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A STUDY TO EVALUATE PREOPERATIVE SCORING SYSTEM FOR DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract
Background: Laparoscopic cholecystectomy is one of the most commonly performed laparoscopic procedures. However, in certain patients, the surgery may be technically challenging and associated with increased operative time or a higher risk of conversion to open cholecystectomy due to various preoperative and intraoperative factors. The present study aimed to identify and evaluate these risk factors and to assess the usefulness of a preoperative scoring system incorporating such parameters to predict difficult laparoscopic cholecystectomy and its outcomes. ***Materials and Methods:*** This prospective study was conducted on 60 patients admitted to the Department of General Surgery, BMCRI, Bengaluru, who met the inclusion and exclusion criteria and provided informed consent. Preoperative clinical, laboratory, and ultrasonographic parameters were assessed and scored. Intraoperative difficulty and outcomes were recorded and analysed. ***Results:*** The study demonstrated that age greater than 50 years, male gender, history of previous hospital admissions for gallbladder-related symptoms, palpable gallbladder, increased gallbladder wall thickness, and the presence of pericholecystic collection were statistically significant predictors of difficult laparoscopic cholecystectomy. ***Conclusion:*** The preoperative scoring system evaluated in this study is reliable and effective in predicting difficult laparoscopic cholecystectomy and the potential need for conversion to open surgery. Its routine use may aid in better surgical planning, patient counselling, and optimisation of operative outcomes.

Keywords: Laparoscopic cholecystectomy, gallbladder, acute cholecystitis.

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INTRODUCTION

Laparoscopic cholecystectomy is one of the most commonly performed laparoscopic procedures worldwide. Although it is widely regarded as a safe and effective technique, laparoscopic cholecystectomy can occasionally be technically challenging and may require conversion to open surgery. Preoperative prediction of difficult laparoscopic cholecystectomy or the need for conversion to open cholecystectomy is therefore an important aspect of surgical planning. In the present study, various risk factors associated with difficult laparoscopic cholecystectomy are analysed, and a preoperative scoring system is utilised to predict operative difficulty (1).

Since its introduction, laparoscopic cholecystectomy (LC) has significantly reduced the need for open cholecystectomy and has become the gold standard treatment for symptomatic gallstone disease. The management of biliary tract disease has evolved from a major surgical intervention to a safe procedure that can often be performed on a day-care basis, allowing for reduced postoperative pain, shorter hospital stay, and early return to normal activities (2).

Despite these advantages, several intraoperative challenges may be encountered during laparoscopic cholecystectomy. These include difficulty in creating pneumoperitoneum, presence of anatomical variations, dense adhesions, difficulty in accessing the peritoneal cavity, dissection of Calot's triangle, identification of critical anatomy, avoidance of common bile duct injury, and extraction of the gallbladder. Laparoscopic cholecystectomy associated with these difficulties and with prolonged operative time is considered a difficult procedure (3).

The present study is based on the assumption that operative difficulty can be predicted preoperatively. The study design is directed towards identifying these predictors in order to minimise postoperative complications and reduce the rate of conversion to open cholecystectomy (4).

Gallstone disease is one of the most common disorders affecting the digestive tract. Autopsy studies have reported a prevalence of gallstones ranging from 11% to 36% (3). The prevalence of gallstone disease is

influenced by multiple factors, including age, gender, ethnic background, and certain predisposing conditions. Obesity, pregnancy, dietary factors, Crohn's disease, terminal ileal resection, gastric surgery, haemolytic anaemia, hereditary spherocytosis, sickle cell disease, and thalassemia are all associated with an increased risk of gallstone formation (4). Additionally, first-degree relatives of patients with gallstones have been shown to have a twofold higher prevalence of the disease (5).

MATERIALS AND METHODS

Study Design and Setting

This prospective observational study was conducted in the Department of General Surgery at Mamata Medical College and Hospital, Khammam. The study meticulously analysed the clinical profile, operative findings, and outcomes of patients undergoing laparoscopic cholecystectomy over a two-year period from October 2023 to October 2025.

Sample Size and Patient Selection

A total of 60 patients were enrolled in the study. The sample size was determined based on a calculation aimed at estimating a sensitivity not exceeding 96%, with a confidence interval of 95% and an absolute precision of ±5%. The sample size calculation was performed using the formula:

Where:

Z = Z value (1.96 for 95% confidence level)
p = anticipated sensitivity (0.96)
c = absolute precision (0.05)

The calculated sample size was 59, which was rounded up to 60 to ensure a study power of 90% for detecting sensitivity.

Inclusion and Exclusion Criteria

Patients included in the study were adults aged above 18 years diagnosed with symptomatic gallstone disease and admitted to the Department of General Surgery at Mamata Medical College and Hospital. Inclusion was contingent upon obtaining informed written consent from the patients.

Patients were excluded from the study if they were unfit for general anaesthesia, declined consent for participation, or were below 18 years of age.

Methodology

Following approval from the Institutional Ethics Committee, a structured and systematic approach was adopted for data collection. Detailed patient information was recorded using a predesigned study proforma, which also incorporated parameters for preoperative scoring.

The collected data included the following components:

1. Demographic parameters, including age, sex, and body mass index (BMI).
2. Medical history, with special emphasis on previous hospital admissions for acute cholecystitis.
3. Clinical examination findings, particularly the presence of abdominal scars and a palpable gallbladder.
4. Investigational findings, such as gallbladder wall thickness, pericholecystic collection, and the presence of stones impacted at the neck of the gallbladder.
5. Preoperative counselling, wherein high-risk informed consent was obtained after explaining the possibility of difficult surgery and the potential need for conversion to open cholecystectomy.

All patients underwent a standard four-port laparoscopic cholecystectomy. Intraoperative difficulty was assessed based on multiple criteria, including duration of surgery, bile or calculus spillage, injury to the cystic artery or common bile duct (CBD), and the requirement for conversion to open cholecystectomy.

Statistical Analysis

The data obtained were systematically compiled and entered into a Microsoft Excel worksheet. Statistical analysis was performed using SPSS version 20 software. Descriptive statistics were employed to compute measures such as mean, median, mode, standard deviation (SD), interquartile range (IQR), and percentages.

Associations between various preoperative factors, scoring system parameters, and intraoperative findings were analysed using the Chi-square test and Fisher's exact test. The McNemar test was utilised to compare preoperative predictions with operative outcomes. A p value of less than 0.05 was considered statistically significant.

RESULTS

Table 1: Sex Distribution of the Study Population

Sex	Number of Patients (n)	Percentage (%)
Male	20	33.3
Female	40	66.7
Total	**60**	**100.0**

Table 1 demonstrates the sex-wise distribution of patients included in the study. Females constituted the majority of the study population, with 40 patients (66.7%), while males accounted for 20 patients (33.3%). This female predominance is consistent with the known higher prevalence of gallstone disease among women, highlighting the influence of gender as an important epidemiological factor in gallbladder pathology.

Table 2: Age Distribution of the Study Population

Age Group (Years)	Number of Patients (n)	Percentage (%)
< 19	1	1.7
21–30	10	16.7
31–40	13	21.7
41–50	24	40.0
51–60	8	13.3
61–70	4	6.7
Total	**60**	**100.0**

Table 2 illustrates the age-wise distribution of patients included in the study. The majority of patients belonged to the 41–50 years age group, accounting for 24 patients (40.0%), followed by the 31–40 years group with 13 patients (21.7%). Patients aged between 21 and 30 years constituted 16.7% of the study population, while those above 50 years represented a smaller proportion. Only one patient (1.7%) was below 19 years of age. This distribution indicates that gallstone disease requiring laparoscopic cholecystectomy was most prevalent among middle-aged individuals in the present study.

Figure 1: Distribution of Patients According to the Preoperative Scoring System

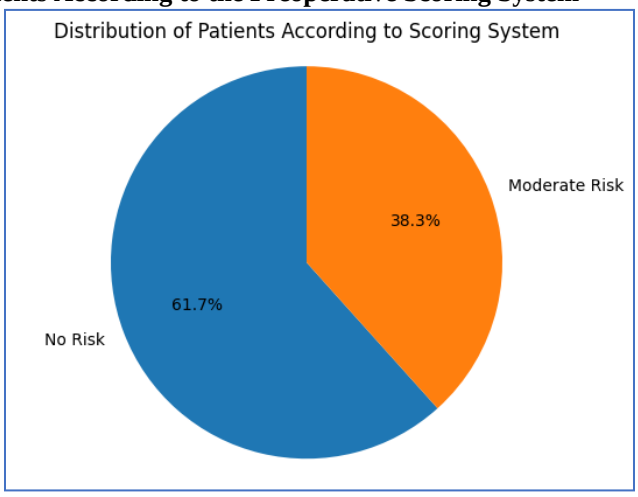

Figure 1 shows the distribution of patients according to the preoperative scoring system used to assess the risk of difficult laparoscopic cholecystectomy. Out of the total 60 patients included in the study, 37 patients (61.7%) were categorised under the *no-risk* group, indicating a lower likelihood of operative difficulty. The remaining 23 patients (38.3%) fell into the *moderate-risk* category, suggesting a comparatively higher probability of encountering intraoperative challenges. No patients were classified into a high-risk group in the present study. This distribution highlights that the majority of patients were predicted preoperatively to undergo laparoscopic cholecystectomy without significant difficulty.

Figure 2: Distribution of Patients Based on Intraoperative Findings

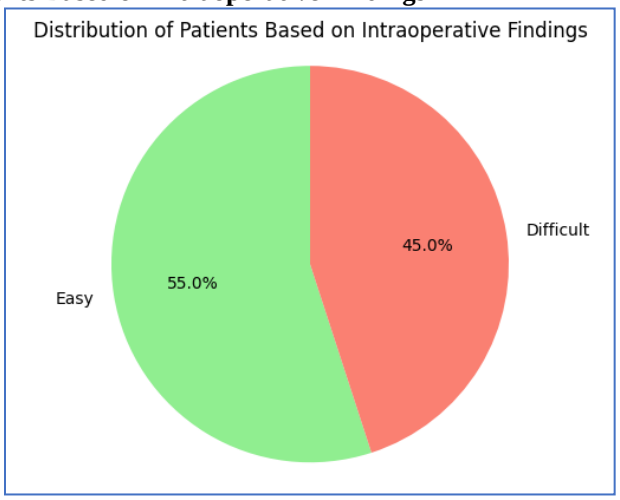

Figure 2 depicts the intraoperative assessment of difficulty during laparoscopic cholecystectomy among the study population. Out of 60 patients, 33 patients (55.0%) underwent an easy laparoscopic cholecystectomy, whereas 27 patients

(45.0%) experienced a difficult procedure based on predefined intraoperative criteria. This finding indicates that nearly half of the patients encountered operative challenges, underscoring the importance of reliable preoperative predictors to anticipate surgical difficulty and facilitate appropriate operative planning.

DISCUSSION

The present study provides meaningful insights into the factors influencing preoperative risk assessment and intraoperative difficulty in patients undergoing laparoscopic cholecystectomy for gallbladder stone disease. Over the study period, 60 patients who underwent laparoscopic cholecystectomy were evaluated, allowing focused analysis of demographic, clinical, and radiological parameters associated with operative difficulty.

Analysis of age distribution revealed that the majority of patients belonged to the 41–50 years age group (40%), followed by the 31–40 years group (21.7%). This pattern is consistent with previously published studies, which have reported a higher prevalence of gallbladder disease and cholecystitis among middle-aged individuals, particularly those between 41 and 50 years of age (6). Advancing age has been associated with recurrent inflammatory episodes, fibrosis, and adhesions, which may contribute to increased operative difficulty.

A significant gender disparity was observed in the present study, with females comprising 66.7% of the study population and males accounting for 33.3%. This female predominance is well documented in the literature and may be attributed to hormonal influences, particularly oestrogen, which increases cholesterol saturation in bile and predisposes to gallstone formation (7). Despite the lower prevalence, male patients demonstrated a higher propensity for difficult laparoscopic cholecystectomy, consistent with earlier reports.

The preoperative scoring system used in this study effectively stratified patients into No Risk and Moderate Risk categories. Of the total study population, 61.7% were classified as No Risk, while 38.3% were categorised as Moderate Risk. These findings support previous studies that have demonstrated the usefulness of scoring systems in predicting the difficulty of laparoscopic cholecystectomy and the likelihood of conversion to open surgery (8-9).

The specificity of the scoring system was high (96.97%), indicating excellent accuracy in identifying patients likely to undergo an uncomplicated procedure. The sensitivity, although satisfactory at 81.48%, suggests that a proportion of patients with moderate operative difficulty may not be fully captured, highlighting the need for refinement of predictive parameters.

Age emerged as a significant determinant of operative risk, with a greater proportion of patients above 50 years falling into the Moderate Risk category. This observation is in agreement with previous studies that have reported increased surgical difficulty in older patients due to chronic inflammation, dense adhesions, and altered anatomy (10-11).

Gender also played a significant role, with males constituting a higher proportion of patients in the Moderate Risk category compared to females. This finding aligns with published literature suggesting that males often present with more severe disease and advanced inflammatory changes, leading to increased operative complexity (12-13).

A history of previous hospital admissions for acute cholecystitis was strongly associated with increased operative risk. In the present study, a majority of patients with prior admissions were classified as Moderate Risk. Recurrent inflammation is known to result in fibrosis and distorted anatomy, thereby increasing technical difficulty during laparoscopic dissection (14).

Additional factors such as palpable gallbladder, increased gallbladder wall thickness, and the presence of pericholecystic collection were also found to be significantly associated with higher risk scores. These findings reinforce the importance of detailed preoperative clinical and ultrasonographic assessment in predicting difficult laparoscopic cholecystectomy.

Comparison with earlier studies highlights both similarities and variations in risk factor significance across different populations. Earlier studies reported comparable age and gender distribution patterns, with males exhibiting a higher risk of operative difficulty (15). In contrast, earlier studies identified body mass index as a significant predictor of surgical difficulty, a finding that was not statistically significant in the present study (16). Such differences may reflect variations in population characteristics, study design, and sample size.

CONCLUSION

In conclusion, this study identifies age, male gender, history of previous admissions for acute cholecystitis, palpable gallbladder, increased gallbladder wall thickness, and pericholecystic collection as significant predictors of operative difficulty in laparoscopic cholecystectomy. The preoperative scoring system evaluated demonstrated high specificity and acceptable sensitivity, making it a useful tool for predicting difficult laparoscopic cholecystectomy and aiding in surgical planning. Further refinement of the scoring system may enhance its sensitivity and broaden its

clinical applicability. These findings underscore the importance of comprehensive preoperative risk assessment to optimise surgical outcomes and minimise complications.

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