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Original Research Article

Feasibility and safety of difficult laparoscopic cholecystectomy without using salvage procedures: a tertiary center experience

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ABSTRACT

Background: Difficult laparoscopic cholecystectomy is associated with an increased risk of serious complications and a higher conversion rate. Iatrogenic injuries and conversion rates during laparoscopic cholecystectomy are still high which can be reduced with a surgeon's experience, special techniques, and intraoperative investigations. The present study aims to determine the outcomes of performing laparoscopic total cholecystectomy rather than salvage procedures.
Methods: A retrospective analysis of 100 patients who underwent difficult laparoscopic cholecystectomy between March 2023 and March 2024 was considered for this study. Inclusion criteria were abnormal anatomy, Mirizzi syndrome, Frozen Calot's triangle, gangrenous gallbladder, and perforated gallbladder. Statistical analysis was done utilizing statistical package for the social sciences (SPSS) version 21.0, with a significance level of $p<0.05$ deemed significant.
Results: Current results show that the mean age was 58 years (18-89 years) with male predominance (68%). Three major categories of difficulty were identified which include: difficult dissection of the Calot's triangle in 42% of cases, difficulty in grasping and retracting the gallbladder (GB) in 45% of cases, and abnormal anatomy in 13% of cases. In 97% of patients, cholecystectomy was performed within the first 48 hours of admission. Among the total number of patients, 42% had phlegmonous, 12% had gangrenous cholecystitis and 5% had a subhepatic abscess. Total cholecystectomy was carried out in all patients without any damage control measures or conversion to open surgery and mortality was found to be 0%. Over a follow-up of 8 months, patients were performing well with no complications.
Conclusions: Difficult laparoscopic cholecystectomy can be completed without conversion to open surgery or switch to salvage procedures. The utmost importance is to achieve a critical view of safety (CVS).

Keywords: Difficult laparoscopic cholecystectomy, Laparoscopic total cholecystectomy, Critical view of safety

INTRODUCTION

About 10% to 15% of people have gallstone disease, which is prevalent and frequently treated surgically.[1] The most prevalent condition in hepatobiliary and digestive tract surgeries is acute cholecystitis (AC).[2]

Because of inflammatory changes like edema, exudate, adhesions with surrounding structures, hypervascularity, and congestion that degrade tissue quality and make it challenging to see the anatomical structures clearly, acute cholecystitis was once thought to be a relative contra-indication for laparoscopic cholecystectomy (LC).[3] But now, laparoscopy has emerged as the "gold standard" for treating acute cholecystitis as technology advancements have been accompanied by improvements in surgical performance.[4]

The treatment of choice for AC prior to the introduction of LC was open cholecystectomy. As a result, it became

commonplace to undergo LC after completing conservative therapy.[5] Early LC is a safe alternative in acute cholecystitis; if cholecystectomy is postponed, the patient may experience more gallstone complications and require a longer hospital stay; if not, there may be a higher chance of conversion to open cholecystectomy.[6] Two medical and financial benefits of LC's viability make it the technique of choice: a short postoperative stay and low morbidity.[7]

Acute cholecystitis was classified into grade I, grade II, and grade III by the Tokyo guidelines 2018 (TG18), which are linked to a higher risk of vasculobiliary damage and a higher conversion rate to open surgery.[8] TG18 recommends early cholecystectomy regardless of the development of symptoms, but it also recommends early cholecystectomy within 72 hours of symptoms.[9]

Difficult gall bladder (DGB) is linked to Mirizzi syndrome, significant adhesions, GB perforation, and surgery that takes longer than 120 minutes.[10] Because of these factors, a higher percentage of patients require a subtotal cholecystectomy (STC) rather than the gold standard for treating AC, i.e. laparoscopic total cholecystectomy (LTC).[11] Lidsky et al described STC as the inability of a surgeon to safely separate the cystic duct, whereas Strasberg et al classified it into fenestrating and reconstituting types.[12,13] The goal of the current study is to ascertain the success rate of LTC and its outcomes for patients with DBG.

METHODS

The Department of Surgical Gastroenterology and Minimal Access Surgery at Yashoda Super Specialty Hospitals, Somajiguda, Hyderabad, conducted this single-centric retrospective observational study from March 2023 to March 2024.

The electronic medical records of 100 individuals whose surgeries were carried out by the same surgical team with experience in LC were chosen for analysis out of 228 patients who had LC for acute cholecystitis and cholelithiasis in order to compare standard surgical performances. Background information was gathered on gender, age, comorbidities, cholecystitis grade, gallbladder pre-operative drainage, LC timing, morbidity, and mortality.

Clinical, laboratory, and radiological data were used to diagnose AC. Clinical criteria include axillary body temperature above 37.5°C, local tenderness, and pain in the right upper quadrant of the abdomen. Laboratory requirements included C reactive protein (CRP) values above 5 mg/L and white blood cell counts above 10,000 cells/cc. Pericholecystic fluid, gallbladder distention with increased wall thickness, and a positive ultrasonographic Murphy's sign were the radiological criteria. Pre-operative biliary tract evaluations were performed for all patients suspected of cholecystitis with USG or CECT or magnetic resonance cholangiopancreatography (MRCP) of whole abdomen.

Inclusion criteria

The consecutive patients who underwent LC and met the criteria for DGB i.e. necrotic or gangrenous GB, involved Mirizzi syndrome, had extensive adhesions and surgery lasted for more than 120 min were included in this study

Exclusion criteria

Patients without a difficult gall bladder and who underwent LC during other surgical procedures were excluded from this study.

Empirical antibiotic treatment (AT) was administered to patients with AC in accordance with the following guidelines.[14,15] In grade I AC, AT was stopped 48 hours after LC, and in grade II, if certain conditions were present (such as perforation, gangrenous/emphysematous changes pericholecystic abscess, or gallbladder necrosis), it was prolonged for 3–7 days. In grade III AC, AT was administered for 4–7 days following LC.

LC was carried out for DGB, such as necrotic or gangrenous gall bladder (Figure 1a) with Mirizzi syndrome, which had substantial adhesions (Figure 1b), using a normal four-trocar technique.[16] The common bile and hepatic ducts were preserved, the lower third of the gallbladder was separated from the liver to expose a cystic plate, Calot's triangle was cleared of fatty and fibrous tissue, and only two structures were eventually introduced into the gallbladder (Figure 1c). Hasson's trocar was used to enter the abdominal cavity from the umbilicus. A suction needle was used to decompress the gallbladder, and it's vital to meet the critical view of safety.[17] While blunt dissection is better in an emergency situation to avoid vascular or biliary damage and to take advantage of anatomical planes concealed from the inflammatory response, monopolar diathermy is still recommended for accurate dissection. Following identification, a retrograde cholecystectomy was performed, and the cystic duct and cystic artery were clipped and separated. The time from skin incision to closure is included in the operation's duration. An Endo bag was used to externalize the resected specimens through the umbilical port. At the conclusion of the procedure, the fasciae at the epigastric trocar entry point and the sheath at the umbilical port were closed. A consultant with over 30 years of experience in minimally invasive surgery carried out all operations.

Statistical analysis

The statistical analysis was performed using IBM statistical package for the social sciences (SPSS) version 21.0. Mean±SD was used to present the quantitative data. Cronbach's alpha test was used if the data failed the Normality test and the unpaired t -test was used if the data passed. Number (%) was used to present the results of

categorical measurements. Fisher's exact test and Chi-square test with continuity correction were used to evaluate the associations between qualitative variables in all two-by-two tables. A $p<0.05$ was deemed statistically significant.

RESULTS

Analysis was done on the outcomes of 100 patients who had laparoscopic total cholecystectomy (LTC) in DGB. Table 1 shows the demographic characteristics of the 100 patients enrolled in the study. After being admitted to the hospital, 17% of patients had surgery within 12 hours, 47% within 24 hours, 33% within 48 hours, and 3% within 72 hours. According to the data, the procedure was carried out within the first 48 hours for 97% of patients, following active measures. Following preoperative preparation, the laparoscopic procedure was carried out. The patients' ages ranged from 18 to 89 years (average age of 58.7 years), and 68% of them were men. 42 patients had no comorbidities, while 58 patients had comorbid conditions such as diabetes mellitus, bronchial asthma, cardiovascular disease, hypertension, and neurogenic diseases.

Table 1: Baseline characteristics of the study sample.

Characteristics	Total study sample (n=100), N (%)
Age (years)	18-89
Male	68 (68)
Female	32 (32)
Timing of surgery after hospitalization (hours)	
12	17 (17)
24	47 (47)
48	33 (33)
72	03 (3)
Comorbidities	
Yes	58 (58)
No	42 (42)

The diagnostic criteria for acute cholecystitis were determined by the Tokyo guidelines. According to the severity grading of the TG18, the severity of patients 32% was grade I (mild), 59% was grade II (moderate) and 9% was grade III (severe) (Table 2).

Table 2: Severity grading according to TG18.

Severity grading according to TG18	Total study sample (n=100), N (%)
Grade I	32 (32)
Grade II	59 (59)
Grade III	9 (9)

All patients with clinical suspicion of acute cholecystitis underwent ultrasound as their primary imaging modality, while 86 patients had signs of acute calculous cholecystitis and 14 patients had acute cholecystitis without radiologically visible stones. Computed tomography was primarily used in patients with severe or diffuse symptoms (22%), and MRCP in patients (12%) who also had suspected bile duct stones.

The three main categories of difficulty are displayed in Table 3. 45 cases had trouble gripping and retracting the GB, 42 cases had trouble dissecting the Calot's triangle, and 13 cases had aberrant anatomy. The gallbladder was tight, swollen, and frequently soldered to the greater omentum in all of these instances. In 39 cases, the gallbladder was punctured and 30 to 50 ml of bile was evacuated. Out of all the patients, 5% had a subhepatic abscess, 12% had gangrenous cholecystitis, and 42% had phlegmonous.

Table 3: Category of difficulty and GB condition.

	Total study sample (n=100), N (%)
Category of difficulty	
Difficulty in grasping and retraction of the GB	45 (45)
Difficult dissection of the Calot’s triangle	42 (42)
Abnormal anatomy	13 (13)
Gall bladder condition	
Phlegmonous	42 (42)
Gangrenous cholecystitis	12 (12)
Subhepatic abscess	5 (5)

In 28% of instances, there was a gallbladder perforation during dissection or extraction. While the gall bladder bed was sutured in a small number of cases, SNoW (oxidized regenerated cellulose) was used in 64% of cases to establish hemostasis. Twelve patients require the insertion of a drain in the subhepatic space. Using the conventional method, the operation took between 50 and 150 minutes (an average of 84.0±5.7 minutes).

There were no patients who underwent conversion from laparoscopic to open cholecystectomy. Of the 15 patients who experienced postoperative complications, 2 had surgical site infections, 5 had pulmonary complications, 3 had cardiac complications, and 5 who experienced nausea and vomiting (PONV) needed more antiemetics than usual; none had postoperative cholangitis or postoperative bile leak; there were no biliary injuries, postoperative cholangitis, or 30-day mortality.

83 patients were discharged from the hospital 2-3 days after the procedure, while the remaining 17 were hospitalized for 4-5 days because their concomitant conditions worsened and needed further medication correction. A clinical evaluation was conducted on 52 individuals during an 8-month follow-up period. No abnormalities were found in any of the patients, except three who experienced mild epigastric pain. According to histopathological analysis, 76% of patients had acute cholecystitis, 14% had gangrenous cholecystitis, and 10% had an exacerbation of chronic cholecystitis (Table 4).

Table 4: Histopathological findings.

Histopathology findings	Total study sample (n=100), N (%)
Acute cholecystitis	76 (76)
Gangrenous cholecystitis	14 (14)
Chronic cholecystitis	10 (10)

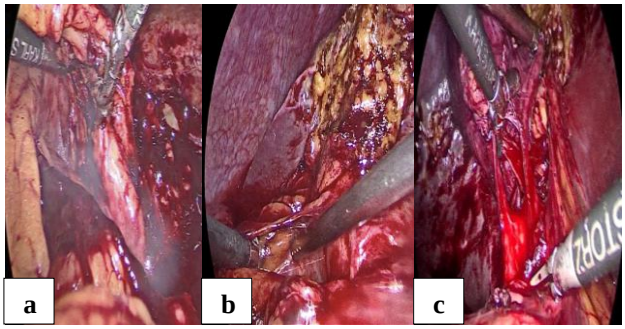

Figure 1: (a) Gangrenous gall bladder, (b) gallbladder extensive adhesions, and (c) two structures should be introduced into the gallbladder.

DISCUSSION

LC has emerged as the prevailing method for the management of acute cholecystitis. Safety and viability are the main issues, as evidenced by the possibility of conversion to an open cholecystectomy and the possibility of postoperative problems, especially those involving bile duct damage. Indicators of the complexity of laparoscopic cholecystectomy procedures include age, gender, the frequency of pain episodes, and the presence of comorbidities.[18] The majority of the participants in our study were older men, which was consistent with evidence from around the world showing that male sex and advanced age were predictors of challenging cholecystectomy.[19]

Severe Calot's triangle inflammation can cause fibrosis and change the anatomical landmarks, putting the common hepatic duct, common bile duct, and cystic duct at risk for iatrogenic injury.[20] The Tokyo 2018 recommendations have linked a higher risk of bile duct injury (BDI) to the severity of acute cholecystitis.[21]

Locating Rouvière's sulcus and achieving a critical view of safety (CVS) are two methods for preventing BDI.[22] Here, Calot's triangle is dissected, the lower 1/3 of the gallbladder separated from the liver and the two structures enter the gallbladder. According to Kaushik et al, a frozen calot or a bile duct damage is the primary cause of conversion.[23] However, unwanted conversion can frequently be avoided during the operation with the assistance of a senior expert. According to our research, the laparoscopic method had a decreased rate of wound infection, which is consistent with findings of Elshaer et al.[24] To treat acute cholecystitis with DGB, our study has shown that laparoscopic complete cholecystectomy is feasible with no special complications during the surgery.

While laparoscopic treatment for Mirizzi syndrome (MS) reports a cumulative conversion rate of 36.4% Chowbey et al, Yeh et al, observed a 22% conversion rate in MS patients.[25,26] It is difficult to perform randomized controlled trials comparing laparoscopic partial cholecystectomy with laparoscopic total cholecystectomy in the treatment of DBG since few centers are opting for laparoscopic total cholecystectomy for AC with DGB.

Due to the retrospective enrollment in this single-center investigation, bias about a limited number of selected patients may be one of the study's drawbacks. Additionally, certain difficulties occur too seldom for conclusions to be made about them.

CONCLUSION

Laparoscopic total cholecystectomy appears to be a reliable, safe, and cost-effective procedure for DGB. We believe that intraoperatively, it is of utmost importance to achieve CVS with a careful approach. However, the decision to complete the cholecystectomy or use a salvage strategy will depend on the judgment and skills of the surgeon.

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REFERENCES

1. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: cholelithiasis and cancer. Gut Liver. 2012;6(2):172-87.
2. Bouassida M, Hamzaoui L, Mroua B, Chtourou MF, Zribi S, Mighri MM. et al. Should acute cholecystitis be operated on in the 24 hours following symptom onset? A retrospective cohort study. Int J Surg. 2016;25:88-90.
3. Spirou Y, Petrou A, Christoforides C, Felekouras E. History of biliary surgery. World J Surg. 2013;37(5):1006-12.
4. Nagle P, Soper NJ, Hines JR. Cholecystectomy (open and laparoscopy). In: Maingot's: Abdominal Operations. Zinner MJ, Asmhley SW, Editors. McGraw-Hill, New York, NY, USA, 11th edition. 2007;847-61.
5. Cuschieri A, Dubois F, Mouiel J, Mouret P, Becker H, Buess G, et al. The European experience with

laparoscopic cholecystectomy. Am J Surg. 1991;161(3):385-7.
6. Koo KP, Thirlby RC. Laparoscopic cholecystectomy in acute cholecystitis: what is the optimal timing for operation? Arch Surg. 1996;131(5):540-5.
7. Gourgiotis S, Dimopoulos N, Germanos S, Vougas V, Alfaras P, Hadjiyannakis E. Laparoscopic cholecystectomy: a safe approach for management of acute cholecystitis. J Soc Laparoendosc Surg. 2007;11(2):219-24.
8. Schirmer BD, Edge SB, Dix J, Hyser MJ, Hanks JB, Jones RS. Laparoscopic cholecystectomy. Treatment of choice for symptomatic cholelithiasis. Ann Surg. 1991;213(6):665-76.
9. Wakabayashi G, Iwashita Y, Hibi T, Takada T, Strasberg SM, Asbun HJ, et al. Tokyo Guidelines 2018: surgical management of acute cholecystitis: safe steps in laparoscopic cholecystectomy for acute cholecystitis (with videos). J Hepatobiliary Pancreat Sci. 2018;25(1):73-86.
10. Wennmacker SZ, Bhimani N, van Dijk AH, Hugh TJ, de Reuver PR. Predicting operative difficulty of laparoscopic cholecystectomy in patients with acute biliary presentations. ANZ J Surg. 2019;89(11):1451-6.
11. Maehira H, Kawasaki M, Itoh A, Ogawa M, Mizumura N, Toyoda S, et al. Prediction of difficult laparoscopic cholecystectomy for acute cholecystitis. J Surg Res. 2017;216:143-8.
12. Shin M, Choi N, Yoo Y, Kim Y, Kim S, Mun S. Clinical outcomes of subtotal cholecystectomy performed for difficult cholecystectomy. Ann Surg Treat Res. 2016;91(5):226-32.
13. Serralta S, Bueno JL, Planells MR, Rodero DR. Prospective evaluation of emergency versus delayed laparoscopic cholecystectomy for early cholecystitis. Surg Laparosc Endosc Percutaneous Technique. 2003;13(2):71-5.
14. Strasberg SM, Pucci MJ, Brunt LM, Deziel DJ. Subtotal Cholecystectomy-"Fenestrating" vs "Reconstituting" Subtypes and the Prevention of Bile Duct Injury: Definition of the Optimal Procedure in Difficult Operative Conditions. J Am Coll Surg. 2016;222(1):89-96.
15. Gomi H, Solomkin JS, Takada T, Strasberg SM, Pitt HA, Yoshida M, et al. TG13 antimicrobial therapy for acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci. 2013;20(1):60-70.
16. Solomkin JS, Mazuski JE, Bradley JS, Rodvold KA, Goldstein EJ, Baron EJ, et al. Diagnosis and management of complicated intra-abdominal infection in adults and children: guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. Clin Infect Dis. 2010;50(2):133-64.
17. Ambe P, Weber SA, Christ H, Wassenberg D. Cholecystectomy for acute cholecystitis. How time-critical are the so called "golden 72 hours"? Or better "golden 24 hours" and "silver 25-72 hour"? A case control study. World J Emerg Surg. 2014;9(1):60.
18. Akcakaya A, Okan I, Bas G, Sahin G, Sahin M. Does the Difficulty of Laparoscopic Cholecystectomy Differ Between Genders? Indian J Surg. 2015;77(Suppl 2):452-6.
19. Gallagher TK, Kelly ME, Hoti E. Meta-analysis of the cost-effectiveness of early versus delayed cholecystectomy for acute cholecystitis. BJS Open. 2019;3(2):146-52.
20. Sugrue M, Sahebally SM, Ansaloni L, Zielinski MD. Grading operative findings at laparoscopic cholecystectomy-a new scoring system. World J Emerg Surg. 2015;10:14.
21. Mayumi T, Okamoto K, Takada T, Strasberg SM, Solomkin JS, Schlossberg D, et al. Tokyo Guidelines 2018: management bundles for acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci. 2018;25(1):96-100.
22. van Dijk AH, Donkervoort SC, Lameris W, de Vries E, Eijsbouts QAJ, Vrouenraets BC, et al. Short and long-term outcomes after a reconstituting and fenestrating subtotal cholecystectomy. J Am Coll Surg. 2017;225(3):371-9.
23. Kaushik R, Sharma R, Batra R, Yadav TD, Attri AK, Kaushik SP. Laparoscopic cholecystectomy: an Indian experience of 1233 cases. J Laparoendosc Adv Surg Tech A. 2002;12(1):21-5.
24. Elshaer M, Gravante G, Thomas K, Sorge R, Al-Hamali S, Ebdewi H. Subtotal cholecystectomy for "difficult gallbladders": systematic review and meta-analysis. JAMA Surg. 2015;150(2):159-68.
25. Chowbey PK, Sharma A, Mann V, Khullar R, Baijal M, Vashistha A. The management of Mirizzi syndrome in the laparoscopic era. Surg Laparosc Endosc Percutan Tech. 2000;10(1):11-4.
26. Yeh CN, Jan YY, Chen MF. Laparoscopic treatment for Mirizzi syndrome. Surg Endosc. 2003;17(10):1573-8.

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