Section: Surgery

Original Research Article

PREDICTION OF POSTOPERATIVE OUTCOME USING OPERATIVE GRADING SYSTEM IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRAC

Background: Laparoscopic cholecystectomy (LC) is the standard of care for symptomatic gallstone disease, though intraoperative difficulty varies widely. The operative grading system (OGS) aims to standardize intraoperative findings and predict postoperative outcomes. The aim is to evaluate the effectiveness of OGS in predicting postoperative outcomes in patients undergoing Laparoscopic cholecystectomy.

Materials and Methods: A prospective observational study was conducted on 84 patients with gallstones undergoing elective LC at a tertiary care hospital. Patients were scored intraoperatively using Sugrue's OGS and categorized into Mild (<2), Moderate (2–4), Severe (5–7), and Extreme (8–10). Outcomes assessed included operative time, hospital stay, complications, and conversion to open surgery.

Results: Mean age was 40.0±13.1 years; majority were female (77.4%). Radiological findings showed multiple gallstones in 59.5% of patients. Difficulty distribution was Mild in 69.0%, Moderate 23.8%, Severe 6.0%, and Extreme 1.2%. Mean operative time increased from 49.7 minutes (Mild) to 96 minutes (Extreme). Hospital stay rose from 2.6 days (Mild) to 8.0 days (Extreme). Bile leak and conversion to open surgery occurred only in extreme difficulty cases.

Conclusion: OGS is a simple, reproducible intraoperative tool that correlates with operative complexity and postoperative outcomes, and can aid in operative planning and patient counseling.

Keywords: Laparoscopic cholecystectomy; Operative grading system; Surgical difficulty; Postoperative outcome; Conversion.

INTRODUCTION

Laparoscopic cholecystectomy (LC), introduced in the late 1980s, is now the gold standard for symptomatic gallstone disease due to its advantages of less invasiveness, shorter recovery, and reduced morbidity compared with open surgery.[1-8] However, intraoperative complexity varies significantly due to gallbladder wall thickening, adhesions, anatomical anomalies, and impacted stones.[7,9] Conversion to open surgery may be required in 2%–15% of cases, primarily due to operative difficulty.[10,11]

Prediction of difficult LC is essential for operative planning, informed consent, and minimizing complications. While preoperative scoring systems based on clinical, radiological, or laboratory parameters exist, their predictive accuracy has been inconsistent.[12,13] For instance, studies have reported positive predictive values ranging from 76% to 100% for difficult cases, but overall reliability varies across patient cohorts and settings.[12,13] Sugrue et al. introduced the Operative Grading System (OGS), the first intraoperative scoring system designed to classify operative difficulty from mild to extreme, based on standardized operative findings.[1] Other operative grading scales, including the Nassar score,

WSES G10 system, and Parkland Grading Scale, have demonstrated predictive value for operative time, complications, and conversion.[2-6] Earlier classifications, such as Cuschieri's four-grade system for intraoperative difficulties, laid the groundwork for these tools.[14]

Recent advancements in intraoperative assessment have further refined the predictive capabilities of grading systems like OGS, particularly in identifying high-risk cases that may benefit from multidisciplinary approaches or advanced surgical techniques.[15] Studies in diverse populations have also highlighted the impact of regional surgical expertise and patient demographics on postoperative outcomes, suggesting that OGS can be tailored to local contexts for improved accuracy.[16] Moreover, longitudinal data on LC complications indicate that intraoperative grading correlates with long-term recovery metrics, emphasizing its role in postoperative care planning.[17] In the Indian subcontinent, research has underscored the prevalence of complex gallstone disease and the need for standardized tools like OGS to enhance surgical decision-making.[18]

This study evaluates the effectiveness of OGS in predicting postoperative outcomes in LC in a tertiary care hospital in North India, aiming to validate its clinical applicability.

MATERIALS AND METHODS

Study Design and Setting: This was a prospective observational study carried out in the Department of General Surgery, Era's Lucknow Medical College & Hospital, over a period of 24 months from 2023 to 2025.

Subject: A total of 84 consecutive patients with gallstones undergoing elective Laparoscopic Cholecystectomy were included. Written informed consent was taken from all patients

Ethics: Institutional Ethical Committee approval was obtained with Ref,No.ELMC&H/R_Cell,2023/88.

Statistics:

$n = ((Z\alpha + Z\beta)^2 \times \sigma^2) / d^2 \times k$

Where σ^2 = 2.23, SD of new scoring system of cholecystectomy

d = 25% of mean score (=3.52), the difference considered to be clinically significant (Ahmed et al., 2018)94

Design effect k = 1

type I error α = 5% corresponding to 95% confidence level type II error β = 10% for detecting results with 90% power of study the minimum sample size needed n = 84

Statistical Analysis: Data were analyzed using SPSS v21.0. Results were expressed as mean±SD and percentages. ANOVA was applied for continuous variables, Chi-square test for categorical variables, with $p<0.05$ considered significant

Inclusion and Exclusion criteria

Patients aged ≥18 years of either gender were eligible. Exclusion criteria included jaundice, gallbladder malignancy, hepatitis B or C infection, and emergency surgeries.

Operative Grading: Intraoperative difficulty was assessed using Sugrue's Operative Grading System (OGS), which evaluates five parameters: gallbladder appearance and adhesions, distension or contraction, ease of access, septic/local complications, and time taken to identify the cystic duct and artery. Scores range from 0–10, stratified as Mild (<2), Moderate (2–4), Severe (5–7), and Extreme (8–10).

Operative Grading System

Gall Bladder Appearance	
No Adhesion	0
Adhesion < 50% of GB	1
Adhesion burying GB	3
Maximum Score	3
Distension/Contraction	
Distended GB (or Contracted shriveled GB)	1
Unable to grasp with a traumatic laparoscopic forceps	1
Stone >/= 1 cm impacted in Hartman's pouch	1
Access	
BMI>30	1
Adhesion from previous surgery limiting access	1
Severe Sepsis /Complications	
Bile or Pus outside GB	1
Time to identify cystic artery and duct > 90 minutes	1

Figure 1: Distended Gall bladder with pericholecystic fluid

Figure 2: Adhesions < 50% of GB

Total Score Range: 0–10

• Mild: <2
• Moderate: 2–4
• Severe: 5–7
• Extreme: 8–10

Outcomes: Operative time, postoperative complications (bile leak, bleeding, SSI, jaundice), conversion to open surgery, and hospital stay were recorded.

RESULTS

Table 1: Age distribution of patients (n=84).

Age Group (years)	Number of Cases	Percentage (%)
20–29	22	26.2
30–39	29	34.5
40–49	15	17.9
50–59	10	11.9
≥60	8	9.5

Mean age of the patients was 40.04±13.17 years and ranged between 20 & 76 years. The majority of the patients were aged between 20 & 39 years (60.7%). Patients in 5th, 6th & 7th decade were 17.9%, 11.9% and 9.5%.

Table 2: Gender distribution of patients.

Gender	Number of Cases	Percentage (%)
Female	65	77.4
Male	19	22.6

The majority of the patients were Females (77.4%), while the remaining were Males (22.6%).

Table 3: Pre-operative radiological findings.

Radiological Finding	Number of Cases	Percentage (%)
Multiple stones	50	59.5
Single stone	22	26.2
Thickened GB wall	12	14.3

In terms of the radiological findings, the most common was Multiple Stones in GB (59.5%), followed by Single stones (26.2%). Thickened edematous GB wall was reported in 14.3% of the patients.

Table 4: Distribution of cases by degree of operative difficulty

Difficulty Grade	Number of Cases	Percentage (%)
Mild (<2)	58	69.0
Moderate (2–4)	20	23.8
Severe (5–7)	5	6.0
Extreme (8–10)	1	1.2

In terms of the intra-operative difficulty, the majority of the patients had mild difficulty (69.0%). Moderate difficulty was found in 23.8% of the cases. Severe Difficulty & Extreme Difficulty were found in 6.0% & 1.2% respectively.

Table 5: Association of operative difficulty with mean surgery duration and hospital stay

Difficulty Grade	Mean Surgery Duration (min)	Mean Hospital Stay (days)
Mild	49.7	2.6
Moderate	59.1	3.4
Severe	80.2	5.2
Extreme	96.0	8.0

On comparing Surgery duration among the grades of severity, significantly longer time was taken for surgery in patients with Extremely Difficult surgery (96.00±0.00 mins) as compared to Mild to Severely Difficulty surgeries and comparing Hospital stay among the grades of severity, significantly longer stay was required in patients with Extremely Difficult surgery (8.00±0.00 days) as compared to Mild to Severely Difficulty surgeries.

Table 6: Complications noted

Complication	Number of Cases	Percentage (%)
Bile leak	1	1.2
Conversion to open	1	1.2

Bile leak and conversion to open surgery occurred only in cases with extreme difficulty while none of the patients, irrespective of the difficulty, had Post-op bleeding, SSI & Jaundice.

DISCUSSION

This study evaluated the role of Sugrue's Operative Grading System (OGS) in predicting outcomes of laparoscopic cholecystectomy. We found that higher OGS grades correlated significantly with increased operative time, longer hospital stay, and complications. This reinforces the utility of OGS as a simple, reproducible tool for intraoperative risk stratification.

Our results align with previous studies. Agarwal et al. and Bunkar et al. identified multiple predictors of difficult LC, including gallbladder wall thickening and impacted stones. Singh et al. and Di Buono et al. further highlighted imaging findings such as contracted gallbladder and pericholecystic fluid as predictors. In our study, although radiological thickened gallbladder wall was present in only 14.3% of patients, difficulty increased significantly in these cases.

The conversion rate in our series (1.2%) was lower than reported rates of 5–15% in the literature, possibly due to careful patient selection and surgical expertise. Similar to Nassar et al. and Tongyoo et al., we observed that operative difficulty was directly proportional to operative time and hospital stay.

While our findings underscore the usefulness of OGS, limitations include single-center design, relatively small sample size, and lack of integration of preoperative predictors (e.g., CRP, WBC count). Larger multicenter studies integrating both preoperative and intraoperative grading may yield more comprehensive predictive models.

Overall, our findings support the use of OGS as a practical intraoperative classification system that enhances surgical planning, patient counseling, and postoperative care.

CONCLUSION

The present study was undertaken to evaluate the effectiveness of the Operative Grading system in predicting postoperative outcomes in patients undergoing laparoscopic cholecystectomy. For this, 84 patients presenting to the Department of Surgery, with gall stones were included in the study after screening for inclusion and exclusion criteria and giving consent for participation. The age of the patients ranged between 20 & 76 years, mean age was 40.04±13.17 years, majority were Females (77.4%). Key findings of the study were as follows:

1. The majority of the patients presented with Right upper quadrant pain of abdomen (64.3%), which is a characteristic sign for gall stones. However, 23.8% were asymptomatic and were found to have gall stones during routine investigations. A small proportion of patients presented with Fever along with pain (8.3%) and Nausea & Vomiting (3.6%), indicating that these signs are relatively less common in patients with Gall stones.
2. In terms of the Radiological findings, most common was Multiple Gall stones (59.5%), followed by Single stone (26.2%) and only a few had Thickened GB wall (14.3%).
3. With respect to the difficulty as measured by operative scoring, Mild, Moderate, Severe & Extreme difficulty was found in 69.0%, 23.8%, 6.0% and 1.2% of the cases.
4. No significant association was found for Difficulty with Age and Gender of the patients.
5. Significantly longer time was taken for surgery in patients with Extremely Difficult surgery (96.00±0.00 mins) as compared to Mild to Severe Difficult surgeries. Further, a trend of increasing duration of surgery with increasing difficulty (Mild> Moderate> Severe> Extreme) was found.
6. A significant association was found for incidence of Bile leak and Conversion to Open surgery with Extreme difficulty during surgery. However, none of the patients in the study had Post-op bleeding, SSI or Jaundice.
7. Hospital stay was significantly longer in patients with Extremely Difficult surgery (8.00±0.00 days) as compared to Mild to Severely Difficulty surgeries. Further, a trend of increasing hospital stay with increasing difficulty (Mild> Moderate> Severe> Extreme) was found.

The findings of the present study, depict that the operative scoring might help screen and identify patients at risk for longer hospital stay and increased risk of post-op complications. However, the present study was limited by a smaller sample size, given the incidence of gall stones in our settings and hence it is recommended that a prospective, multicentric study with larger sample size, and including multiple surgeons (including Trainee surgeons) should be conducted to fill the gaps of the present study.

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