



ORIGINAL ARTICLE

Comparison between outcome of early and delayed laparoscopic surgery in patients with acute cholecystitis – A prospective randomized controlled trial.

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ABSTRACT... Objective: To determine the comparison between outcome of early and delayed laparoscopic cholecystectomy among patients presenting with acute cholecystitis. **Study Design:** Prospective Randomized Controlled Trial. **Setting:** Dr. Akbar Niazi Teaching Hospital, Islamabad. **Period:** September 2022 to February 2023. **Methods:** Total 108 patients (54 in each group) were included in the study. Group-A planned for surgery before 7 days of onset of symptoms, while Group-B planned for surgery after 7 days of onset of symptoms. The outcomes were measured in terms of hospital stay and operating time. **Results:** Patient's age range was 15-60 years with mean age of 40.8 ± 12.6 and 42.2 ± 12.8 years in group-A and B, respectively. Conversion to open cholecystectomy, bile duct injury, surgical site infection and hypertension were comparable in both groups. Mean hospital stay in group-A was 9.26 ± 2.43 and in group-B 15.41 ± 3.37 days ($p = 0.001$). Mean operating time was significantly less in group-A as compared to group-B (64.93 ± 6.68 vs 72.78 ± 8.03 min; $p = 0.001$). Stratification with regard to gender and hypertension was significant ($p \leq 0.05$), whereas stratification with regard to age and surgical site infection was insignificant ($p \geq 0.05$). **Conclusion:** Early laparoscopic cholecystectomy is safe and associated with less complications and lower conversion rates as compared to late cholecystectomy for acute cholecystitis.

Key words: Acute, Cholecystitis, Cholecystectomy, Laparoscopic, Surgical Procedure.

INTRODUCTION

Cholelithiasis (Gallstones) affects 10-15% of the population in western countries.¹ However, its occurrence in South Asian countries is increasing drastically.^{2,3} The literature suggests that approximately 11-21% of population mainly adults suffered from gall stones. Among these one-third of population suffer from acute cholecystitis.⁴ The presence of gall stones lead to acute cholecystitis, which is considered as emergency situation for surgical procedure.^{5,6} Cholecystectomy for acute cholecystitis or recurring biliary colic is the most frequent procedure which is performed by the general surgeons, including approximately 600,000 surgeries per annum. The treatment of acute calculous cholecystitis has been renewed from a conservative approach to early cholecystectomy over a period of time.³ The first-line and definitive treatment for acute cholecystitis is early laparoscopic cholecystectomy (ELC).⁴

Laparoscopic cholecystectomy is the ideal method in this regard; though, laparoscopic cholecystectomy is linked with a high incidence of close to open cholecystectomy.⁵

A detailed literature review tells us heterogenous views in this regard. A study was performed to evaluate the effects of delayed and early laparoscopic cholecystectomy. The delayed laparoscopic was performed 6 to 12 weeks later. However recent laparoscopic is associated with time span of 24 to 72 hours. The study concluded that although it was advantageous in terms of hospital stay but no benefit was observed regarding post-operative complications and conversion rate.⁶ A local study reported that early and late laparoscopic surgery in acute cholecystitis are equally safe and feasible but early laparoscopy has got benefit of decreasing the hospital stay of the patients.^{7,8,9} Another study

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showed that total hospital stay was noticeably higher in the delayed cholecystectomy group. Whereas, a study showed postoperative complications in early LC was 24% as compared to 8% in delayed LC.¹⁰ The high conversion rate is associated with early laparoscopy in the opinion of some experts.¹¹ An estimated 5-6% conversion rate has been observed for elective laparoscopic cholecystectomy.¹²

Therefore, with this division of stance among the surgical community, more data is required to ascertain the outcome of patients in early vs delayed laparoscopy in terms of the extent of biliary duct injury, calculous or acalculous, fever grade, and development of postoperative infections. The lack of sufficient literature providing a conclusive outlook between both surgeries necessitates to conduct of our study. Hence, this study is being carried out to compare the outcomes of early and delayed laparoscopic cholecystectomy among patients presenting with acute cholecystitis.

METHODS

The prospective randomized control trial was performed after the approval of the Institutional Review Board (76/IMDC/IRB-2022 Dated: 7th October 2022). The setting of the study was the Department of surgery at Dr. Akbar Niazi Teaching Hospital, Islamabad. The study period was five months from September 2022 to February 2023.

The sample size was calculated by WHO sample size calculator, with a significance level of 5% and power test of 80% was applied.⁸ A total of 108 patients were recruited in to two groups A and B, (n=54 each) i.e., control group and experimental group. The lottery method was used to randomize the patients. The participants were briefed about the study and their consent was taken before onset of study. Group-A patients underwent early surgical intervention whereas group-B patients underwent delayed laparoscopic cholecystectomy. Patients in group-A planned for surgery within 7 days of onset of symptoms, while group-B was planned for surgery after 7 days of onset of symptoms.

As per the inclusion criteria, only the patients with

the age bracket of 15-60 years, male and female, who were diagnosed with acute cholecystitis, were included in the study. Whereas, patients having hemorrhage linked with liver cirrhosis, patients who developed any complication due to general anesthesia or allergic to local anesthesia, and patients having diabetes mellitus or COPD were left out from the study.

Then the laparoscopic cholecystectomy was done by a standard 4-port technique. The peritoneal insufflation was maintained by using carbon dioxide (CO₂). A pressure of 8 mmHg and 10 mmHg was kept for abdominal pressure. At the level of the sub-umbilical region, a Hasson-type trocar was introduced for the laparoscope. The port of diameter 10 mm was inserted into the epigastrium region and port of size 5 mm was introduced in the right hypochondrium. A port of diameter 5mm was inserted in the right iliac fossa to grasp the fundus of the gall bladder. The drain was introduced to observe for any bleeding postoperatively and remove the drain on day 1 after surgery. All the patients were kept under observation and were evaluated by the surgeon for the consequences of surgical procedures.

The data was analyzed and entered using SPSS version 23. The numeric data such as age, stay in the hospital, and operative time was presented in the form of mean and standard deviation. The categorical variables such as gender, rate of conversion, injury to bile duct and infection at the surgical site were presented in the form of frequency and percentage. The qualitative data was analyzed using Chi square test. P-value \leq 0.05 was considered as significant. Stratification was used to control modifiers such as age, gender and hypertension. Post-stratification chi square test was applied.

RESULTS

The study recruited a total of one hundred and eight (n=108) participants. The patients were observed for postoperative findings followed by early and delayed cholecystectomy. The normality of the data was assessed by Kolmogorov Smirnov and Shapiro-Wilk tests. The data was normally distributed ($p \geq 0.05$) throughout the assessment.

Age range was 15-60 year with mean age of 40.8 ± 12.6 and 42.2 ± 12.8 years in group A and B, respectively. There was a majority of female patients in both groups, 34 (63%) and 40 (74%) in Group A and B respectively. In group-A there were 7 smokers (13%) while in group-B 10 smokers (18.5%). Comparison of mean hospital stay and operating time of both groups is shown in Table-I.

Stratification with regard to age, gender, hypertension and surgical site infection was also carried out by chi square test (Table-II).

The clinical outcomes which were assessed in the study were the frequency of conversion to open cholecystectomy, bile duct injury, surgical site infection, and hypertension. They are presented in Table-III (n=108).

The stratification of age, gender, hypertension and surgical site infection with operating time by chi square test, (n=108) assessed in the study is presented in Table-4.

Table 4 Stratification of age, gender, hypertension and surgical site infection with operating time.

	Group-A	Group-B	t (Independent sample t-test)	P-Value
	Mean \pm SD	Mean \pm SD		
Hospital stays (days)	9.26 ± 2.43	15.41 ± 3.37	-10.859	0.001
Operating time (minute)	64.93 ± 6.68	72.78 ± 8.03	-5.521	0.001

Table-I. Comparison outcomes between two groups

Hospital Stays (days)		Group-A	Group-B	P-Value
		Mean \pm SD	Mean \pm SD	
Age (year)	≤ 40	9.00 ± 1.50	14.83 ± 3.37	.001
	41-60	9.47 ± 2.99	15.84 ± 3.24	
Gender	Female	9.26 ± 2.47	15.05 ± 3.17	.001
	Male	9.25 ± 2.42	16.43 ± 3.81	
Hypertension	Yes	8.70 ± 1.41	15.92 ± 3.13	.001
	No	9.59 ± 2.84	14.97 ± 3.56	
Surgical site infection	Yes	10.20 ± 1.48	16.09 ± 3.41	.001
	No	9.16 ± 2.50	15.23 ± 3.37	

Table-II. Stratification of age, gender, hypertension and surgical site infection with hospital stay, n=108

		Group-A (n=54)	Group-B (n=54)	Chi value	P-Value
Conversion to open cholecystectomy	Yes	6 (11.1%)	12 (22.3%)	2.400	0.121
	No	48 (88.9%)	42 (77.7%)		
Bile duct injury	Yes	2 (3.7%)	1 (1.9%)	0.343	0.585
	No	52 (96.3%)	53 (98.1%)		
Surgical site infection	Yes	5 (9.3%)	11 (20.4%)	2.641	0.104
	No	49 (90.7%)	43 (79.6%)		
Hypertension	Yes	20 (37%)	25 (46.3%)	0.952	0.329
	No	34 (63%)	29 (53.7%)		

Operating Time (min)		Group-A	Group-B	P-Value
		Mean \pm SD	Mean \pm SD	
Age (year)	≤ 40	65.83 ± 5.61	73.04 ± 8.62	.001
	41-60	64.20 ± 7.43	72.58 ± 7.71	
Gender	Female	63.56 ± 6.94	72.80 ± 7.65	.001
	Male	67.25 ± 5.63	72.71 ± 9.35	
Hypertension	Yes	64.65 ± 5.46	72.40 ± 7.97	.001
	No	65.09 ± 7.37	73.10 ± 8.21	
Surgical site infection	Yes	62.80 ± 8.72	73.06 ± 8.18	.001
	No	65.14 ± 6.51	73.02 ± 8.14	

Table-III. Descriptive statistics of clinical outcomes

DISCUSSION

The objective of current study was to compare the effects of early and delayed laparoscopic surgery among the patients suffering from acute cholecystitis.

The findings of present study concluded that performing early cholecystectomy is better than delayed cholecystectomy. It's far better in terms of hospital stay (9.26 ± 2.43 vs 15.41 ± 3.37 days; $p = 0.001$) and operating time (64.93 ± 6.68 vs 72.78 ± 8.03 min; $p = 0.001$). Surgical site infection ($p = 0.104$), bile duct injury ($p = 0.585$) and conversion to open cholecystectomy ($p = 0.121$) were comparable in both groups.

Majority of the following studies are consistent with our findings. Abbasi et al concluded that no potential benefit exists in delaying the surgery of acute cholecystitis. The delaying of surgery was equipped with long hospital stay, more complications, and increase rate of conversion to open surgery.¹⁴ Mahapatra et al indicated that strong evidence exists for better outcomes and advantages for early laparoscopic surgery. The hospital stay is decreased and in turn decreases the complications, morbidity and mortality rate.¹⁵ Furthermore, Gurusamy et al also believed that instant cholecystectomy is bound with decrease hospital stay which in turn decreases the complications and conversion rate.¹⁷ All of these studies are similar to our findings where hospital stay of early vs delayed was 9.26 ± 2.43 vs 15.41 ± 3.37 days; $p = 0.001$. However, Mahapatra et al, also state that the complication associated with bile duct is more common after delayed laparoscopic procedure. Whereas our study does not provide a significant difference and the literature also lacks in this area. Therefore, more randomized controlled trials are required to intrigue the potential harm and benefits associated with complications.

Kulvatunyou et al concluded that early laparoscopic surgery should be the surgery on priority for acute cholecystitis in patient's candidate for surgery. In terms of complications, costs and rate of morbidity and mortality, the instant laparoscopic surgery is far superior to

the conservative approach. The results were extracted after 24 hours stay in the hospital.¹⁶ Although our results are also in favour of early laparoscopic surgery but our study does not specifically perform the cost analysis.

Zhou et al conducted a systematic review incorporating seven RCT's including 1106 participants.¹⁸ The study concluded that no difference exists between two groups in terms of rate of conversion and injury to bile duct. These results are quite similar to ours where our study also does not provide a significant difference. In Zhou's study, the hospital stay was short i.e. 4 days for early laparoscopic procedure which is somehow in accordance to the findings of our study (around 6 days shorter).

De Mestral et al conducted a retrospective cohort study including 23,203 patients, a balanced matched cohort, 15,210 patients were defined for early cholecystectomy.¹⁹ The early cholecystectomy was strongly linked with decreased level of injury to bile duct which is in contrast with other studies including our own. However, the hospital stay was less and the conversion rate for both the groups was same which is in line with the rest of the studies reviewed for our study.

Overall, the studies included in this research suggests that instant laparoscopic cholecystectomy should be performed for acute cholecystitis. The laparoscopic cholecystectomy is increasing day by day for the patients of acute cholecystitis. The shift of paradigm is due to decreased hospital stay, decrease complications. As a result, patient restore normal activities of living, return to work, and observe limited level of morbidity from gall bladder disease.^{13,20}

Hence, our study added significant insights by comparing the effects of early and delayed laparoscopic surgery among patients suffering from acute cholecystitis and also after detailed comparison with other studies in multiple aspects.

However, our study fell short on providing conclusive evidence of a difference existing

between early and delayed cholecystectomy in terms of rate of conversion and injury to bile duct. Therefore, more studies are required to ascertain these factors.

CONCLUSION

Early laparoscopic cholecystectomy is safe and associated with less complications and lower conversion rates as compared to late cholecystectomy for acute cholecystitis.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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



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2	Sabah Ali Chaudhary	Data collection & result complication.	
3	Atiq Ur Rehman	Ethical revisions & revisions.	
4	Maham Farooq	Data collection & result complication.	
5	Usman Akram	Data analysis & interpretation.	
6	Tahira Hameed	Complication & drafting of article.	