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A COMPARATIVE STUDY OF OUTCOME OF IMMEDIATE CHOLECYSTECTOMY VS INTERVAL CHOLECYSTECTOMY IN ACUTE CALCULUS CHOLECYSTITIS

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Abstract

Objective: *To compare the outcomes of immediate cholecystectomy vs interval cholecystectomy in acute calculus cholecystitis*

Study design: *A Prospective Cohort Study*

Settings: *Department of General Surgery CMH, Lahore.*

Materials & Methods: *Total sample size of 70 patients (35 in each group) was included in our study. Patients of both genders are of age 18 years and above suffering from acute calculus cholecystitis, confirmed by clinical, laboratory, and radiological criteria, were included. Patients in the immediate cholecystectomy group underwent surgical removal of the gallbladder within 24 to 72 hours of diagnosis, while those in the interval cholecystectomy division received conservative management initially, which is followed by elective cholecystectomy with the resolution of acute symptoms, typically within 4 to 6 weeks. The primary result measures include duration of hospital stay and postoperative complications. Analysis was performed with IBM SPSS, version 27.0. A p-value < 0.05 was considered to be significant.*

Results: *The mean age of patients undergoing early cholecystectomy was 41 ± 10 years, while in the late cholecystectomy group, it was 43 ± 11 years. The commonest age of presentation is 31 to 50 years which is 70% of patients in our study group with 70% female patients and 30% male patients. Predominantly, laparoscopic cholecystectomy was performed in both early (94.3%) and late (82.9%) cholecystectomy groups. The Conversion of laparoscopic to open cholecystectomy rate was 5.7% in early cholecystectomy group as compared to 17.1% in late cholecystectomy group in our investigation.*

Conclusion: *In conclusion, early cholecystectomy for acute cholecystitis with cholelithiasis is secure and easy, with the extra benefit of shorter duration of hospital. Although it should be offered to the patients with acute cholecystitis,*

such that the surgery is performed within 72 hours of acute symptoms by a qualified surgeon.

INTRODUCTION

Acute calculus cholecystitis is a condition characterized by inflammation of the gallbladder due to the presence of gallstones. This inflammatory process can lead to a range of symptoms, from mild discomfort to severe complications.[1,2] The gallbladder, plays an important role in the digestion of fats by storing and concentrating bile which is produced by the liver. Bile is stored in bile duct and released from the gallbladder in the small intestine which help in the digestion and absorption of dietary fats. However, gallstones which are formed in the gallbladder, may obstruct the flow of bile and trigger an inflammatory response, leading to acute cholecystitis.[3]

Gallstones, or cholelithiasis, are primarily composed of cholesterol or bilirubin and form when there is an imbalance in the constituents of bile. Factors contributing to the formation of gallstones include obesity, rapid weight loss, a diet high in cholesterol and fats, certain medications, and metabolic disorders.[4] When a gallstone obstructs the cystic duct, which connects the gallbladder to the common bile duct, bile becomes trapped in the gallbladder, causing distention, ischemia, and ultimately inflammation. The clinical presentation of acute calculus cholecystitis typically includes right upper quadrant abdominal pain, which may radiate to the back or shoulder.[5]

Diagnosis of acute calculus cholecystitis involves a combination of clinical assessment, laboratory tests, and imaging studies. Laboratory findings may show elevated levels of white blood cells, serum bilirubin, and liver enzymes. Abdominal ultrasound is the preferred imaging modality for evaluating gallbladder pathology, determining gallstones, thickening of gallbladder wall, pericholecystic fluid, and Murphy's sign.[6] Management of acute calculus cholecystitis relies on the severity of symptoms and the appearance of complications. Immediate cholecystectomy and interval cholecystectomy are two surgical approaches used in the management of gallbladder diseases, particularly acute cholecystitis.[7]

Immediate cholecystectomy refers to the surgical removal of the gallbladder shortly after the diagnosis of acute cholecystitis. This approach aims to address the inflammation and potential complications associated with the condition promptly. Immediate cholecystectomy is often favored when patients present with uncomplicated acute cholecystitis and are deemed fit for surgery. It offers the advantage of a shorter hospital stay and reduced risk of recurrent attacks or complications related to gallstones.[8] On the other hand, interval cholecystectomy involves a delay in surgical intervention after the acute episode of cholecystitis has resolved. During this interval period, patients may undergo conservative management to stabilize their condition, which may include intravenous antibiotics and supportive care. Once the acute inflammation subsides, typically within a few weeks, patients undergo elective cholecystectomy to remove the gallbladder. Interval cholecystectomy may be preferred in cases where immediate surgery poses higher risks due to patient factors such as comorbidities or when the diagnosis of acute cholecystitis is uncertain.[9]

The rationale for conducting a comparative study of the results of immediate cholecystectomy than interval cholecystectomy in acute calculus cholecystitis lies in the need to optimize treatment strategies for this common condition. By directly comparing these two surgical approaches, we aim to elucidate which method offers superior patient outcomes, including postoperative complications, length of hospital stay, and recurrence rates. Additionally, this study seeks to address existing gaps in the literature regarding the prime timing of cholecystectomy in acute calculus cholecystitis. The findings from the research endeavor will provide valuable insights for clinicians in decision-making, potentially leading to improved patient care and better-informed treatment recommendations.

METHODOLOGY

This study was administered in compliance to the principles outlined in the Declaration of Helsinki and was accredited by the institutional review board of hospital. The study design was prospective cohort study. The study was administered at Department of

General Surgery CMH, Lahore between 1st January to 30th June. Informed consent was obtained from all participants before enrollment in the study. Total sample size of 70 patients (35 in each group) was calculated based on a significance level (α) of 0.05 and a desired power of 0.80, ensuring adequate statistical power for detecting clinically significant differences between treatment groups.

Patients of age 18 years and older suffering from acute calculus cholecystitis, confirmed by clinical, laboratory, and radiological criteria, were eligible for inclusion. Patients with a history of prior cholecystectomy, acute cholecystitis of non-calculous etiology, or concurrent biliary tract malignancy were excluded. Eligible patients were randomized into two groups using computer-generated randomization codes in a 1:1 ratio. Patients in the immediate cholecystectomy group underwent surgical removal of the gallbladder within 24 to 72 hours of investigation, while those in a interval cholecystectomy group received conservative management initially, persued by elective cholecystectomy after settling of acute symptoms, typically within 4 to 6 weeks. The primary outcome measures included duration of stay at hospital and post-operative complications. Secondary outcome measures encompassed conversion to open surgery.

Analysis was performed with IBM SPSS, version 27.0. Categorical variables are determined as frequency and percentage, and these were assessed with the use of the Chi-square and Fisher's exact test. Continuous variables are determined as mean and standard deviation (SD) and compared by Student's t-test. The results were visualized in the form of bar charts where possible for easier interpretation. A p-value of < 0.05 considered as significant.

Inclusion Criteria:

1. Patients aged 18 years or older.
2. Diagnosis of acute calculus cholecystitis, confirmed by:

Clinical criteria (e.g., right upper quadrant pain, Murphy's sign).
Laboratory findings (e.g., elevated white blood cell count, liver enzymes).
Radiological evidence (e.g., ultrasonography or CT scan findings).

Exclusion Criteria:

1. History of prior cholecystectomy.
2. Diagnosis of acute cholecystitis of non-calculous etiology (e.g., acalculous cholecystitis).
3. Presence of biliary tract malignancy or other concurrent malignancies.
4. Patients who were deemed unfit for surgery due to severe comorbid conditions or poor general health.
5. Pregnancy or lactation.
6. Refusal to provide informed consent.

RESULTS

Total 70 patients participated in this research, evenly distributed between the early and late cholecystectomy groups. The mean age of patients undergoing early cholecystectomy was 41 ± 10 years, while in the late cholecystectomy group, it was 43 ± 11 years. The commonest age of presentation is 31 to 50 years which is 70% of patients in our study group with 70% female patients and 30% male patients. There were no statistically significant differences observed in age distribution between the early and late groups ($p = 0.406$) as shown in Table 1.

Table 1: Age wise distribution of patients in both groups.

	Early Group		Late Group		p value
	N	%	n	%	
Age Groups (years)					0.406 [a]
21-30	4	11.4	4	11.4	
31-40	14	40.0	12	34.3	
41-50	11	31.4	12	34.3	
51-60	5	14.3	4	11.4	
61-70	1	2.9	3	8.6	
Age (years), mean ± SD	41 ± 10		43 ± 11		

[a] Unpaired t-test

Female preponderance is evident in both groups. Female patients were 70% in our study group and male patients were only 30% of total patients. There was no significant disparity in sex incidence between both groups (p = 0.434) as shown in Table 2.

Table 2: Sex incidence in patients in both groups.

Gender	Early Group		Late Group		p value
	n	%	N	%	
Female	23	65.7	26	74.3	0.434 [a]
Male	12	34.3	9	25.7	

[a] Chi square test

Predominantly, laparoscopic cholecystectomy was performed in both early (94.3%) and late (82.9%) cholecystectomy groups. In our research, the rate of conversion of laparoscopic versus open cholecystectomy rate was 5.7% in early cholecystectomy group as compared to 17.1% in late cholecystectomy group. The data is not statistically significant (p>0.05) [Table 3 & Figure 1].

Table 3: Details of different operative procedures

Type of Operation	Early Group		Late Group		p value
	N	%	n	%	
Laparoscopic Cholecystectomy	33	94.3	29	82.9	0.259 [a]
Lap to Open conversion	2	5.7	6	17.1	

[a] Fisher's exact test

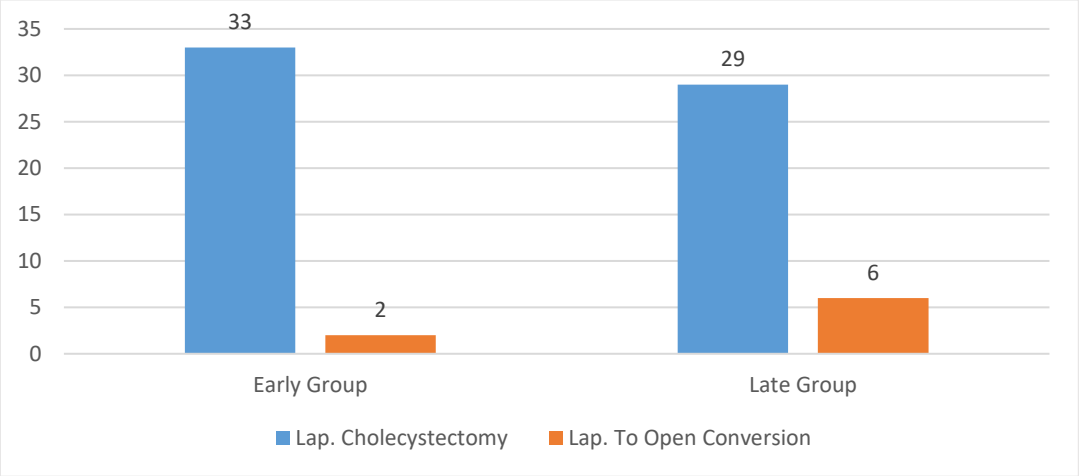

Figure 1: Details of different operative procedure

Significant disparity in operative time comparing the early and late cholecystectomy cases was noticed (p < 0.001). The mean operative time for early cholecystectomy was 84.74 ± 10.15 minutes, whereas for late cholecystectomy, it was 70.94 ± 15.17 minutes [Table 4 & Figure 2]. This indicates that the variance in surgical time is not incidental, and the duration of surgery is decreases in late cholecystectomy.

Table 4: Operative Time

	Early Group Mean ± SD	Late Group Mean ± SD	p value
Operation Time (mins)	84.74 ± 10.15	70.94 ± 15.17	<0.001[a]

[a] Unpaired t-test

Notably, no instances of common bile duct (CBD) injury and bowel injury were reported in either group. Bile or stone spillage during surgery was more frequent in early cholecystectomy group (35%) in comparison to the late cholecystectomy cases (5.7%). Conversely, hemorrhage during surgery was more

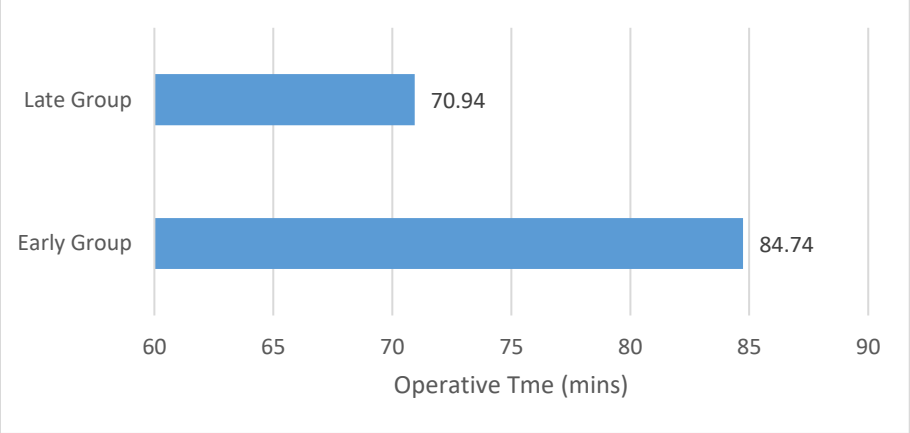

Figure 2: Details of operative time in both groups.

prevalent in late cholecystectomy group (25.7%) in comparison with early cholecystectomy group (8.6%). Post-operative complications (wound infection, bile leakage and strictures) are more common in late cholecystectomy group as shown in Table 5.

Table 5: Per-Operative and Post-Operative Complications.

	Early Group n (%)	Late Group n (%)	p value[a]
Per-Operative Complications			
Bile/Stone Spillage	7 (35)	2 (5.7)	0.151
Hemorrhage	3 (8.6)	9 (25.7)	0.057
CBD Injury	0	0	
Bowel Injury	0	0	
Conversion to Open Cholecystectomy	2 (5.7)	6 (17.1)	0.259
Post-Operative Complications			
Wound Infection	3 (8.6)	4 (11.4)	1.000
Bile Leakage	1 (2.8)	3 (8.6)	0.614
Strictures	0	1 (2.8)	1.000

[a] Fisher's exact test

Total duration of hospital stay is 6.22 days in early cholecystectomy group while it is 10 to 11 days in late cholecystectomy group with a p-value <0.001. The post hospital stay is 4.31 days in the early

cholecystectomy group and 3.86 in the late cholecystectomy group with a p-value of >0.05. This proposed that total length of stay at hospital is significantly high in late cholecystectomy group. Post-operative duration at hospital is high is early cholecystectomy group, but it is insignificant as this variation could be due to liability of p value as it is >0.05. Also, no significant difference was observed in the number of days required to return to normal daily activities between the two groups (p = 0.171) [Table 6 & Figure 3].

Table 6: A comparison of length of hospital stay and the number of days required to resume full activity following post-surgery between two groups.

	Early Group Mean ± SD	Late Group Mean ± SD	p value[a]
Total Hospital Stay (days)	6.22 ± 1.08	10.11 ± 1.3	<0.001
Post-op Hospital Stay (days)	4.31 ± 1.16	3.86 ± 1.61	0.177
Return to normal daily activities (days)	6.51 ± 1.52	7.22 ± 2.65	0.171

[a] Unpaired t-test

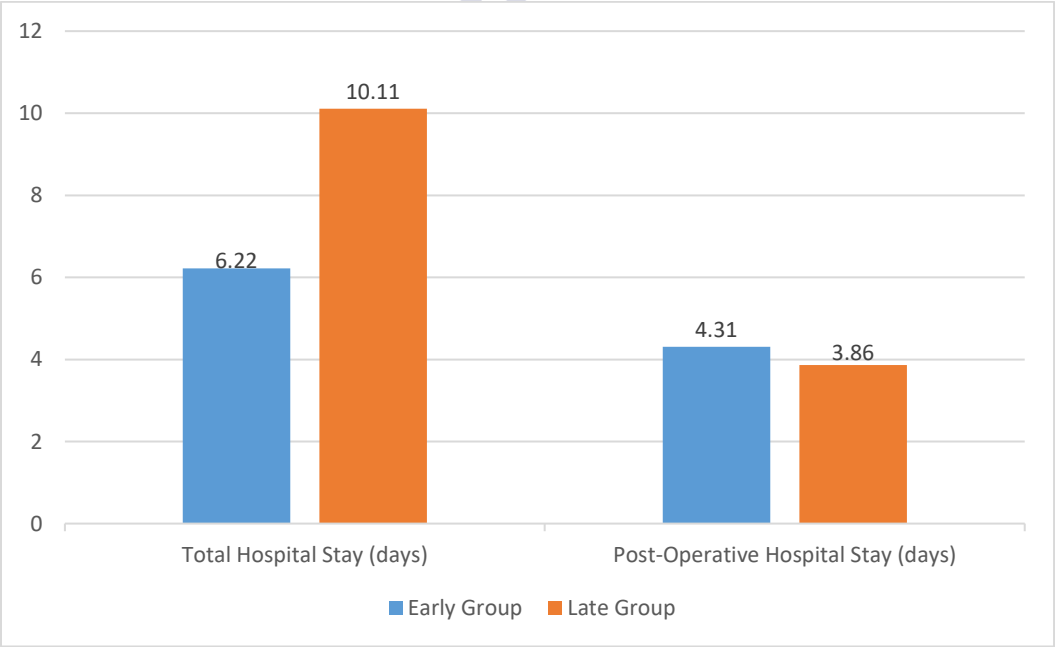

Figure 3: Details of Hospital Stay in both groups.

DISCUSSION

Immediate cholecystectomy and interval cholecystectomy are two surgical approaches employed in the management of acute calculus cholecystitis. Immediate cholecystectomy involves the prompt surgical removal of the gallbladder following diagnosis, aiming to address inflammation and prevent complications. In contrast, interval cholecystectomy defers surgery until the acute episode resolves, usually after a period of conservative

management. While immediate cholecystectomy provides the benefit of preventing repetitive attacks and reducing hospital stays, interval cholecystectomy may be preferred in cases of high surgical risk or diagnostic uncertainty.[10]

Our study purpose is to compare the results of early cholecystectomy versus late cholecystectomy in patients with acute cholecystitis. Specifically, we sought to evaluate factors such as operative time, postoperative complication rates, and total hospital stay to elucidate the most effective and efficient management strategy for this patient population.

In our study, the age of patients was 21 years to 70 years, with a mean age was 42 ± 10.5 years. In a national study carried out by Chaudhary et al at Bahawalpur, the mean age was 42.2 ± 10.6 years which was equivalent to our study.[11] In other study carried out by Haque et al the mean age was 48.4 ± 14.2 years which contrast with our study.[12]Among the 70 patients in our study, 49 (70%) were females and 21 (30%) were males. So male to female ratio was 3:7. In a study carried out by Anwar et al the male to female ratio was 3:7 as is same & similar with our observations.[13] In other study Goel et al also reported that disease is more prevalent in female than in male i.e. 76% female and 24% male which is comparable with our study.[14]

Laparoscopic to open conversion rate was 5.7% in early cholecystectomy group in comparison to 17.1% in late cholecystectomy group in our research. A metanalysis study in American journal of gastroenterology exhibited that the transformation rate to open surgery in early laparoscopic cholecystectomy was 7.99%.[15] In our case, we observed that mean operative span was 84.74 minutes in early cholecystectomy group and 70.94 minutes in late cholecystectomy group with a p value of <0.05 which is characteristic of significant reducing operative span in late cholecystectomy. In a study, the mean operative time was 87.04 minutes in early cholecystectomy group and 70.56 minutes in late cholecystectomy group which supports the data of our study.[12] In another study G. et al reported that the mean operative time in early group was 76.16 minutes than that in late group was 116.48 minutes, which contrast with our study.[16] In our study, stone spillage was more common with early (35%) than late cholecystectomy (5.7%) while hemorrhage is more common in late group (25.7%) as compared to early cholecystectomy (8.6%). In a study, both sone spillage (26%) and hemorrhage (20%) were more common in early cholecystectomy as compared to late cholecystectomy (6.66%).[17]

Injury to biliary tree is a complication that occurs during surgery, but it may be missed per-operatively and later-on appears as postoperative complication in the form of bile leak in the peritoneal cavity. In our study no case of injury to biliary tree was noted per-operatively. But post-operatively four cases of injury to biliary tree were noted, 1 (2.8%) in early group and 3 (8.6%) in late group. In an international study carried out in West Indies Cawich SO et al described 3.6% of cases of injury to bile duct after open cholecystectomy which was diagnosed one week after the surgery. The results of our study are comparable with this study.[18]

Wound infection is a postoperative complication which can occur after any surgery. In our study 3 (8.6%) patients of early group and 4 (11.4%) patients of late group had wound infection. Ghani et al & Khan SSA et al reported that complications of wound were little commoner in the early surgery group than the delayed surgery group.[19,10] So, the results are comparable with our study as far as wound infection is concerned.

In our study, average total length of hospital was found to be 6.22 days in early cholecystectomy and 10.11 days in late cholecystectomy. A meta-analysis study in American journal of gastroenterology suggested that total hospital length was significantly short in the early surgery group (9.6 days vs 17.8 days).[15] In the study by S.A. Khuwaith suggested that the average length of total hospital stay for delayed cholecystectomy to be 18.5 days.[21] In our study the mean post operative hospital stay in early group was 4.31 days and in late group was 3.86 days. In a national study carried at Lady Reading Hospital Peshawar, Ghani et al reported the almost similar results regarding postoperative hospital stay.[20] So, our study is comparable with this study for postoperative hospital stay.

CONCLUSION:

In conclusion, early cholecystectomy for acute cholecystitis with cholelithiasis is secure and easy, giving the extra benefit of shorter hospital stays. It should be given to the patients with acute

cholecystitis, as long as the surgery is performed within 72 hours of acute symptoms by a trained surgeon. Small sample size and short length of study were the limitations of this study.

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CONFLICT OF INTEREST: None.

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AUTHOR'S CONTRIBUTION: M.N.B. conceived and designed the study, supervised data collection, and critically revised the manuscript. T.T. performed data analysis, interpreted results, and drafted the initial manuscript. M.I. and R.F. contributed to patient recruitment, clinical assessment, and data collection. R.B.A.R. provided statistical expertise, helped in data visualization, and contributed to manuscript editing. R.K. reviewed the literature, supported in drafting the methodology section, and assisted in revising the final manuscript.
All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

LIMITATIONS OF THE STUDY:

1. Single-Center Study: Findings may not be generalizable to other settings or populations.
2. Small Sample Size: Limited ability to detect rare complications or subtle differences between groups.
3. Short Follow-Up: Long-term outcomes, such as recurrence or quality of life, were not assessed.
4. Potential Bias: Despite randomization, inherent clinical or patient selection bias may exist.
5. Limited Outcome Scope: Cost-effectiveness and patient satisfaction were not evaluated

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