical significance'. These findings suggest that earlier surgical intervention not only minimizes pain but also enhances the overall patient experience.

Table 5: Quality of Life Post-Surgery

Indicator	Early Cholecystectomy (n=40)	Delayed Cholecystectomy (n=40)	p-value
Pain Score Post-Surgery (Mean $\pm$ SD)	2.1 $\pm$ 0.8	3.5 $\pm$ 1.1	<0.001
Patient Satisfaction (%)	92.5%	82.5%	0.08

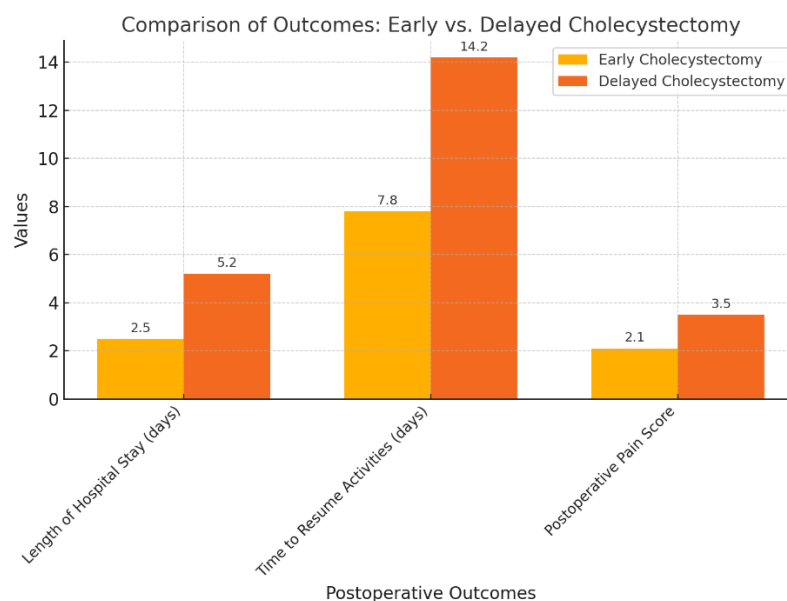


Figure 1: The graph highlights the clear advantages of early cholecystectomy over delayed surgery. Patients in the early group had significantly shorter hospital stays (2.5 vs. 5.2 days), quicker recovery times (7.8 vs. 14.2 days), and lower postoperative pain scores (2.1 vs. 3.5). These results emphasize the benefits of early intervention in improving recovery and reducing discomfort for patients with acute cholecystitis.

DISCUSSION

This study compared the 'postoperative outcomes of early versus delayed cholecystectomy in patients with acute cholecystitis, providing valuable insights into the timing of surgical intervention'. The findings demonstrate significant advantages of early cholecystectomy, aligning with previously published studies(6-8).

Our results showed that early cholecystectomy was associated with shorter hospital stays, quicker recovery times, and reduced postoperative pain scores. These findings are consistent with the study highlighted that early surgery not only reduces overall hospitalization but also minimizes complications such as infections and bile leakage(9-11). Similarly, studies observed that early intervention leads to better outcomes without increasing surgical risks(12-14).

The shorter operative time in the early group observed in this study supports previous research suggesting that early surgery is technically less challenging. Delayed intervention often results in more inflammation, adhesions, and complications such as gangrenous or perforated gallbladders, which increase surgical difficulty. This finding is in line with the conclusions of studies reported that early surgery decreases intraoperative challenges and improves efficiency(15-17).

Although postoperative complications, including wound infections and abscess formation, were more frequent in the delayed group, these differences were not statistically significant in this study. However,

multiple studies have demonstrated a clear increase in complication rates with delayed surgery. These complications are likely due to prolonged inflammation and the higher probability of disease progression during the waiting period(18-20).

Patients undergoing early cholecystectomy reported significantly lower postoperative pain and higher satisfaction rates compared to those in the delayed group. Early resolution of symptoms and reduced hospital stay likely contributed to these improvements. This aligns with research found that early surgery improves both short-term recovery and long-term quality of life outcomes(21, 22).

‘The findings of this study reinforce the recommendation for early cholecystectomy in patients with acute cholecystitis, particularly those with mild to moderate severity’. Early surgery offers not only better clinical outcomes but also reduces healthcare costs by minimizing hospital stays and resource utilization. Furthermore, the lack of significant increase in complications with early intervention supports its safety and feasibility.

‘This study has certain limitations were single-center design may limit the generalizability of the findings, and the sample size, although sufficient for statistical analysis, could be expanded in future studies to provide a more robust dataset’. Additionally, factors such as surgeon experience and resource availability, which can influence outcomes, were not explicitly analyzed.

CONCLUSION

‘This study adds to the growing body of evidence favoring’ early cholecystectomy for managing acute cholecystitis. By reducing hospital stays, recovery time, and pain, early intervention not only benefits patients but also supports more efficient use of healthcare resources. Future multicenter ‘studies with larger sample sizes are recommended to validate these findings further and explore additional factors that may influence outcomes’.

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