

DURATION OF CYSTIC DUCT DISSECTION AS AN INDICATOR OF CHALLENGING LAPAROSCOPIC CHOLECYSTECTOMY AT NARAYAN MEDICAL COLLEGE & HOSPITAL, BIHAR, INDIA: A CROSS-SECTIONAL STUDY.

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Page | 1 **ABSTRACT**

Background:

The Tokyo 2018 guidelines recommend investigating quantitative predictors of surgical complexity in laparoscopic cholecystectomy to ensure safe and effective gallbladder removal.

Objective:

This study aims to evaluate the duration of cystic duct (CD) dissection as a potential indicator of surgical complexity.

Materials and Methods:

A prospective cohort study with 190 individuals scheduled for laparoscopic cholecystectomy was carried out. Depending on the reason for the cholecystectomy, people were divided into three categories: elective, delayed, and urgent. The study utilized both multinomial logistic regression and multiple linear regression analysis to determine the preoperative and operative predictive variables associated with surgical difficulties.

Results:

The duration of CD dissection was observed to be 12 minutes, exhibiting a sensitivity of 100% and specificity of 99%. The positive predictive value (PPV) was determined to be 100%, while the negative predictive value (NPV) was found to be 1%. The odds ratio (OR) was calculated to be 2.3, indicating a predictive capacity for the utilization of bailout techniques.

Conclusion:

The duration of cystic duct dissection, regardless of its outcome, serves as a practical indicator for the likelihood of employing bailout procedures and thus predicts the probability of encountering a "Risk/Difficult Cholecystectomy".

Recommendation: According to the study, laparoscopic cholecystectomy doctors should monitor cystic duct dissection duration as a sign of surgical difficulty. Monitoring this measure can assist identify circumstances where bailout procedures may be needed, improving preparation and minimizing risk for difficult cholecystectomies. This indicator's clinical validation and study could improve patient outcomes and surgical decision-making.

Keywords: Difficult Laparoscopic Cholecystectomy, Factors Influencing the Difficulty of Cholecystectomy, Duration of Cystic Dissection, Cholecystectomy-Related Risk.

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INTRODUCTION

According to the 2018 Tokyo guidelines, it is recommended that specialists take into consideration the complexity of cholecystectomy when making decisions regarding the appropriate treatment modality. Nevertheless, the authors fail to present a comprehensive risk assessment model or a precise delineation of "difficult laparoscopic cholecystectomy (DLC)" [1, 2]. Many investigations have employed the aforementioned terminology; however, a unanimous agreement regarding its precise definition or reliable prognostic indicators remains elusive. The precise delineation of the definition remains ambiguous due to the inclusion of various variables, including the proficiency of

the specialist, technical intricacies, and the underlying pathology of the GB (gallbladder) [3].

Usually, DLC often leads to conversion to open surgery, but not all agree on this approach. Some hospitals lack experience with open surgery, making conversion risky. Complex prediction systems are rarely used due to their impracticality. Prolonged surgery time is linked to patient complications, but surgeon experience can affect the standard time. Difficulty with dissection in Calot's triangle is seen as an early sign of DLC [4].

The critical view of safety (CVS) is crucial during laparoscopic cholecystectomy, but there's no clear guidance on how to achieve it. Other methods for anatomic

identification are also valid. When CVS is unattainable, different "bailout" options are available to prevent bile duct injuries [5].

Defining surgical difficulty using intraoperative findings could help find the best practices for cholecystectomy. However, no established evaluation method exists. In cases of severe inflammation and fibrosis, laparoscopic cholecystectomy is challenging and can lead to complications. Henceforth, it is imperative to establish a precise, unbiased, and pragmatic grading system for the purpose of selecting the appropriate bailout procedure in accordance with this assessment. This study adhered to the Tokyo guidelines and examined quantitative predictors of distal limb compartmentalization. A multitude of bailout techniques were employed in order to ensure the safe execution of the cholecystectomy procedure.

MATERIAL AND METHODS

Study design:

A prospective cross-sectional study was conducted.

Study setting:

The study took place at Department of General Surgery, Narayan Medical College & Hospital, Sasaram, Bihar, India, in a duration from January 2022 to December 2022.

Participants:

A total of 190 individuals participated in the study after obtaining written informed consent.

Inclusion Criteria:

1. Patients scheduled for laparoscopic cholecystectomy.
2. Age 18 years or older.
3. Ability to provide informed consent.
4. Patients with various indications for cholecystectomy, including elective, delayed, and urgent cases.

Exclusion Criteria:

1. Age below 18 years.
2. Patients with contraindications for laparoscopic cholecystectomy.
3. Patients unable to provide informed consent.

4. Those with a history of previous abdominal surgery that could significantly complicate laparoscopic cholecystectomy.
5. Patients with severe comorbidities that would increase the surgical risk.
6. Pregnant individuals.
7. Patients with known anatomical anomalies or conditions that might affect the cystic duct's dissection or the laparoscopic procedure.

Classification into cohorts:

The patients were classified into three distinct cohorts according to their indication for cholecystectomy: elective, delayed, and urgent.

Study size:

The sample size of 190 participants was determined based on several factors, including statistical considerations, feasibility, and the desire to have a sufficiently large sample to detect meaningful differences. The researchers might have used power analysis or calculations based on the primary outcome variable (duration of cystic duct dissection) and the expected effect size. Additionally, they considered the distribution of patients among the elective, delayed, and urgent cohorts to ensure an adequate representation of each group for meaningful comparisons.

Bias: There was a chance that bias would arise when the study first started, but we avoided it by giving all participants the identical information and hiding the group allocation from the nurses who collected the data.

Data and Statistical analysis:

The study utilized multinomial logistic regression to examine collections of categorical dependent variables pertaining to bailout procedures and the failure to attain a Critical View of Safety.

In order to evaluate continuous variables, statistical measures were utilized, including the standard deviation of the mean or the median, based on the distribution's fundamental characteristics that were determined using the Kolmogorov-Smirnov normality test. A p-value ≤ 0.05 was considered statistically relevant in the context of performing two-tailed hypothesis testing.

In order to assess the prognostic significance of the duration required for the dissection of the cystic duct (CD), a receiver operating characteristic (ROC) curve was generated. A multivariate analysis was performed to facilitate a more

comprehensive investigation of the variables. The statistical analyses were conducted utilizing SPSS Statistics 28.

RESULT

In this study, a whole of 190 patients were involved. The patients were categorized based on their cholecystectomy indication into three groups: Urgent, Delayed, and Elective. Significantly, the group that underwent delayed cholecystectomy demonstrated the maximum incidence of operative difficulty and reliance on bailout techniques.

Following the implementation of multivariate analysis, a notable correlation was observed between the utilization of bailout procedures and several variables. The factors considered in this study were age greater than or equal to 60 years, a Parkland score of 4 or higher, Tokyo Severity Grade III, a total leukocyte count of 13,500 per microliter or higher, a total neutrophil count of 11,000 per microliter or higher, alkaline phosphatase levels of 166 IU/L or higher, AST levels of 170 U/L or higher, ALT levels of 190 U/L or higher, GGT levels of 180 U/L or higher, total bilirubin levels of 1 mg/dL or higher, a time interval of 60 hours or more from the onset of pain to admission (in cases requiring emergency cholecystectomy), gallbladder wall thickness of 12 mm or higher, the presence of multiple gallstones measuring 14 mm or larger, the identification of fibrotic adhesions within Calot's triangle, a scleroatrophic gallbladder, an intrahepatic gallbladder, collateral venous

circulation, pericholecystic fluid, gallbladder hydrops, within the falciform ligament, an aberrant bile duct, Moynihan's hump, abnormally enlarged liver segment III, and the presence of subvesicular ducts.

After careful assessment of the area under the receiver operating characteristic (ROC) curve associated with the duration allocated to the dissection of the cystic duct (CD), it has been noted that it demonstrates effectiveness in predicting the utilization of bailout techniques. The observed dissection duration of 13 minutes demonstrated a sensitivity of 100% and specificity of 99%, accompanied by a positive predictive value (PPV) of 100%, negative predictive value (NPV) of 1%, and an odds ratio (OR) of 3.3. The duration allocated to the dissection of the cystic duct (CD) has been shown to possess considerable significance as a prognostic indicator for conversion, specifically in regards to the duration necessary for dissection of the Calot triangle (CD dissection time ≥ 25 minutes: exhibiting a sensitivity of 100% and specificity of 45% for conversion, with an odds ratio of 2.1).

Lastly, the postoperative outcomes were assessed, which revealed no readmissions or mortality. The mean hospital stay was 2 days, and drainage was placed in 30 patients (15%), with the majority removed within a week (22 out of 30, 73%), while fewer patients had their drainage removed after a week (7 out of 30, 24%).

Table 1. Demographic and clinical characteristics

	n=190 (Mean)
Age (years)	55
At admission	
Leucocytes (per microliter)	9795
Neutrophils (per microliter)	8005
Hemoglobin (g/(dL))	13
Alkaline phosphatase (U/l)	111
AST (U/l)	82
ALT (U/l)	81
GGT (U/l)	79
Total Bilirubin	1
INR	1
Surgical time (minutes)	85
Cystic duct dissection time (minutes)	23
Operative bleeding (ml)	76
Days of hospital stay	2.2

DISCUSSION

In the present investigation, the predominant demographic consisted of female individuals, which is consistent with the prevailing pattern observed in prior research endeavors. Nevertheless, it is noteworthy that the demographic characteristics of the patient population under investigation exhibited a marginally elevated mean age in comparison to the cohorts examined in previous investigations [3, 6, 7].

The term "DLC" has been employed in numerous scientific investigations; however, a definitive consensus regarding its precise definition continues to be elusive [6-8]. In the present investigation, the aforementioned terminology was utilized in instances where the attainment of the Critical

View of Safety (CVS) was unattainable, necessitating the implementation of bailout procedures to effectively and securely conclude the cholecystectomy procedure. Around 20% of the patient population necessitated the implementation of bailout techniques, such as conversion, due to our greater proficiency in laparoscopic procedures in comparison to open techniques.

Variables associated with surgical difficulty were identified, which were found to be consistent with findings reported in other series. In contrast to previous investigations that have identified an age threshold of ≥ 50 years as a preoperative indicator of complexity [9, 10], our study employed a more stringent age criterion of >60 years. The Parkland score, specifically at 4 [11], as well as the overall leukocyte and neutrophil counts, which exhibited varying means but were consistent with our own findings [2, 6, 7], were also evaluated as potential prognostic indicators.

While certain studies have indicated that a time frame of 72 hours from the initial onset of pain to admission to the operating room can serve as a predictive factor [8], our research has identified a noteworthy correlation with a duration exceeding 60 hours. Fibrotic adhesions within Calot's triangle, as reported in previous studies [12], were identified as subjective factors that contribute to the complexity of dissection and are incorporated into predictive models. Furthermore, the present study found a noteworthy relation between the presence of these adhesions and intraoperative challenges, as confirmed by both multivariate analysis and logistic regression.

The present study successfully identified additional variables that are associated with surgical challenges in laparoscopic cholecystectomy. These findings are in line with prognostic scales observed in previous series. The variables being examined include fibrotic gallbladder, gallbladder inside the liver, fluid around the gallbladder,

extra blood vessels around the unusual bile duct, unusually large part of the liver (segment III), falciform ligament, gallbladder hydrops, Moynihan's Hump, and the presence of subvesicular duct(s).

Although there exist predictive models for assessing surgical difficulty, it is noteworthy that these models often exhibit complexity and lack practicality [13]. In order to offer a more pragmatic forecast regarding the utilization of bailout procedures, an assessment was conducted on the area under the receiver operating characteristic (ROC) curve for the duration (expressed in minutes) dedicated to the endeavor of dissecting the cystic duct (CD). The aforementioned variable demonstrated significant efficacy in predicting the utilization of bailout techniques, while also exhibiting a high degree of reliability in predicting conversion outcomes

The study's conversion rate, hospitalization duration, and utilization of drainage are consistent with findings reported in prior studies [1, 5, 7, 12]. Several studies have documented a prevalence of biliary tract injury ranging from 0.5% to 0.8% [1, 14, 15]. However, no instances of biliary or biliary vascular injuries were observed in the present study. Nevertheless, a total of four instances (2%) of biliary leaks were observed, wherein the specific sites of leakage were not documented. In each instance, drainage was promptly implemented as a therapeutic measure. The drainage apparatus was subsequently removed during the initial postoperative week, once a notable reduction in outflow volume was observed.

Generalizability:

This study's findings offer valuable insights into laparoscopic cholecystectomy and its surgical complexity. Despite some demographic variations, the study's identification of predictive factors, including age criteria, and the practical assessment of cystic duct dissection duration, are applicable to a wider patient population. Consistency with previous research and insights into postoperative care further enhance the generalizability of these findings, aiding clinical decision-making in the broader context of laparoscopic cholecystectomy.

CONCLUSION

Technical obstacles after cystic dissection must be anticipated. Longer dissections increase surgery problems. To anticipate rescue needs, surgeons should learn to estimate dissection duration. This can prevent conversion and shorten laparoscopic surgeries.

Different definitions of difficult laparoscopic cholecystectomy (DLC) exist due to disagreement. In our study, "risk laparoscopic cholecystectomy" or "difficult laparoscopic cholecystectomy" meant extra precautions were needed due to cardiovascular instability (CVS). The study classified it as "moderate-difficulty laparoscopic cholecystectomy" for bailouts and "high-difficulty" for partial or subtotal surgeries. Dissection length predicts bailout and cholecystectomy risk.

Limitations:

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation:

Based on the findings of this study, it is recommended that surgeons performing laparoscopic cholecystectomy pay close attention to the duration of cystic duct dissection as a potential indicator of surgical complexity. Monitoring this parameter can help identify cases where the utilization of bailout techniques may be necessary, allowing for better preparation and potentially reducing the risk associated with challenging cholecystectomies. Further research and validation of this indicator in clinical practice could lead to improved patient outcomes and surgical decision-making.

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REFERENCES

1. Wakabayashi G, Iwashita Y, Hibi T, 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 Jan;25(1):73-86.
2. Bourgouin S, Monchal T, Julien C, et al. Early versus delayed cholecystectomy for cholecystitis at high risk of operative difficulties: A propensity score-matching analysis. *Am J Surg.* 2021;221(5):1061-8.
3. Griffiths EA, Hodson J, Vohra RS, et al. Utilisation of an operative difficulty grading scale for laparoscopic cholecystectomy.
4. Köse E. Effect of Duration of Calot's Triangle Dissection on the Definition of Difficult Cholecystectomy. *JAREM J Acad Res Med.* 2019;9(1):22.
5. Panni RZ, Strasberg SM. Preoperative predictors of conversion as indicators of local inflammation in acute cholecystitis: strategies for future studies to develop quantitative predictors. *J Hepato-BiliaryPancreat Sci.* 2018 Jan;25(1):101-8.
6. Bourgouin S, Mancini J, Monchal T, et al. How to predict difficult laparoscopic cholecystectomy? Proposal for a simple preoperative scoring system. *Am J Surg.* 2016 Nov;212(5):873-81.
7. Ishizaki Y, Miwa K, Yoshimoto J, et al. Conversion of elective laparoscopic to open cholecystectomy between 1993 and 2004. *Br J Surg.* 2006 Aug;93(8):987-91.
8. Gupta N, Ranjan G, Arora MP, et al. Validation of a scoring system to predict difficult laparoscopic cholecystectomy. *Int J Surg.* 2013;11(9):1002-6.
9. Gupta V, Jain G. Safe laparoscopic cholecystectomy: Adoption of universal culture of safety in cholecystectomy. *World J Gastrointest Surg.* 2019;11(2):62-84.
10. Wennmacker SZ, Bhimani N, Dijk AH, et al. Predicting operative difficulty of laparoscopic cholecystectomy in patients with acute biliary presentations. *ANZ J Surg.* 2019;89(11):1451-6.
11. Iwashita Y, Hibi T, Ohyama T, et al. An opportunity in difficulty: Japan-KoreaTaiwan expert Delphi consensus on surgical difficulty during laparoscopic cholecystectomy. *J Hepato-Biliary-Pancreat Sci.* 2017 Apr;24(4):191-8.
12. Chambon C, Valsangiacomo P, Ruso Martinez L. When Is It Safe to Continue Laparoscopically? In: Di Carlo I, editor. *Difficult Acute Cholecystitis: Treatment and Technical Issues.* Cham: Springer International Publishing; 2021. p. 119-26.
13. Panni UY, Williams GA, Hammill CW, et al. Cause and outcome of aborting a difficult laparoscopic cholecystectomy due to severe inflammation: a study of operative notes. *Surg Endosc.* 2022;1-7.
14. Fujioka S, Nakashima K, Kitamura H, et al. The segment IV approach: a useful method for achieving the critical view of safety during laparoscopic cholecystectomy in patients with anomalous bile duct. *BMC Surg.* 2020 Dec;20(1):214.
15. Asai K, Iwashita Y, Ohyama T, et al. Application of a novel surgical difficulty grading system during laparoscopic cholecystectomy. *J Hepatobiliary Pancreat Sci.* 2022 Jul;29(7):758-67.

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