International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 9, September 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.9.2024.29

ORIGINAL RESEARCH

A comparative study of early versus delayed laparoscopic cholecystectomy for acute calculous cholecystitis

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Received Date: 22 July, 2024 Acceptance Date: 27 August, 2024

ABSTRACT

Background: Acute calculous cholecystitis is one of the most common clinical conditions frequently encountered in surgical department. Patients with acute calculous cholecystitis can be managed with either early laparoscopic cholecystectomy or initial conservative treatment followed by delayed laparoscopic cholecystectomy. It is still not clear which of these treatment modalities is preferable.**Methods:**The present study was designed to compare the outcomes of early laparoscopic cholecystectomy versus delayed laparoscopic cholecystectomy in patients with acute calculous cholecystitis.This comparative study was conducted in the Department of General Surgery, Adesh Medical College and Hospital, Shahbad. 50 patients were enrolled in the study and diagnosis of acute calculous cholecystitis was made by a combination of clinical, laboratory and radiological findings.IBM SPSS Statistics for Windows, Version 25.0. (Armonk, NY: IBM Corp.) was used for statistical analysis. Results were expressed as mean ± standard deviation. **Results:** The operating time and hospital stay was significantly shorter in the early group compared to delayed group.**Conclusion:**We recommend early laparoscopic surgery for acute calculous cholecystitis as it enables easier dissection, quicker access to Calot's triangle, early symptom relief, shorter hospital stays and reduced financial burden.

Keywords: Acute calculous cholecystitis,Early laparoscopic cholecystectomy, Delayed laparoscopic cholecystectomy, Gallstones

INTRODUCTION

Acute calculous cholecystitis is one of the most common clinical conditions frequently encountered in surgical department. In this condition, there is acute inflammation of gall bladder along with stones in gall bladder. These patients often present with abdominal pain and tenderness primarily in right hypochondrium, nausea, vomiting, fever and positive Murphy's sign.Gallstones are present in an estimated 10% to 15% of the general population, with prevalence varying by country. Among individuals with gallstones, 20% to 40% will develop gallstone related complications, occurring at an annual incidence of 1% to 3%. Acute calculous cholecystitis is the initial clinical presentation in approximately 10% to 15% of these cases.[1]

Until the early 1990s, laparoscopic surgery was generally not recommended for patients with acute cholecystitis and open cholecystectomy was considered the standard technique.[2] However, now laparoscopic cholecystectomy has become the preferred treatment for acute cholecystitis, though the preferred timing for surgery remains a topic of debate.Patients with acute calculous cholecystitis can be managed with either early laparoscopic cholecystectomy or initial conservative treatment followed by delayed laparoscopic cholecystectomy.The definition of early surgery varies in different reports. The Society of American Gastrointestinal and Endoscopic Surgeon (SAGES) guidelines and The Tokyo Guidelines 2013 recommend performing early laparoscopic cholecystectomy within 72 hours of onset of

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symptoms.[3,4]In contrast, the World Society of Emergency Surgery (WSES) guidelines 2016 suggest that early laparoscopic cholecystectomy should be conducted within 7 days of hospital admission and within 10 days of symptom onset.[5]

The Tokyo Guidelines 2013 recommend the treatment of acute cholecystitis based on grade of severity. In Grade I (mild) cases, early laparoscopic cholecystectomy is the preferred treatment. For Grade II (moderate) cases, either early or delayed cholecystectomy is recommended, depending on the patient's condition. In Grade III (severe) cases, delayed cholecystectomy should be performed if surgery is indicated.[4]However, the Tokyo Guidelines 2018 broadened the indications for laparoscopic cholecystectomy, supporting same-admission laparoscopic cholecystectomy for patients across all three severity grades of acute cholecystitis.[1] This aligns with the recommendations from the WSES Guidelines 2016.[5]

The decision between early laparoscopic cholecystectomy and delayed laparoscopic cholecystectomy in the management of acute calculous cholecystitis is challenging due to the limited availability of studies comparing their outcomes. The lack of comprehensive comparative studies leaves a gap in understanding the relative benefits and risks of these two approaches. Hence, the present study was designed to compare the outcomes of these two treatment strategies in patients with acute calculous cholecystitis. Specifically, the study evaluates the effectiveness, safety, and overall patient outcomes associated with early laparoscopic cholecystectomy performed within 72 hours of symptom onset versus delayed laparoscopic cholecystectomy performed 6 to 8 weeks after symptom onset.

METHODS

The present study was conducted in the Department of General Surgery, Adesh Medical College and Hospital, Shahbad. After taking clearance from the ethical committee, 50 patients were enrolled in the study. Informed written consent was obtained from each patient prior to their participation.

All patients underwent clinical examination, routine blood investigations and abdominal ultrasound. The diagnosis of an acute episode was confirmed by presence of right subcostal tenderness, positive Murphy's sign, leucocytosis, a thickened and edematous distended gallbladder, presence of gallstones, and pericholecystic fluid collection on ultrasound.Male and female patients aged 18 or older with clinical, laboratory and ultrasound findings suggestive of acute calculous cholecystitis were included in the study.

Patients with choledocholithiasis, obstructive jaundice, gangrenous cholecystitis,biliary peritonitis, emphysematous cholecystitis, acute cholecystitis in pregnancy, acute cholangitis, decompensated liver cirrhosis, ascites, gall bladder perforation,co-morbid conditions like pulmonary and cardiac problems, cerebrovascular disease and previous upper abdominal surgery were excluded from the study.

The closed envelope method was used to randomise patients to either the early or delayed operation group. 25 patients were selected for early laparoscopic cholecystectomy (within 72 hours of onset of symptoms) and 25 patients for delayed laparoscopic cholecystectomy (after a gap of 6 to 8 weeks from onset of symptoms). Patients in delayed group were manged conservatively by antibiotics, analgesics and intravenous fluids and delayed laparoscopic cholecystectomy was done 6 to 8 weeks later.

Detailed information regarding age, gender, clinical findings, medical history, laboratory tests and ultrasound reports were recorded for all patients. During postoperative hospitalization, patients were closely monitored. Operative and postoperative variables such as duration of hospitalization, rate of conversion to open cholecystectomy, intraoperative and postoperative complications and operative time were evaluated. For delayed operation group, total length of stay was calculated by adding the duration of initial hospitalization (for conservative treatment) and subsequent hospitalization (for the delayed surgery).

IBM SPSS Statistics for Windows, Version 25.0. (Armonk, NY: IBM Corp.) was used for statistical analysis. Results were expressed as mean ± standard deviation. Chi-square test and Fisher's exact test were applied. Data was considered to be significant when p value<0.05 and highly significant if p value <0.001.

RESULTS

The study included 50 patients, with 25 in each group. The mean age in early group was 41.25 ± 9.36 years, and in delayed group, it was 43.71 ± 8.65 years. Age distribution between two groups was comparable, with no statistically significant difference (p>0.05). Of 50 patients, 39 were female and 11 were male, yielding a female to male ratio of 3.5:1. There was no statistically significant difference in gender distribution between the groups (p>0.05; Table I)

All patients presented with pain and tenderness in right hypochondrium. Nausea and vomiting were reported by 19 patients in early group and 17 in delayed group, while fever was noted in 16 and 14 patients, respectively. Murphy's sign was positive in 17 patients in early group and 21 patients in delayed group. Overall, no statistically significant differences were found in the clinical presentations between two groups (p>0.05; Table I). Laboratory investigations and ultrasonographic findings of patients in two groups are shown in Table II.

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Table I: Demographic data and clinical presentation of patients in early and delayed laparoscopic cholecystectomy groups

		Early laparoscopic cholecystectomy (n= 25)	Delayed laparoscopic cholecystectomy (n =25)	p value
Age (years)		41.25 ± 9.36	43.71 ± 8.65	0.339
Sex (No. & %)	Male	5 (20)	6 (24)	0.732
	Female	20 (80)	19 (76)	
Clinical findings (No. & %)				
Pain and tenderness		25(100)	25 (100)	1
Nausea and vomiting		19 (76)	17 (68)	0.528
Fever (100^{o} F)		16 (64)	14 (56)	0.563
Murphy's sign		17 (68)	21 (84)	0.185

Table II: Laboratory and ultrasound findings of patients in early and delayed laparoscopic cholecystectomy groups

	Early laparoscopic cholecystectomy (n= 25)	Delayed laparoscopic cholecystectomy (n =25)	p value
Laboratory investigations (No. & %)			
Total Leucocyte Count (>10,000/cumm)	22 (88)	21 (84)	0.683
Total Bilirubin (>1.2 mg/dL)	1 (4)	2 (8)	0.551
Alanine transaminase (Deranged)	3 (12)	2 (8)	0.637
Aspartate transaminase (Deranged)	3 (12)	2 (8)	0.637
Alkaline phosphatase (Deranged)	1 (4)	1 (4)	1
Serum amylase (Deranged)	0	0	0
Ultrasound findings (No. & %)			
Gall stones	25 (100)	25 (100)	1
Increased anterior gallbladder wall thickness	21 (84)	22 (88)	0.683
Pericholecystic fluid	8 (32)	7 (28)	0.757
Intrahepatic bile duct dilatation	2 (8)	2 (8)	1

The mean operating time was 53.21 ± 21.47 minutes in early group and 65.33 ± 20.14 minutes in delayed group, with statistically significant difference ($p<0.05$). The hospital stay was significantly shorter in early group (4.30 ± 1.10 days) compared to delayed group (7.40 ± 2.60 days) and the difference was statistically highly significant ($p<0.0001$). Conversion to open cholecystectomy occurred in 1 patient in early group and 2 in delayed group, with no significant difference in conversion rates.Intraoperative and postoperative complications in both groups are shown in Table III, with no statistically significant difference observed between two groups.

Table III: Operative and post operative findings of patients in early and delayed laparoscopic cholecystectomy groups

	Early laparoscopic cholecystectomy (n= 25)	Delayed laparoscopic cholecystectomy (n =25)	p value
Operating time (min)	53.21 ± 21.47	65.33 ± 20.14	0.045
Hospitalization duration (days)	4.30 ±1.10	7.40 ±2.60	< 0.0001
Conversion to open cholecystectomy	1(4)	2(8)	0.551
Intraoperative and postoperative complications (No. & %)			
Fever	3 (12)	2 (8)	0.637
Bile duct injury	0	0	0
Wound infection	0	0	0

DISCUSSION

The present study included 50 patients undergoing laparoscopic cholecystectomy for acute calculous cholecystitis. In our study, the clinical findings, laboratory results and radiological characteristics of patients in both groups were comparable.

Few studies like Gul et al and Ahmed et al showed higher operating time in early group as compared to delayed group.[6,7] In contrast, Johansson et al and Ozkardes et al reported lower operating time in early group as compared to delayed group, though the difference was not statistically significant

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($p>0.05$).[8,9]In our study, the operating time was significantly shorter in the early group (53.21 ± 21.47 minutes) compared to the delayed group (65.33 ± 20.14 minutes), with a statistically significant difference ($p = 0.045$).

In Ozkardes et al study, total hospital stay was significantly longer in delayed laparoscopic cholecystectomy group compared to early group (7.8 ± 1.65 days vs. 5.2 ± 1.40 days; $p = 0.04$).[9] Similarly, Ahmed et al reported a mean hospital stay of 13.2 ± 3.19 days for delayed group versus 9.625 ± 2.02 days for early group.[7] Papi et al in their meta-analysis found that patients in early surgery group had a significantly shorter hospital stay (9.6 ± 2.5 days vs. 17.8 ± 5.8 days; $p < 0.0001$).[10] In our study, hospital stay was also significantly shorter in early group (4.30 ± 1.10 days) compared to delayed group (7.40 ± 2.60 days), with this difference being highly significant ($p < 0.0001$). The longer hospital stay in the delayed group was primarily due to readmissions. These findings align with those reported in other studies, further supporting the benefits of early surgery in reducing hospitalization time.

In the present study, the conversion rate from laparoscopic to open surgery was 1 out of 25 in early group and 2 out of 25 in delayed group, which was found to be statistically insignificant. No significant difference in conversion rates between the two groups was reported in studies by Verma et al, Gul et al,Ozkardes et al and Ahmed et al. Our findings are consistent with these studies.[6,7,9,11] In the early group, conversions were due to friable and inflamed gallbladders that tore upon handling, while in the delayed group, main challenge was limited gallbladder exposure caused by dense adhesions and fibrosis, which obscured the anatomy of Calot's triangle.

In the present study, 3 patients in the early surgery group and 2 patients in the delayed surgery group developed postoperative fever, a difference that is statistically insignificant ($p = 0.637$). These findings are consistent with studies by Verma et al, Gul et al and Ahmed et al, which also reported no significant difference in overall complication rates between the two groups.[6,7,11]

Papi et al, Somasekar et al, Cameron et al, Ahmed et al have advocated early cholecystectomy for acute cholecystitis.[7,10,12,13]We believe that performing an early laparoscopic cholecystectomy within 72 hours of symptoms onset can be done safely without increasing the rates of conversion to an open procedure or raising the risk of complications. It also leads to shorter hospital stay which alleviates burden on healthcare systems while also lowering medical expenses and minimizing the loss of daily wages for patients. Although adhesions may form in both early and delayed groups, they are often firmer and more difficult to dissect in the delayed group, which can obscure Calot's triangle and complicate the procedure. In contrast, early surgery allows for clearer dissection planes and easier access to Calot's triangle.

CONCLUSION

We recommend early laparoscopic surgery for acute calculous cholecystitis for several key reasons. It facilitates easier dissection, provides quicker access to Calot's triangle, and results in early relief from pain and other symptoms, improving patient comfort and speeding up recovery. Additionally, early intervention leads to shorter hospital stay, which not only reduces medical expenses for patients but also minimizes the loss of daily wages. This approach also reduces pressure on healthcare systems by optimizing use of resources and improving patient flow.

Conflicts of interest: Nil
Funding source: Nil

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