



ORIGINAL ARTICLE

**Safety and Feasibility of Early versus Interval Laparoscopic Cholecystectomy for Acute Calculus Cholecystitis**

Dhruv Jodhabhai Dodiya<sup>1</sup>, Sanjeev Agarwal,<sup>2</sup> Mitkumar Patel,<sup>3</sup> Dushyant Kumawat,<sup>4</sup> Yogesh Kumar,<sup>4</sup> Mohit Kumar Badgurjar,<sup>5</sup> Manav Jindal<sup>1</sup> and Pooja Jain<sup>1</sup>

<sup>1</sup>Resident, Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur

<sup>2</sup>Professor and HOD, Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur

<sup>3</sup>Associate Professor, Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur

<sup>4</sup>Assistant Professor, Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur

<sup>5</sup>Professor, Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur

Accepted: 06-October-2025 / Published Online: 10-November-2025

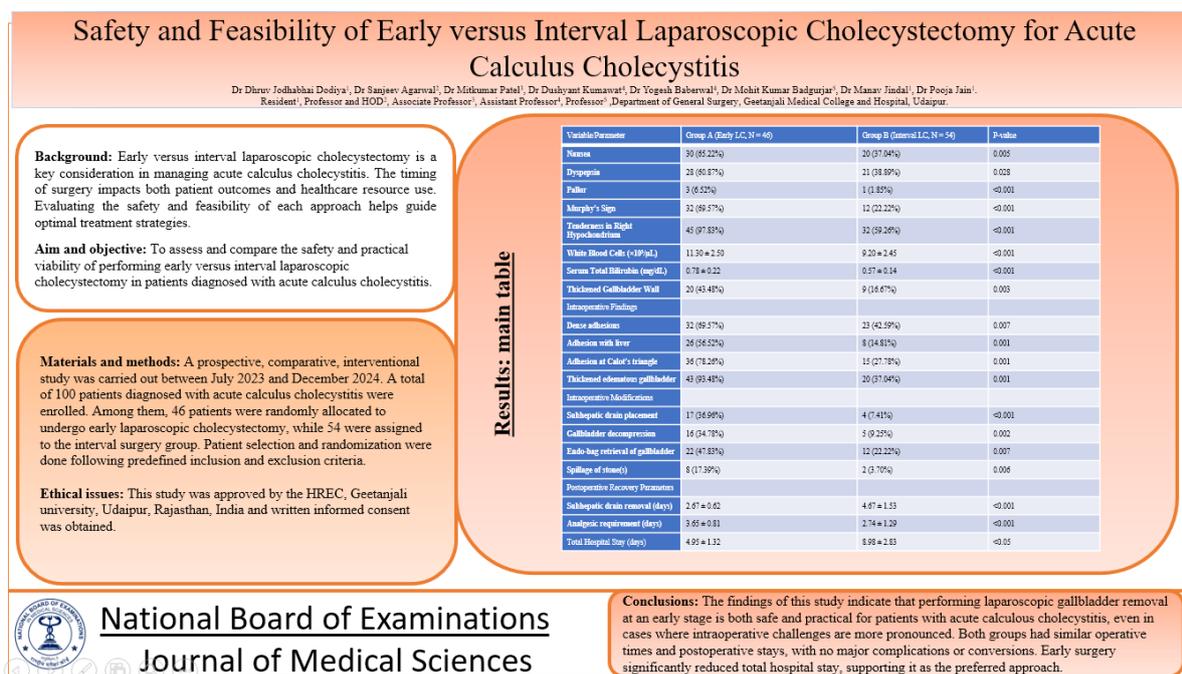
**Abstract**

**Background:** Early versus interval laparoscopic cholecystectomy is a key consideration in managing acute calculus cholecystitis. The timing of surgery impacts both patient outcomes and healthcare resource use. Evaluating the safety and feasibility of each approach helps guide optimal treatment strategies. **Aim and objective:** To assess and compare the safety and practical viability of performing early versus interval laparoscopic cholecystectomy in patients diagnosed with acute calculus cholecystitis. **Materials and methods:** A prospective, comparative, interventional study was carried out between July 2023 and December 2024. A total of 100 patients diagnosed with acute calculus cholecystitis were enrolled. Among them, 46 patients were randomly allocated to undergo early laparoscopic cholecystectomy, while 54 were assigned to the interval surgery group. Patient selection and randomization were done following predefined inclusion and exclusion criteria. **Results:** The comparison between the early and interval laparoscopic cholecystectomy groups revealed no statistically significant variations in conversion rates to open surgery, operative duration, the incidence of postoperative complications, or the length of postoperative hospitalization. However, the early laparoscopic cholecystectomy group showed significantly intraoperative complications and required intraoperative modifications. Additionally, patients in the early surgery group had a notably shorter overall hospital stay. **Conclusion:** The findings of this study indicate that performing laparoscopic gallbladder removal at an early stage is both safe and practical for patients with acute calculous cholecystitis, even in cases where intraoperative challenges are more pronounced. Both groups had similar operative times and postoperative stays, with no major complications or conversions. Early surgery significantly reduced total hospital stay, supporting it as the preferred approach.

**Keywords:** Acute calculus cholecystitis, early laparoscopic cholecystectomy, interval laparoscopic cholecystectomy, cholelithiasis

\*Corresponding Author: Dhruv Jodhabhai Dodiya  
Email: dr.dhruvdodiya@gmail.com

## Graphical Abstract



## Introduction:

Acute calculus cholecystitis is one of the most frequent emergencies in gastrointestinal and hepatobiliary surgery, especially affecting older populations [1]. Cholecystectomy remains the definitive treatment, with laparoscopic cholecystectomy (LC) now widely accepted as the standard surgical approach [8]. However, the optimal timing of LC whether early (within 5 to 7 days of symptom onset [12]) or delayed (after 6–8 weeks of conservative management) continues to be a topic of clinical debate [4, 10, 13].

Early LC offers the advantage of definitive treatment during the same hospital admission, potentially reducing complications, recurrence, and total hospital stay. On the other hand, technical difficulties such as inflammation, edema, and distorted anatomy may increase the risk of intraoperative complications during early surgery [2, 3]. Delayed LC allows inflammation to resolve but carries the risk

of recurrent symptoms, failed conservative therapy, and longer overall treatment duration [11].

This research is designed to evaluate both the safety and practical feasibility of performing laparoscopic cholecystectomy either at an early stage or after a delay (interval) in patients diagnosed with acute calculus cholecystitis and help guide optimal surgical timing.

## Materials and Methods

The research employed a prospective, comparative approach at the General Surgery Department and Surgical Gastroenterology, GMCH, Udaipur, after secure permission from the Institutional Research Ethics Committee. One hundred patients diagnosed with acute calculus cholecystitis and scheduled for laparoscopic cholecystectomy were enrolled following informed written consent.

Patients aged 18 years or older of both genders are admitted with acute

calculous cholecystitis were included. Those presenting after 7 days of symptom onset with complicated cholecystitis, patients with choledocholithiasis or those who had undergone ERCP were excluded from the research.

Eligible participants were randomly divided into two groups using a randomization technique. Group A (early laparoscopic cholecystectomy) comprised 46 patients who underwent surgery within 5 to 7 days after the onset of symptoms. Group B (interval laparoscopic cholecystectomy) included 54 patients who first received conservative management and then had surgery roughly six weeks later.

All patients underwent thorough preoperative evaluation, including clinical examination and investigations such as CBC, KFT, LFT, coagulation profile, abdominal ultrasound and additional tests as required. Intraoperative findings such as adhesions, bile leaks, additional port use, operative time, and conversion to open operation were documented. Postoperative outcomes including analgesic needs, complications, drain removal timing, and

hospital stay duration, were also documented using a standardized data collection form.

Data analysis was conducted using SPSS version 16. Categorical variables were summarized as frequencies and percentages and compared using the Chi-square test. Continuous variables were reported as mean  $\pm$  standard deviation and assessed with the unpaired t-test following normality verification. A p-value below 0.05 was deemed statistically significant.

### Results

The research involved 100 patients accompanied by acute calculous cholecystitis, randomly allotted to early laparoscopic cholecystectomy (46 patients) or interval laparoscopic cholecystectomy (54 patients). Both groups were analogous in standings of average age  $49.07 \pm 15.55$  years in the early group and  $49.17 \pm 14.87$  years in the interval group with no statistically notable gap. Gender distribution was also similar, with females making up 58.7% in the early group and 74.1% in the interval group ( $p = 0.63$ ) (Table 1).

Table 1. Baseline Demographic and Clinical Characteristics of Study Participants.

Variable	Group A (Early LC) (N = 46)	Group B (Interval LC) (N = 54)	P-value
<b>Age Group (years)</b>			
21 to 40	17 (36.96%)	17 (31.48%)	> 0.05
41 to 60	19 (41.30%)	24 (44.44%)	
61 to 80	10 (21.74%)	13 (24.07%)	
Mean Age (years)	$49.07 \pm 15.55$	$49.17 \pm 14.87$	
<b>Sex</b>			
Female	27 (58.70%)	40 (74.07%)	0.63
Male	19 (41.30%)	14 (25.93%)	
Male: Female ratio	1:2.03		
<b>Comorbidities</b>			

Hypertension	11 (23.91%)	9 (16.67%)	0.37
Previous Abdominal Surgery	8 (17.39%)	13 (24.07%)	0.41
Diabetes Mellitus	4 (8.70%)	6 (11.11%)	0.68

Values are displayed as numbers alone, as mean  $\pm$  standard deviation and number (%).

The prevalence of comorbid conditions such as hypertension, prior abdominal operation and diabetes did not vary suggestively between groups, indicating balanced baseline characteristics. (Table 1).

All patients in both groups presented with abdominal aching, Nausea, dyspepsia and vomiting were more frequent in the early surgery group, with nausea showing a statistically significant difference ( $p = 0.005$ ). Murphy's sign and

right upper quadrant tenderness were significantly frequent in Group A ( $p < 0.001$ ). Laboratory values showed higher WBC counts and bilirubin (total) levels in the early group ( $p < 0.001$ ), indicating a more acute inflammatory response. Ultrasound revealed more cases of gallbladder wall thickening in the early group ( $p = 0.003$ ), while the quantity of gallstones and pericholecystic fluid presence did not differ significantly (Table 2).

Table 2. Preoperative Clinical Features, Laboratory Parameters, and Ultrasonographic Findings

Parameter	Group A (Early LC) (N = 46)	Group B (Interval LC) (N = 54)	P-value
<b>Presenting Symptoms</b>			
Pain	46 (100%)	54 (100%)	–
Nausea	30 (65.22%)	20 (37.04%)	0.005
Dyspepsia	28 (60.87%)	21 (38.89%)	0.028
Vomiting	24 (52.17%)	18 (33.33%)	0.057
<b>Clinical Signs</b>			
Pallor	3 (6.52%)	1 (1.85%)	<0.001
Murphy's Sign	32 (69.57%)	12 (22.22%)	<0.001
Tenderness in Right Hypochondrium	45 (97.83%)	32 (59.26%)	<0.001
<b>Laboratory Investigations</b>			
Haemoglobin (g/dL)	12.89 $\pm$ 1.15	12.45 $\pm$ 1.17	0.543
White Blood Cells ( $\times 10^3/\mu\text{L}$ )	11.30 $\pm$ 2.50	9.20 $\pm$ 2.45	<0.001
Serum Total Bilirubin (mg/dL)	0.78 $\pm$ 0.22	0.57 $\pm$ 0.14	<0.001
SGOT (IU/L)	46.66 $\pm$ 18.28	36.96 $\pm$ 11.41	0.090
SGPT (IU/L)	47.92 $\pm$ 19.97	38.16 $\pm$ 14.14	0.071
ALP (IU/L)	101.32 $\pm$ 45.42	104.62 $\pm$ 52.53	0.737
Serum Amylase (IU/L)	55.16 $\pm$ 22.12	36.58 $\pm$ 8.79	0.081

<b>Ultrasonographic Findings</b>			
Single Calculus	18 (39.13%)	16 (29.63%)	>0.05
Multiple Calculi	28 (60.87%)	38 (70.37%)	>0.05
Thickened Gallbladder Wall	20 (43.48%)	9 (16.67%)	0.003
Pericholecystic Fluid	5 (10.87%)	1 (1.85%)	0.06

Values are displayed as numbers alone, as mean  $\pm$  standard deviation and number (%).

Dense adhesions, subhepatic collections, and adhesions at Calot's triangle and the liver surface were significantly frequent in the early surgery group ( $p < 0.05$ ). A thickened and

edematous gallbladder was also notably more frequent in this group (93.48% vs. 37.04%;  $p = 0.001$ ). The critical view of safety was achieved in most patients across both groups (Table 3).

Table 3. Intraoperative Findings, Modifications, Complications, and Operating Time.

<b>Parameter</b>	<b>Group A (Early LC) (N = 46)</b>	<b>Group B (Interval LC) (N = 54)</b>	<b>P-value</b>
<b>Intraoperative Findings</b>			
Dense adhesions	32 (69.57%)	23 (42.59%)	0.007
Subhepatic collection	12 (26.09%)	6 (11.11%)	0.050
Adhesion with liver	26 (56.52%)	8 (14.81%)	0.001
Adhesion at Calot's triangle	36 (78.26%)	15 (27.78%)	0.001
Thickened edematous gallbladder	43 (93.48%)	20 (37.04%)	0.001
Contracted gallbladder	0 (0.0%)	2 (3.70%)	0.187
Critical view of safety achieved	41 (89.13%)	50 (92.59%)	0.547
Turbid bile/pus	4 (8.70%)	1 (1.85%)	0.118
<b>Intraoperative Modifications</b>			
Subhepatic drain placement	17 (36.96%)	4 (7.41%)	<0.001
Epigastric port enlargement	28 (60.87%)	19 (35.19%)	0.186
Use of fifth port	0 (0.0%)	1 (1.85%)	0.354
Gallbladder decompression	16 (34.78%)	5 (9.25%)	0.002
Endo-bag retrieval of gallbladder	22 (47.83%)	12 (22.22%)	0.007
Conversion to open cholecystectomy	0 (0.0%)	0 (0.0%)	–
Subtotal cholecystectomy	0 (0.0%)	0 (0.0%)	–
<b>Intraoperative Complications</b>			
Bile duct injury	0 (0.0%)	0 (0.0%)	–
Cystic artery bleeding	10 (21.74%)	6 (11.11%)	0.148
Liver bed bleeding	6 (13.04%)	2 (3.70%)	0.086
Spillage of bile	16 (34.78%)	10 (18.52%)	0.065
Spillage of stone(s)	8 (17.39%)	2 (3.70%)	0.006
Bowel injury	0 (0.0%)	0 (0.0%)	–
<b>Mean Operating Time (minutes)</b>	120.22 $\pm$ 27.78	119.26 $\pm$ 30.37	–

Values are displayed as numbers alone, as mean  $\pm$  standard deviation and number (%).

More intraoperative adjustments were needed in the early group, including subhepatic drain placement ( $p < 0.001$ ), gallbladder decompression ( $p = 0.002$ ), and endo-bag retrieval ( $p = 0.007$ ). No conversions to open operation were reported in either group (Table 3).

Stone spillage occurred more in early cases ( $p = 0.006$ ), while other complications like bleeding and bile spillage were higher but not statistically significant. Operating times were nearly similar among the two groups (Table 3).

Postoperative complications were minimal in both groups. Fever occurred in a few patients (6.52% in early LC vs. 1.85% in interval LC), with no cases of wound infection, ileus, or respiratory issues in either group. Recovery indicators showed significantly earlier subhepatic drain removal in the early group ( $2.67 \pm 0.62$  days) compared to the interval group ( $4.67 \pm 1.53$  days;  $p < 0.001$ ). The early group also required more postoperative analgesics ( $p < 0.001$ ). VAS pain scores on postoperative Days one and two were similar between groups (Table 4).

Table 4. Postoperative Outcomes and Recovery Parameters.

Parameter	Group A (Early LC) (N = 46)	Group B (Interval LC) (N = 54)	P-value
<b>Postoperative Complications</b>			
Fever	3 (6.52%)	1 (1.85%)	0.235
Wound infection	0 (0.0%)	0 (0.0%)	–
Ileus	0 (0.0%)	0 (0.0%)	–
Lung-related complication	0 (0.0%)	0 (0.0%)	–
<b>Postoperative Recovery Parameters</b>			
Subhepatic drain removal (days)	$2.67 \pm 0.62$	$4.67 \pm 1.53$	<0.001
Analgesic requirement (days)	$3.65 \pm 0.81$	$2.74 \pm 1.29$	<0.001
<b>Postoperative VAS Pain Score</b>			
Day 1	$3.80 \pm 0.67$	$3.74 \pm 0.52$	0.623
Day 2	$1.52 \pm 0.86$	$1.40 \pm 0.96$	0.511
<b>Postoperative Hospital Stay</b>			
Postoperative stay (days)	$2.30 \pm 0.79$	$2.20 \pm 0.83$	0.539
<b>Total Hospital Stay</b>			
Total hospital stays (days)	$4.95 \pm 1.32$	$8.98 \pm 2.83$	<0.05

Values are displayed as numbers alone, as mean  $\pm$  standard deviation and number (%).

Although the duration of postoperative stay was nearly the same, the early surgery group had a significantly minuscule total hospital stay ( $4.95 \pm 1.32$  vs.  $8.98 \pm 2.83$  days;  $p < 0.05$ ), indicating a more efficient recovery course (Table 4).

## Discussion

This research aimed to assess the safety and feasibility of early versus interval LC in the management of acute calculus cholecystitis. The results propose that early LC is a safe and effective approach, offering several clinical

advantages without accelerating the risk of substantial complications.

Demographic data, including age and sex distribution were analogous between the both groups, indicating that both early and delayed operating interventions were performed on similar patient populations. The overall male to female ratio in the present study was 1:2.03, Janjic G et al. and Gupta G et al. et al. reported the same results [20,22]. The early LC group presented with more severe clinical symptoms and laboratory abnormalities, including significantly higher WBC counts and serum bilirubin (total) levels, reflecting a more pronounced acute inflammatory response. Lal S et al. and Agarwal R et al. reported higher WBC counts and serum total bilirubin levels elevated in group A as compared to group B [16,23].

Intraoperative findings showed that dense adhesions, pericholecystic fluid, and a thickened, edematous gallbladder were significantly more common in the early group, which is expected in the acute phase. Due to acute phase intraoperative findings are more in group A as compares to group B [18,19,21]. Despite these challenges, the rate of achieving the critical view of safety was parallel in both groups and there were no conversions to open surgery or cases of bile duct injury, underscoring the safety of early intervention in experienced hands.

Intraoperative modifications, such as subhepatic drain placement, gallbladder decompression, and use of retrieval bags, were more frequently required in the early group. it can be concluded that fewer intraoperative modifications were required in group B compared to group A, likely due to the more significant intraoperative findings observed in group A [14,15]. These adaptations reflect the surgical

difficulty encountered in acute settings but did not translate into increased morbidity.

The mean operating time was almost similar in both groups, with 120.22 minutes in group A and 119.26 minutes in group B ( $p > 0.05$ ), which does not align with the results described by Lal S et al. and Bhattacharya et al. [16,24]. This discrepancy may be attributed to the fact that surgeries in both groups were performed by younger surgeons and experienced surgeons. Younger surgeons despite their skill, may require more time compared to the more experienced surgeons. The greater experience and familiarity of senior surgeons often contribute to shorter operative times, whereas less experienced surgeons may take longer due to cautious technique and less operative efficiency.

Postoperative outcomes further support early LC. Although analgesic use was slightly higher in the early group, the difference in postoperative VAS pain scores was minimal and statistically insignificant. Importantly, early LC led to significantly shorter total hospital stay, making it not only clinically effective but also economically advantageous.

Overall, this study aligns with previous research suggesting that early LC, when carried out during the initial seven days after symptoms begin, is safe and reduces the need for repeated hospital admissions, delays in definitive treatment, and potential complications of conservative management. The findings reinforce current international guidelines that advocate for early surgical intervention in suitable patients.

## Conclusion

This research demonstrates that performing laparoscopic cholecystectomy

early is both a safe and feasible approach for treating acute calculous cholecystitis, even with more challenging intraoperative conditions. While it may involve more modifications and minor complications, major risks and conversion rates remain low. With comparable operative outcomes and a significantly less total hospital stay, early surgery offers clinical and economic benefits, making it a favorable approach for timely and effective management.

### **Statements and Declarations**

#### **Ethics declarations**

#### **Ethics approval and consent to participate**

This study was approved by the HREC, Geetanjali university, Udaipur, Rajasthan, India and written informed consent was obtained.

#### **Consent for publication**

Written informed consent was obtained from the patients.

#### **Availability of data and material**

Data and material are collected and available in Geetanjali medical college and hospital, Udaipur.

#### **Competing interests**

The authors declare that they have no competing interests.

#### **Conflict of interest**

The authors declare no potential conflicts of interest concerning research, authorship, and/or publication of this article.

#### **Funding**

Not applicable

### **Acknowledgements**

Authors gratefully acknowledge the help of Dr Vidhi Gohil, Resident, Pathology Department, SMIMER hospital, Surat, Gujarat, for invaluable suggestions and revision of manuscript. Authors also like to thank Dr. Happy Datta, Dr. Meet Patel and Dr. Siddharth Daruwala for their thoughtful discussions that enriched the quality of this study.

### **References**

1. Bouassida M, Hamzaoui L, Mroua B, Chtourou MF, Zribi S, Mighri MM. et al. Should acute cholecystitis be operated in the 24 h following symptom onset? A retrospective cohort study. *Int J Surg.* 2016;25:88-90.
2. Spirou Y, Petrou A, Christoforides C, Felekouras E. History of biliary surgery. *World J Surg.* 2013;37:1006-1012.
3. Minutolo V, Licciardello A, Arena M, Nicosia A, Di Stefano B, Calì G, Arena G. Laparoscopic cholecystectomy in the treatment of acute cholecystitis: comparison of outcomes and costs between early and delayed cholecystectomy. *Eur Rev Med Pharmacol Sci.* 2014;18:40-46.
4. Beal JM. Historical perspective of gallstone disease. *Surgery, gynecology & obstetrics.* 1984 Feb;158(2):181.
5. Langenbuch C. Ein fall von exstirpation der gallenblase wegen chronischer cholelithiasis. *Heilung. Berliner Klinische Wochenschrift.* 1882;19:725-7.
6. Muehe E. 296. Die erste Cholecystektomie durch das

- Laparoskop. Langenbecks Archiv für Chirurgie. 1986 Dec 1;369(1):804.
7. Mouret P. From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery: the future prospectives. *Digestive surgery*. 1991;8(2):124-5.
  8. Schoenfield LJ, Lachin JM, Baum RA, Habig RL, Hanson RF, Hersh T, et al. Chenodiol (chenodeoxycholic acid) for dissolution of gallstones: the National Cooperative Gallstone Study: a controlled trial of efficacy and safety. *Annals of internal medicine*. 1981 Sep 1;95(3):257-82.
  9. Schoenfield LJ, Berci G, Carnovale RL, Casarella W, Caslowitz P, Chumley D, et al. The effect of ursodiol on the efficacy and safety of extracorporeal shock-wave lithotripsy of gallstones: the Dornier National Biliary Lithotripsy Study. *New England Journal of Medicine*. 1990 Nov 1;323(18):1239-45.
  10. Soper NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic Cholecystectomy The New'Gold Standard'?. *Archives of surgery*. 1992 Aug 1;127(8):917-23.
  11. Eisen GM, Dominitz JA, Faigel DO, Goldstein JL, Kalloo AN, Petersen BT, et al. An annotated algorithm for the evaluation of choledocholithiasis. *Gastrointestinal endoscopy*. 2001 Jun;53(7):864.
  12. O'Connell PR, McCaskie AW, Sayers RD, editors. *Bailey & Love's Short Practice of Surgery*. 28th ed. Boca Raton: CRC Press; 2023. p. 1245.
  13. Singh G, Singh RR, Bansal D. A comparative study of interval cholecystectomy and early cholecystectomy in acute cholecystitis. *Int Surg J*. 2020 Apr 23;7(5):1419.
  14. Gajjar J, Patel NiravB, Patel TirthD, Parmar BrijeshV. A Prospective Comparative Study Between Early And Interval Laparoscopic/open Cholecystectomy In Patients Of Acute Cholecystitis. *IJABMS*. 2022 Feb 2;24(1):66–75.
  15. Dar R, Salroo N, Matoo A, Sheikh R, Wani S, Gul R. Comparison of early and delayed laparoscopic cholecystectomy for acute cholecystitis: Experience from a single center. *North Am J Med Sci*. 2013;5(7):414.
  16. Lal S, Rohitaj R, Dua M, Singh VK, Chakravarti S. Early and Delayed Laparoscopic Cholecystectomy in Acute Calculus Cholecystitis: A Prospective Randomized-comparative Study.
  17. Kerwat D, Zargaran A, Bharamgoudar R, Arif N, Bello G, Sharma B, et al. Early laparoscopic cholecystectomy is more cost-effective than delayed laparoscopic cholecystectomy in the treatment of acute cholecystitis. *CEOR*. 2018 Feb;Volume 10:119–25.
  18. Kolla SB, Aggarwal S, Kumar A, Kumar R, Chumber S, Parshad R, et al. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a prospective randomized trial. *Surg Endosc*. 2004 Sep;18(9):1323–7.
  19. AlShahrani W. Early versus interval cholecystectomy for acute cholecystitis: 5 years local experience. *IJSM*. 2017;1.
  20. Janjic G, Simatovic M, Skrbic V, Karabeg R, Radulj D. Early vs. Delayed Laparoscopic

- Cholecystectomy for Acute Cholecystitis - Single Center Experience. *Med Arch.* 2020;74(1):34.
21. Sánchez-Carrasco M, Rodríguez-Sanjuán JC, Martín-Acebes F, Llorca-Díaz FJ, Gómez-Fleitas M, Zambrano Muñoz R, et al. Evaluation of Early Cholecystectomy versus Delayed Cholecystectomy in the Treatment of Acute Cholecystitis. *HPB Surgery.* 2016 Oct 10;2016:1–8.
  22. Gupta G, Shahbaj A, Pipal DK, Saini P, Verma V, Gupta S, et al. Evaluation of early versus delayed laparoscopic cholecystectomy in acute calculous cholecystitis: a prospective, randomized study. *J Minim Invasive Surg.* 2022 Dec 15;25(4):139–44.
  23. Agrawal R, Sood KC, Agarwal B. Evaluation of Early versus Delayed Laparoscopic Cholecystectomy in Acute Cholecystitis. *Surgery Research and Practice.* 2015;2015:1–7.
  24. Bhattacharya D, Senapati PSP, Hurle R, Ammori BJ. Urgent versus interval laparoscopic cholecystectomy for acute cholecystitis: a comparative study. *Journal of Hepato-Biliary-Pancreatic Surgery.* 2002 Nov 1;9(5):538–42.