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ORIGINAL ARTICLE

Comparison of outcomes of early vs delayed cholecystectomy in acute biliary pancreatitis at a tertiary care hospital.

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ABSTRACT… Objective: To compare the mean length of hospital stay and frequency of conversion from laparoscopic to open in early versus delayed cholecystectomy in patients with moderate acute biliary pancreatitis. **Study Design:** Randomized Clinical Trial. **Setting:** Department of Surgery in Mayo Hospital Lahore. **Period:** 02-04-2022 to 02-04-2023. **Methods:** All the patients meeting the required criteria were included in the study. Patients were admitted through surgical emergency. Procedure was explained to patients/guardian and informed consent was taken. Patients were randomized by lottery method into two groups. Group A (early cholecystectomy EC) and group B (delayed cholecystectomy DC). Patients were operated and assessed postoperatively by the same operating surgeon to minimize the bias. Data of these patients was collected using a predesigned pro-forma containing details about demographic profile of the patient and severity of the disease. Duration of hospital stay of every patient in each group will be recorded. Frequency of conversion from laparoscopic to open cholecystectomy was noted. Smoking and BMI was taken as confounders. **Results:** Total of 60 patients (30 in each), mean age of EC group was 45.33±3.79 years and mean age of DC group 46.60±4.14 years. Distribution of BMI was 25.41+ 3.66 kg/m2 in early cholecystectomy group and 29.68+6.53 in delayed cholecystectomy group. (p=0.003) There were 52.0% (n=13) male in EC group and 48.6% (n=17) females in EC group and 48.0% (n=12) male in DC group and 51.4% (n=18) females. (p= 1.000). Mean length of hospital stay was 5.36+ 0.76 days in early cholecystectomy group and 8.96+0.76 days in delayed cholecystectomy group. (p=0.000), 22.2% (n=4) had conversion to open cholecystectomy in EC group and 77.8% (n=14) in DC group. **Conclusion:** We concluded that early laparoscopic cholecystectomy reduced the hospital stay and conversion to open cholecystectomy in patients with moderate acute biliary pancreatitis.

Key words: Acute Biliary Pancreatitis, Hospital Stay, Laparoscopic Cholecystectomy.

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INTRODUCTION

Pancreatitis is a common presentation in the emergency department and is associated with significant morbidity and mortality.[1] Causes of acute pancreatitis include pancreatic duct obstruction by a gallstone (the most common cause), alcohol consumption, abdominal trauma, certain drugs and toxins, metabolic abnormalities, infections, and idiopathic origins.[2]

The pathophysiology of acute pancreatitis involves the inappropriate release and activation of pancreatic enzymes. In biliary pancreatitis, pancreatic duct obstruction is thought to trigger the premature activation of these enzymes. However, the exact underlying mechanism remains controversial. The early activation of pancreatic enzymes—particularly trypsin—leads to inflammation and destruction of pancreatic tissue, followed by the release of cytokines, which contribute to both local and systemic complications.[3]

Several scoring systems are used to classify the severity of acute pancreatitis and to predict associated morbidity and mortality. These include the Ranson criteria, BISAP score, and Glasgow scale. The Ranson criteria remain one of the most commonly used tools for severity classification
Based on the Ranson criteria, acute pancreatitis is classified as mild (1–2 points), moderate (3–5 points), or severe (≥6 points).[4]

In cases of gallstone-induced pancreatitis, cholecystectomy is performed to prevent recurrence. Laparoscopic cholecystectomy is considered the gold standard.[5]

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Most recent guidelines recommend early or index admission cholecystectomy for patients with mild to moderate acute biliary pancreatitis. The International Association of Pancreatology also supports cholecystectomy during the same admission for mild biliary pancreatitis.[6] Similarly, the American Gastroenterological Association advises that cholecystectomy be performed during the initial hospital stay and not later than 2–4 weeks post-discharge.[7]

Several factors influence the decision between early and delayed cholecystectomy, including rehospitalization rates (either before or after surgery), intraoperative difficulty, conversion to open cholecystectomy, duration of surgery, length of hospital stay, and gallstone-related complications such as recurrent pancreatitis, acute cholecystitis, cholangitis, or biliary colic.[8,9]

In a study by Jee LS et al. (2018), the total hospital stay for early cholecystectomy in mild to moderate acute pancreatitis was 8 days (6–10 days) (8±1), compared to 9 days (8–11 days) (9±0.75) in the delayed group.[9] The same study reported conversion rates from laparoscopic to open cholecystectomy of 10.53% in the early group versus 11.76% in the delayed group.[9] Another study found conversion rates of 16.7% in the early group and 60% in the delayed group.[10]

Proponents of early cholecystectomy (within 48 hours of admission) argue that it is not associated with increased morbidity or mortality and that it reduces postoperative hospital stay. In contrast, advocates for delayed cholecystectomy suggest it lowers operative complications, as the inflammatory process has subsided, but results in a longer overall hospital stay.

There is limited evidence—both locally and internationally—regarding the optimal timing of laparoscopic cholecystectomy in moderate cases of acute biliary pancreatitis. In our routine clinical practice, we typically opt for delayed cholecystectomy in such cases. However, the limited existing literature—though on a small scale—favors early cholecystectomy. Therefore, this study was conducted to generate evidence within our population and to contribute to the broader understanding and utility of timing in cholecystectomy for moderate acute biliary pancreatitis.

METHODS

Objective

To compare the mean length of hospital stay and frequency of conversion from laparoscopic to open in early versus delayed cholecystectomy in patients with moderate acute biliary pancreatitis.

Hypothesis

Mean Length of hospital stay and conversion rate from laparoscopic to open is less in early cholecystectomy in moderate acute biliary pancreatitis as compared to delayed cholecystectomy.

We conducted a randomized clinical trial in the Department of Surgery at Mayo Hospital, Lahore, from April 2, 2022, to April 2, 2023 after approval from ethical committee (612/RC/KEMU-07-09-21). A total of 60 patients were included in the study, with 30 patients assigned to each group. The sample size was calculated using a 95% confidence interval and 80% power, based on expected conversion rates of 16.7% in the early cholecystectomy group and 60% in the delayed group.[11] Non-probability consecutive sampling was used, and patients were randomly allocated to the two groups through the lottery method: Group A received early cholecystectomy, and Group B received delayed cholecystectomy.

The study included patients aged between 12 and 70 years who presented with moderate acute biliary pancreatitis, defined by a Ranson's score of 3 to 5. Patients with mild or severe acute biliary pancreatitis, uncontrolled diabetes mellitus, uncontrolled hypertension, or ASA classification of 3 or above were excluded. All eligible patients were admitted through the surgical emergency unit. The procedure was explained to each patient or their guardian, and informed consent was obtained. To minimize bias, all surgeries and postoperative assessments were carried out by the same operating surgeon.

Data were collected using a predesigned pro forma that recorded demographic information, severity of disease, hospital stay duration, and

whether conversion from laparoscopic to open cholecystectomy occurred. Data analysis was performed using SPSS version 26. Quantitative variables such as hospital stay, BMI, and age were presented as mean and standard deviation, while qualitative variables such as gender and conversion rates were reported as frequency and percentage. Comparisons between the two groups were made using the chi-square test for categorical variables and the independent-samples t-test for continuous variables, with a p-value of ≤ 0.05 considered statistically significant. Potential confounders including age, gender, BMI, and smoking were controlled through stratification.

RESULTS

After fulfilling inclusion and exclusion criteria 60 patients were selected to compare the mean length of hospital stay and frequency of conversion to open cholecystectomy versus delayed cholecystectomy in patients of moderate acute biliary pancreatitis undergoing EC with DC.

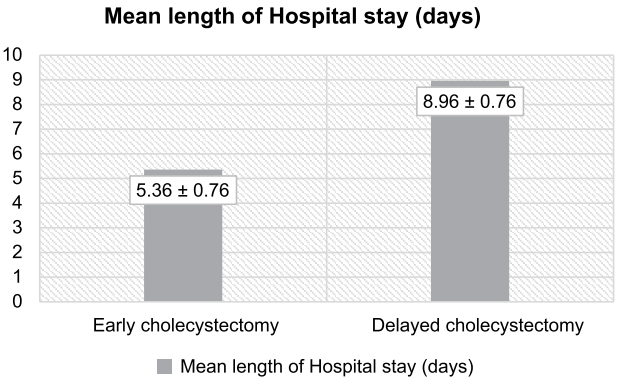
The mean length of hospital stay was 5.36+ 0.76 days in early cholecystectomy group and 8.96+0.76 days in delayed cholecystectomy group. (p=0.000) (Figure-1)

Total of 60 patients (30 in each group), 13.33% (n=4) had conversion to open cholecystectomy in early cholecystectomy group and 46.66% (n=14) in delayed cholecystectomy group. Both group were compared for mean hospital stay and conversion to open cholecystectomy and showed significance results (p<0.05). (Table-I & Figure-1)

Distribution of gender was calculated, 43.33% (n=13) were male in EC group and 56.67% (n=17) were females in EC group and 40.0% (n=12) were male in DC group and 60.0% (n=18) were females. Overall 58.33% (n=35) were females and 41.67% (n=25) were males (p>0.005) (Table-II). The data was stratified for age, gender, BMI, and smoking shown in Table-II respectively.

FIGURE-1

Distribution of hospital stay (N= 60)



P <0.001

TABLE-I

Stratification for mean hospital stay in both groups with respect to age using independent sample t-test (N= 60)

	Age Group	Groups	N	Mean	S.D	P-Value
Mean Hospital Stay	12-40 years	Early cholecystectomy	2	5.50	0.70	0.051
		Delayed cholecystectomy	2	8.50	0.70	
	41-70 years	Early cholecystectomy	28	5.35	0.78	0.000
		Delayed cholecystectomy	28	9.00	0.76	
Stratification for mean hospital stay in both groups with respect to gender						
	Gender	**Groups**	**N**	**Mean**	**S.D**	**P-Value**
Mean Hospital Stay	Male	Early cholecystectomy	13	5.53	0.51	0.000
		Delayed cholecystectomy	12	8.83	0.71	
	Female	Early cholecystectomy	17	5.23	0.90	0.000
		Delayed cholecystectomy	18	9.05	0.80	
Stratification for mean hospital stays in both groups with respect to BMI using independent sample t-test						
	BMI Group	**Groups**	**N**	**Mean**	**S.D**	**P-Value**
Mean Hospital Stay	17-25kg/m2	Early cholecystectomy	14	5.50	0.85	0.000
		Delayed cholecystectomy	3	8.66	0.57	
	>25kg/m2	Early cholecystectomy	16	5.25	0.68	0.000
		Delayed cholecystectomy	27	9.00	0.78	
Stratification for conversion to open cholecystectomy in both groups with respect to age using chi-square test						

Age Group	Conversion to Open Cholecystectomy	Groups		Total	P-Value
		Early Cholecystectomy EC	Delayed Cholecystectomy DC		
12-40 years	Yes	1 (50.0%)	1 (50.0%)	2 (50%)	1.000
	No	1 (50.0%)	1 (50.0%)	2 (50%)	
	Total	2 (50.0%)	2 (50.0%)	4 (100%)	
41-70 years	Yes	3 (10.7%)	13 (46.42%)	16 (28.57%)	0.007
	No	25 (90.3%)	15 (53.58%)	40 (71.43%)	
	Total	28	28	56 (100.0%)	

Stratification for conversion to open cholecystectomy in both groups with respect to gender using chi-square test

Gender	Conversion to Open Cholecystectomy	Groups		Total	P-Value
		Early Cholecystectomy EC	Delayed Cholecystectomy DC		
Male	Yes	1 (7.69%)	5 (41.67%)	6 (24%)	0.073
	No	12 (92.31%)	7 (68.33%)	19 (76%)	
	Total	13	12	25	
Female	Yes	3 (17.64%)	9 (50%)	12 (34.28%)	0.075
	No	14 (82.36%)	9 (50%)	23 (65.71%)	
	Total	17	18	35	

Stratification for conversion to open cholecystectomy in both groups with respect to BMI group using chi-square test

BMI Group	Conversion to Open Cholecystectomy	Groups		Total	P-Value
		Early Cholecystectomy EC	Delayed Cholecystectomy DC		
17-25kg/m2	Yes	2 (14.28%)	0 (0.0%)	2 (11.77%)	1.000
	No	12 (85.72%)	3 (100%)	15 (88.23%)	
	Total	14	3	17	
>25kg/m2	Yes	2 (12.5%)	14 (51.85%)	16 (36.20%)	0.021
	No	14 (87.5%)	13 (48.15%)	27 (62.79%)	
	Total	16	27	43	

TABLE-II

Distribution of conversion to open cholecystectomy (N= 60)

Conversion to Open Cholecystectomy	Groups		Total	P-Value
	Early Cholecystectomy EC	Delayed Cholecystectomy DC		
Yes	4 (13.33%)	14 (46.67%)	18 (30%)	**=0.010**
No	26 (86.67%)	16 (53.33%)	42 (70%)	
Total	30	30	60 (100%)	

DISCUSSION

The timing of cholecystectomy in patients with acute biliary pancreatitis (ABP) remains a subject of ongoing debate. Traditionally, in cases of moderate ABP, cholecystectomy is delayed until local complications resolve—usually around six weeks.[12] While multiple studies have explored the optimal timing of surgery in mild ABP, randomized prospective trials remain scarce. This lack of high-quality evidence has led to varying recommendations, and uncertainty persists regarding whether patients can be safely discharged before undergoing cholecystectomy following an episode of ABP.

In the present study, we compared the mean hospital stay and the frequency of conversion to open cholecystectomy between early and delayed surgical intervention in patients with moderate ABP. A total of 60 patients were included, with 30 assigned to each group. Age distribution revealed that 6.67% (n=4) were between 12–40 years, while 93.33% (n^{12}=56) were in the 41–70 years range.

The mean age was 45.33 ± 3.79 years in the early cholecystectomy (EC) group and 46.60 ± 4.14 years in the delayed cholecystectomy (DC) group. These values closely resemble those reported by Jee et al., where the mean age was 42.5 years in both groups.[11] Similar findings were also noted by Aksoy et al., with a mean age of 44.7 years.[12]

Regarding gender distribution, 43.33% (n=13) of the EC group were male and 56.67% (n=17) female, while in the DC group, 40.0% (n=12) were male and 60.0% (n=18) female. Overall, 58.33% (n=35) of the total study population were female, and 41.67% (n=25) were male (p = 1.000). These proportions are similar to those observed by Jee et al., who reported 47.37% male and 52.63% female in the EC group, and 38.24% male and 61.76% female in the DC group.[11] Female predominance was also noted in studies by Aksoy et al. and Nebiker et al.,[13] with females comprising 73.3% and 66% of the EC groups, respectively.

Historically, interval cholecystectomy has been favored due to concerns that inflammation and edema from pancreatitis might make dissection more challenging during index admission, increasing surgical complications and the risk of conversion to open surgery. However, recent research, including three meta-analyses and one cohort study, suggests that delayed surgery does not reduce intraoperative complications.[14-16]

In our study, conversion to open surgery was notably higher in the DC group. Of the 60 patients, 13.33% (n=4) in the EC group required conversion, compared to 46.66% (n=14) in the DC group. This contrasts with the findings of Jee et al., who observed no significant difference (10.53% vs. 11.76%, p = 1.000).[9] Nebiker et al. reported conversion rates of 6% and 3% in the EC and DC groups, respectively,[13] while Aksoy et al. reported higher rates: 40% in the EC group and 28.7% in the DC group.[12] These variations may be attributed to differences in sample size, surgeon experience, patient selection criteria, and intraoperative factors such as common bile duct (CBD) injury, anatomical variation, or hemodynamic instability. Our findings suggest that delaying surgery in moderate ABP may increase the risk of conversion to open cholecystectomy.

Another factor influencing surgical timing is the debated role of ERCP in ABP. A meta-analysis by Moretti et al.[9] found that early ERCP provided no benefit in mild pancreatitis but did reduce complications in severe cases. Similarly, a randomized trial by Chang et al.[17] found that in patients without cholangitis, postoperative ERCP resulted in shorter hospital stays and reduced costs compared to preoperative ERCP, without increasing complication rates. The American Society for Gastrointestinal Endoscopy also advises against early ERCP in the absence of signs suggesting retained stones.[18]

Several studies have reported increased complications with delayed cholecystectomy. In a study by Jee et al., complications were so frequent that the trial was halted early, with 44% of patients affected. A large multicenter randomized trial by da Costa et al. found a 33.3% increase in biliary complications (p = 0.02) when surgery was delayed. A Swedish prospective study reached similar conclusions, though its sample size was smaller (n=108).

In our study, hospital stay was significantly longer in the DC group, with a mean duration of 8.96 ± 0.76 days. This is comparable to findings from Khiali et al., who reported hospital stays of 4.56 days in the EC group and 12.10 days in the DC group. Nebiker et al. similarly found longer stays in the DC group (5.7 ± 6.2 days vs. 4.7 ± 2.4 days in EC). These findings support the idea that early cholecystectomy can shorten hospitalization, potentially lowering costs and improving outcomes. Differences in hospital stay may be partially explained by selection criteria; our study focused exclusively on moderate cases, while others included mild cases as well.

Overall, our findings support early cholecystectomy in patients with moderate ABP. Early intervention may reduce complications, hospital stay, and conversion to open surgery, while also optimizing healthcare resources and improving patient outcomes.

This study's strengths include its randomized clinical trial design, appropriate sample size calculation, and

standardized data collection using a structured pro forma. However, limitations include the potential for selection bias due to non-probability sampling, the single-center design limiting generalizability, and a relatively short follow-up period. Additionally, reliance on self-reported smoking status and BMI may introduce measurement bias, and not all confounding factors could be fully controlled.

A meta-analysis done by Zhong et al. in 2019 showed that early laparoscopic cholecystectomy is a safe and effective approach for managing mild acute gallstone pancreatitis in patients during their initial hospitalization. However, it is crucial to exercise strict control over the indications and contraindications for this procedure.

Future studies should explore long-term outcomes, economic implications, subgroup analyses based on comorbidities and BMI, the role and timing of ERCP, and measures of patient satisfaction and quality of life.

CONCLUSION

In current study, we compared the mean length of hospital stay and frequency of conversion to open cholecystectomy in early versus delayed cholecystectomy in patients with moderate acute biliary pancreatitis. We came to the conclusion that in patients with moderate acute biliary pancreatitis, early laparoscopic cholecystectomy decreased the length of hospital stay and conversion to open cholecystectomy.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	**Jamshaid Ali:** Study design.
2	**Muhammad Usman Siddique:** Data analysis.
3	**Usman Ismat Butt:** Data entry.
4	**Muhammad Haris Janjua:** Data collection.
5	**Saba Choudhry:** Results writing.
6	**Muhammad Umar:** Draft writing.