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Perioperative Complications in Patients of Acute Cholecystitis, Early Laparoscopic Cholecystectomy versus Interval Laparoscopic Cholecystectomy; A Comparative Study

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ABSTRACT

***Objective*:** To compare the frequency of perioperative complications in patients with acute cholecystitis who undergo "early laparoscopic cholecystectomy" versus those who have "interval laparoscopic cholecystectomy".
***Study Design*:** Quasi-experimental study.
***Place and Duration of Study*:** Combined Military Hospital, Rawalpindi Pakistan, from Aug 2022 to May 2023.
***Methodology*:** This study included all the patients who had acute cholecystitis and were admitted to the surgery ward for its management. Half of the patients were selected who underwent early laparoscopic cholecystectomy, while the remaining half had interval laparoscopic cholecystectomy. The frequency of perioperative complications was noted in both groups.
***Results*:** In our study, we included 50 patients (25 in group-A, who had "early laparoscopic cholecystectomy" while 25 in group-B, who had "interval laparoscopic cholecystectomy"). The mean age of the study population was 43.70±5.91 years. 18(36.00%) were male while the remaining 32(64.00%) were female. In our study, frequency of perioperative complications in group-A was injury to common bile duct 2(8.00%), biliary leak 3(12.00%), haemorrhage 4(16.00%) and conversion to open cholecystectomy 1(4.00%) while in group-B these were 0(0.00%), 1(4.00%), 2(8.00%) and 0(0.00%), respectively [with corresponding *p*-values of 0.149, 0.297, 0.384 and 0.312, respectively.
***Conclusion*:** Interval laparoscopic cholecystectomy is a better surgical treatment option for patients with "acute cholecystitis".

Keywords: Acute Cholecystitis, Complications, Early, Interval, Laparoscopic Cholecystectomy.

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INTRODUCTION

The gallbladder is an integral part of the gastrointestinal, specifically the hepato-biliary system, which is located caudally close to the liver in the right upper quadrant of the abdomen and primarily stores bile. When bile crystallizes in the gallbladder due to stasis, it forms cholesterol or pigment gallstones.[1] Several risk factors contribute to the development of gallstones, including having a female gender, age of more than forty years, use of alcohol, having a high body mass index, high levels of serum cholesterol and thyroid dysfunction.[2,3] In general, gallstones do not cause symptoms or discomfort. However, when these become symptomatic, they can result in yellowish discolouration of the eyes due to jaundice (which may or may not occur) accompanied by pain in the right upper quadrant of the abdomen, especially after consuming a high fat-containing diet.[4]

One of the surgical emergencies that patients who have gallstones may develop is an acute inflammation of the gallbladder, i.e., "Acute Cholecystitis".[5] Diagnosis of acute cholecystitis can be made by the combination of careful clinical examination and hemato-radiological investigations (including infection screen and abdominal ultrasonography).[6] Once diagnosed, management involves surgical removal of the gallbladder. For this purpose, "laparoscopic cholecystectomy" is considered the gold standard surgical procedure.[7]

One of the important aspects that should be considered while managing a patient with acute cholecystitis is the timing at which laparoscopic surgical removal of inflamed gallbladder should be performed. In this regard, there have been two different schools of thought. At one end, it is considered that patients who have acute cholecystitis should have laparoscopic cholecystectomy at the earliest after hospitalization.[8] On the other hand, other sets of researchers believe that instead of performing surgery in acute settings, operative intervention should be delayed for some time, ranging from six weeks to as long as twelve weeks, till the ongoing

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inflammation and hyperemia are settled, after which a delayed or interval laparoscopic cholecystectomy can be performed.[9,10]

The timing of performing laparoscopic cholecystectomy is debated, with some studies favouring early laparoscopic cholecystectomy while others favouring interval laparoscopic cholecystectomy in terms of reduction of perioperative complications, conversion to open procedure and improved patient outcome. For this purpose, we aim to conduct this study to compare the frequency of perioperative complications that can occur in patients who have acute cholecystitis and are managed by "early laparoscopic cholecystectomy" versus those who are managed by "interval laparoscopic cholecystectomy" so that ideal timing of performing laparoscopic cholecystectomy in setting of acute cholecystitis can be decided, based on evidence.

METHODOLOGY

The quasi-experimental study was conducted at CMH, Rawalpindi Pakistan, from Aug 2022 to May 2023 after obtaining approval from the Ethical Committee of CMH Rawalpindi (IERB #: 349).

We assumed for sample size estimation, an anticipated frequency of perioperative complications in early laparoscopic cholecystectomy of 26.7% and anticipated frequency of perioperative complications in interval laparoscopic cholecystectomy of 0%.[11]

Inclusion Criteria: We included patients who were 1) aged more than 18 years, 2) have either male or female gender, and 3) have acute cholecystitis "defined as pain and tenderness in the right upper quadrant of the abdomen accompanied by fever, nausea, positive sonographic Murphy sign and an edematous, distended gallbladder".[13]

Exclusion Criteria: We excluded all the patients who were not fit for general anaesthesia, who had co-morbidities like diabetes, asthma, hypertension and smoking, patients who had a history of illicit drug abuse, and patients in which open procedure was performed straight away.

Calculated sample size was 50 patients, amongst which 25 patients were placed in group-A, where patients underwent "early laparoscopic cholecystectomy", while the remaining 25 patients were placed in group-B, where patients underwent "interval laparoscopic cholecystectomy" (Figure).

We defined early laparoscopic cholecystectomy as one performed within the first 72 hours of admission in the hospital, while interval laparoscopic cholecystectomy was one performed 6 weeks after conservative management with antibiotics and fluids and diagnosis of acute cholecystitis.[13,14] All the patients signed written informed consent forms before being included in the study. After inclusion, baseline characteristics, including age, gender and body mass index (BMI), were documented. Patients in both groups, after they had surgery performed, were followed up for operative time and having perioperative complications, including iatrogenic injury to the common bile duct, biliary leak from the biliary stump "diagnosed by visualizing biliary fluid in drain", haemorrhage "due to injury to cystic artery" and conversion to open cholecystectomy.

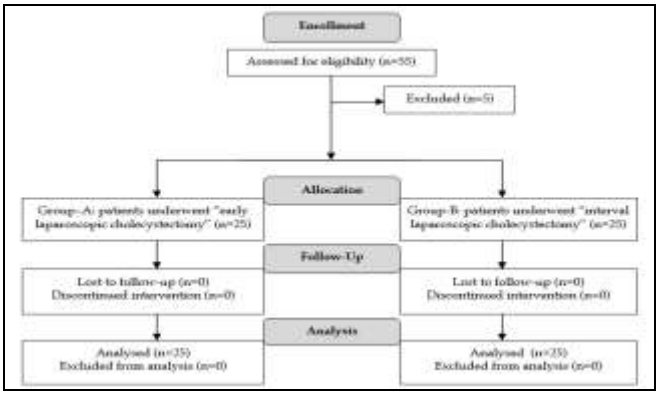

Figure: Patient Flow Diagram (n=50)

Statistical Package for Social Sciences (SPSS version 23.00 software was used for statistical data analysis. To check if data was normally distributed, we used the Shapiro-Wilk test which showed that age was normally distributed while BMI and operative time were not distributed normally. For qualitative variables (gender and perioperative complications), frequency and percentages were used, whereas for quantitative data (age, BMI and operative time), mean with standard deviation and median (IQR) were used. We used the Chi-square test to compare the qualitative variables between the two groups. For comparing quantitative variables (age, BMI and operative time) between the two groups, we preferred using the Student t-test", and the Mann-Whitney U test. The *p*-value of ≤0.05 was considered significant".

RESULTS

In our study, we included 50 patients divided into two different groups. Twenty-five patients (of group-A) had "early laparoscopic cholecystectomy", while the remaining 25 patients (of group-B) had "interval laparoscopic cholecystectomy". In our study,

the mean age of the patients was 43.70±5.91 years. Amongst all the patients in our study, 18(36.00%) were male, while the remaining 32(64.00%) were female. Median BMI of the patients was 31.00(23.00–35.00) kg/m2. We compared baseline characteristics between the two groups, tabulated in Table-I.

Table-I: Comparison of Baseline Characteristics (n=50)

Characteristics	Group-A (Early) (n=25)	Group-B (Interval) (n=25)	*p*-value
Age (years)	43.72±5.53	43.68±6.38	0.981
Gender	Male =8(32.00%) Female =17(68.00%)	Male =10(40.00%) Female =15(60.00%)	0.556
Median BMI (kg/m2)	31.00(23.00–34.00)	26.00(24.00–35.00)	0.867

In our study, we also compared post-operative parameters between the two groups. In group-A, the median operative time (in minutes) was 57.00(35.00–90.00) minutes, while in group-B, the median operative time was 56.00(37.00–91.00) minutes (*p*=0.961). In our study, frequency of perioperative complications in group-A was injury to CBD 2(8.00%), biliary leak 3(12.00%), haemorrhage 4(16.00%) and conversion to open cholecystectomy 1(4.00%) while in group-B these were 0(0.00%), 1(4.00%), 2(8.00%) and 0(0.00%), respectively [with corresponding *p*-values of 0.149, 0.297, 0.384 and 0.312, respectively. This comparison of perioperative complications between the two groups is tabulated in Table-II.

Table-II: Comparison of Perioperative Complications between Groups (n=50)

Complications	Group-A (n=25)	Group-B (n=25)	*p*-value
Injury to Common Bile Duct	2(8.00%)	0(0.00%)	0.149
Biliary leak	3(12.00%)	1(4.00%)	0.297
Hemorrhage	4(16.00%)	2(8.00%)	0.384
Conversion to Open Cholecystectomy	1(4.00%)	0(0.00%)	0.312

DISCUSSION

The selection of timing of performing laparoscopic cholecystectomy in the presence of acute cholecystitis is a highly debated topic to date.[14,15] For this purpose, we conducted this study to aid surgeons in making an informed decision regarding the timing of surgical removal of diseased gallbladder based on evidence. This selection of timing is considered crucial as, according to previous evidence, it can dictate the rates of perioperative complications associated with laparoscopic cholecystectomy. In our study, we found out that the frequency of perioperative complications, including injury to CBD, biliary leak, haemorrhage and conversion to open cholecystectomy, was higher in patients who underwent early laparoscopic cholecystectomy as compared to patients who had interval cholecystectomy. However, the statistical difference between the two study groups was not significant. This finding was congruent with the results of a study which was conducted by Zahur *et al.*,[16] which stated that the difference in composite frequency of perioperative complications between the early and interval laparoscopic cholecystectomy groups was not statistically significant. Conversely, a study conducted by Ozkardeş *et al.*,[12] which compared the outcomes of early and interval laparoscopic cholecystectomy, reported that the difference in composite frequency of perioperative complications between the early and interval laparoscopic cholecystectomy (LC) Groups was statistically significant.

In our study, we found no significant difference between the two groups in terms of bile leak or haemorrhage secondary to perioperative injury to a biliary tree or vessel. This finding was congruent with what was reported in a study by Chang *et al.*,[17] and Kolla *et al.*,[18] which found no statistical difference between early and interval cholecystectomy Groups. In our study, we found that the number of patients in which laparoscopic procedure was abandoned and was converted to an open one was more significant in cases where early LC was selected as compared to cases who underwent interval LC and the difference, in terms of the conversion rate of laparoscopic to open procedure, but was not statistically significant. This was against the results of a study conducted by Sánchez-Carrasco *et al.*,[19] which stated that the difference in frequency of LC to open cholecystectomy between patients who had early LC compared to those who had interval LC was statistically significant. On the other hand, Hegazy *et al.*,[20] found out that this difference in frequency of LC to open cholecystectomy between patients who had early LC compared to those who had interval LC was not statistically significant, which was congruent with the finding of our study.

Based on the frequency of perioperative complications, especially the rate of conversion of safer, less invasive laparoscopic procedure to an invasive and much more complicated open cholecystectomy, interval laparoscopic cholecystectomy is a better surgical option to treat acute cholecystitis. Although our study favours this, many studies state that early LC can also be considered a safe alternative to interval LC.[21] Based on this, we suggest that further studies should be carried out in

this field of surgery so that surgeons can make an evidence-based decision while choosing between "early laparoscopic cholecystectomy" and "interval laparoscopic cholecystectomy" for managing "acute cholecystitis".

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CONCLUSION

There are two opposing schools of thought on the best time to perform a laparoscopic cholecystectomy in patients with the diagnosis of acute cholecystitis. However, our study's findings determined that interval cholecystectomy is a better treatment option for patients with acute cholecystitis, although there is no statistically significant difference between them, which warrants further studies in this regard.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

NH & SMK: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

KB & SMH: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

WB & IA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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