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Original Research Article

USE OF G10 SCORING SYSTEM TO PREDICT DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY AND CONVERSION TO OPEN CHOLECYSTECTOMY

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ABSTRACT

Background: *Laparoscopic cholecystectomy (LC) is the gold standard for treating gallbladder disease; however, some cases present technical challenges that necessitate conversion to open cholecystectomy (OC). Identifying factors associated with difficult LC and conversion to OC can help optimize surgical planning and patient counseling.* ***Objective:*** *To evaluate the frequency of difficult laparoscopic cholecystectomies and the rate of conversion to open cholecystectomies in patients undergoing laparoscopic cholecystectomy (LC).* ***Study Design:*** *Observational cross-sectional study.* ***Setting:*** *The study was conducted at Saidu Teaching Hospital in Swat.* ***Duration of Study:*** *The study was conducted over six months, from August 16, 2024, to February 16, 2025.* ***Methods:*** *A total of 126 patients undergoing laparoscopic cholecystectomy (gallbladder surgery) were included. Surgical difficulty was assessed using the G10 scoring system, which evaluates factors such as inflammation, adhesions, and anatomical variations. Conversion rates from LC to OC were recorded. Demographic characteristics, surgical difficulty, and outcome variables were analyzed using SPSS version 20. The statistical significance of the predictive factors was assessed, with p-values of less than 0.05 considered significant.* ***Results:*** *Difficult labor was observed in 14 patients (11.1%), while conversion to cesarean section was required in 8 cases (6.3%). Age and gender were significant predictors of difficult LC and conversion to OC. Patients with a higher BMI (>24.9 kg/m²) had an increased likelihood of complex surgery and conversion; however, the association was not statistically significant.* ***Conclusion:*** *The frequency of difficult laparoscopic cholecystectomy was 11.1%, and the conversion rate to open surgery was 6.3%. Age and gender were notable predictive factors for surgical difficulty and conversion. Preoperative risk assessment using scoring systems, such as G10, can aid in surgical decision-making and improve patient outcomes.*

Keywords: Laparoscopic Cholecystectomy, Conversion to Open Surgery, G10 Scoring System, Risk Factors, Difficult Cholecystectomy

INTRODUCTION

Gallstones are present in more than eighty percent of asymptomatic individuals. Acute cholecystitis occurs in 1-3% of patients with symptomatic gallstones (1). Acute cholecystitis is marked by persistent pain in the affected upper quadrant. Patients exhibiting symptoms indicative of acute cholecystitis (AC) should receive abdominal ultrasonography for diagnostic confirmation. Should the initial ultrasound yield non-diagnostic results or be required to exclude complications or alternative diagnoses, additional imaging techniques, such as hepatobiliary iminodiacetic acid scans and CT scans, may be warranted. The management of AC includes two components: medical and surgical. Medical management encompasses bed rest, analgesics, antibiotics, and intravenous fluids. Surgical management consists of a procedure known as cholecystectomy, which involves the surgical excision of the gallbladder (2-4). Cholecystectomy may be performed via an open technique as well as a laparoscopic technique.

Laparoscopic cholecystectomy (LC) is increasingly preferred over open cholecystectomy (OC) for the treatment of AC. Laparoscopic advances in technology, combined with increased surgeon competence and experience, have led to the substitution of open surgeries with laparoscopic techniques, resulting in reduced hospital stays and shorter recovery times. In the context of AC, LC plays a multifaceted role and presents multiple drawbacks, including a high conversion rate for open surgery. This is attributed to inflammation, edema, and necrosis linked with AC, which may make the procedure more difficult and elevate the risk of complications following surgery (5-7). Bleeding diathesis, gall bladder malignancy, and patients who are high risk for general anesthesia are absolute contraindications for opting for LC; otherwise, the selection criteria for LC have become more liberal. The conversion rate from LC to OC has declined to 2-10% (8, 9). Scoring systems, such as the Tokyo Guidelines 2013, the AAST severity scoring method for cholecystitis, and the Parkland Grading system, have been developed. Nonetheless, their successful implementation remains unachieved due to insufficient validation, complexity, and relevance. Updates have been issued to improve practicality (10, 11). The G10 scoring system, a 10-point severity score for cholecystitis, was developed in 2015 and subsequently revised in 2019. The assessment relies on the intraoperative characteristics of the gallbladder, including distension or contraction, accessibility, as well as the presence of sepsis and complications during laparoscopic cholecystectomy (12).

This study has not been conducted at our institution; therefore, it will help surgeons make timely decisions intraoperatively about when to convert to an open procedure. The data collected in this study will be a valuable addition to the existing data Pool. The most important aspect is that the G10 scoring system has proven its usefulness; therefore, this study will utilize its validity in the catchment population of our institution.

METHODOLOGY

In our investigation, we employed a cross-sectional study design, which took place within the Department of Surgery at Saidu Teaching Hospital in Swat from August 16, 2024, to February 16, 2025. We enrolled 126 patients, a sample size determined on an anticipated conversion rate to open cholecystectomy of 9%8 %, confidence interval 95%, and a 5% margin of error guiding our calculations.

Participants were selected through a non-probability consecutive sampling approach. We included all individuals aged between 18 and 60 years, encompassing both genders who were presented with symptomatic gallstones and were admitted for laparoscopic cholecystectomy. However, we omitted patients exhibiting jaundice,

those diagnosed with Hepatitis B or C, or those with any malignancy to ensure a focused cohort.

The data collection process began after obtaining ethical approval from the hospital. We recruited 126 eligible patients who gave their consent. We gathered anthropometric details, demographic information, and comorbidities, including diabetes mellitus and hypertension, all recorded on a designated form. During the surgical procedure, the operating surgeon assessed the gallbladder's appearance, its level of distension or contraction, ease of access, and signs of abdominal sepsis such as biliary peritonitis, purulent fluid, or a cholecystoenteric fistula. These observations were carefully noted by the attending surgeon in the operating room to judge whether the laparoscopic approach proved technically demanding or required a shift to open surgery. Each patient's intraoperative experience was scored according to the G10 system, with the details documented in Annexure 3.

For analysis, we processed the collected data using SPSS version 20. Qualitative variables, such as gender, comorbid conditions, and instances of difficult laparoscopy and conversions to open surgery, were displayed as frequencies along with their corresponding percentages. Quantitative measures, including age, weight, height, BMI, and G10 scores, were summarized as means with standard deviations. BMI, Gender, and Age were then stratified with the study outcomes. The Chi-Square test was employed to assess association, with a significance level of P kept at < 0.05.

RESULTS

The mean age of our participants was 41.72 ± 9.005 years, reflecting a relatively broad age range across adulthood. Regarding body mass index (BMI), the mean value was 27.1035 ± 2.00307 kg/m². The mean G10 score was 1.52±1.76.

Upon examining the gender distribution, we found that 54 (42.9%) of the patients were male, while 72 (57.1%) were female (Figure 1). Hypertension was present in 31 (24.6%) patients. Diabetes, on the other hand, affected fewer patients, with 17 (13.5%) diagnosed (Table 1).

Turning to the surgical outcomes, we observed that a problematic laparoscopic cholecystectomy occurred in 14 (11.1%) cases while 112 (88.9%) procedures were completed without such challenges. Conversion to open surgery was required in only 8 (6.3%) patients (Table 2).

When we broke down these outcomes by age, an interesting pattern emerged. Among the 14 patients with a problematic laparoscopy, 2 (14.3%) were aged 25 to 40 years, while 12 (85.7%) were over 40 years (P = 0.01). For conversions, all 8 (100%) patients were over 40 years old. In contrast, none in the 25- to 40-year-old age bracket required this shift (P = 0.01), suggesting that advanced age can lead to difficult laparoscopy and surgical conversion (Table 3).

Gender also seemed to play a role. Of the 14 complex cases, 10 (71.4%) were male and 4 (28.6%) were female (P = 0.02), indicating significance. Similarly, among the eight conversions, 7 (87.5%) were male and only 1 (12.5%) was female (P = 0.008) (Table 4).

We found that patients with a BMI greater than 24.9 kg/m² had a higher frequency of difficult laparoscopy and conversion to surgery, but we could not find a notable difference (Table 5).

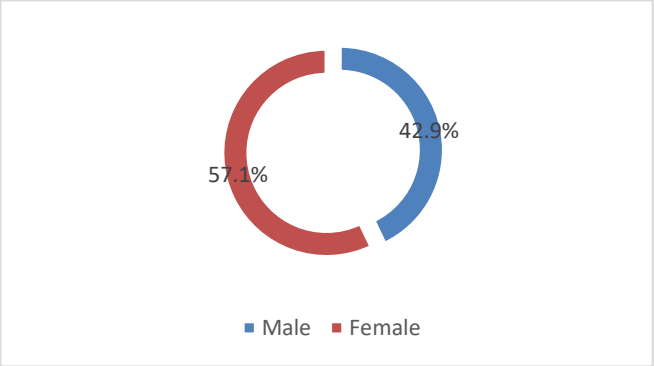

Figure 1: Gender distribution of the patients

Table 1: Comorbidities

Comorbidities		N	%
Hypertension	Yes	31	24.6%
	No	95	75.4%
Diabetes	Yes	17	13.5%
	No	109	86.5%

Table 2: Difficult laparoscopy and conversion to open surgery

Parameters		N	%
Difficult laparoscopy	Yes	14	11.1%
	No	112	88.9%
Conversion to open surgery	Yes	8	6.3%
	No	118	93.7%

Table 3: Association of difficult laparoscopy and conversion to open surgery with age

Parameters		Age distribution (Years)				*P value*
		25 to 40		> 40		
		N	%	N	%	
Difficult laparoscopy	Yes	2	14.3%	12	85.7%	0.02
	No	51	45.5%	61	54.5%	
Conversion to open surgery	Yes	0	0.0%	8	100.0%	0.01
	No	53	44.9%	65	55.1%	

Table 4: Association of difficult laparoscopy and conversion to open surgery with gender

Parameters		Gender				P value
		Male		Female		
		N	%	N	%	
Difficult laparoscopy	Yes	10	71.4%	4	28.6%	0.02
	No	44	39.3%	68	60.7%	
Conversion to open surgery	Yes	7	87.5%	1	12.5%	0.008
	No	47	39.8%	71	60.2%	

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Table 5: Association of difficult laparoscopy and conversion to open surgery with BMI

Parameters		BMI (kg/m2)				P value
		18 to 24.9		> 24.9		
		N	%	N	%	
Difficult laparoscopy	Yes	1	7.1%	13	92.9%	0.41
	No	17	15.2%	95	84.8%	
Conversion to open surgery	Yes	0	0.0%	8	100.0%	0.23
	No	18	15.3%	100	84.7%	

DISCUSSION

Our study demonstrated that the mean age of participants was 41.72±9.005 years, with the majority of difficult laparoscopic cholecystectomies (85.7%) and all conversions to open surgery (100%) occurring in patients aged 40 years or older. This strongly suggests that increasing age is associated with increased surgical difficulty and a higher risk of conversion. The study by Sakpal et al. also found a noteworthy correlation between age and conversion rates, with patients over 50 years having a potentially higher risk of the need for conversion to open surgery (13). Similarly, Ali et al. reported that older patients, particularly those over 60 years of age, had a greater likelihood of conversion (14). These findings reinforce the idea that older patients tend to have more fibrotic and inflamed tissues, leading to technical difficulties in laparoscopic dissection.

Gender differences were also evident in our study, with male patients showing a higher likelihood of experiencing difficult laparoscopic cholecystectomy (71.4% vs. 28.6%; P = 0.02) and conversion to open surgery (87.5% vs. 12.5% ;P = 0.008). This finding is supported by multiple studies, including the work of Abdulhussein et al., which showed a higher conversion rate among male patients due to increased fibrosis, thicker gallbladder walls, and more severe inflammation (15). Ali et al., similarly, found male gender to be a strong predictor of conversion, emphasizing that male patients were at significantly higher risk compared to females (14). The study by Sakpal et al. further affirms these findings, noting that men were more likely to require conversion than women, likely due to more extensive adhesions and severe disease progression (13).

Regarding BMI, our results indicated that patients with a BMI > 24.9 kg/m² had a higher frequency of difficult laparoscopic cholecystectomy and conversion to open surgery, but this relationship did not reach statistical significance. However, previous studies suggest that obesity is a well-recognized risk factor for surgical difficulty. The survey by Abdulhussein et al. identified obesity as a significant predictor of conversion. 15 Ali et al. also observed that obesity increased surgical difficulty, particularly in cases with thickened gallbladder walls and excessive intra-abdominal fat. 14 The discrepancy between our findings and prior research may be due to our relatively moderate mean BMI (27.1 kg/m²), whereas aforementioned studies with higher mean BMI values found stronger associations with conversion rates.

Comorbidities such as hypertension and diabetes were assessed in our study, with hypertension present in 24.6% of patients and diabetes in 13.5%. The literature presents conflicting findings on this matter. Ali et al. identified diabetes as a prominent predictor of conversion, possibly due to associated microvascular disease and impaired tissue healing (14). Similarly, Abdulhussein et al. found that diabetes and metabolic syndrome increased the likelihood of conversion, though hypertension alone was not a strong predictor (15). In contrast, Sakpal et al. did not identify diabetes or hypertension as significant contributors to conversion rates (Sakpal et al., 13). These inconsistencies suggest that while metabolic conditions may complicate surgery in specific populations, their impact is likely multifactorial and dependent on additional patient-specific variables, such as the severity of inflammation and fibrosis.

When assessing the overall frequencies for difficult laparoscopic cholecystectomy and conversion rates, our study reported that 11.1% of patients experienced surgical difficulty and 6.3% required conversion to open surgery. These values are within the lower range of previously published conversion rates, which vary from 3.5% to 15% depending on the study population and inclusion criteria (16, 17). The relatively low conversion rate in our study may be attributed to the exclusion of patients with severe acute cholecystitis and a history of prior abdominal surgeries, which are known to increase the conversion risk.

A key finding in our study was the strong link between advanced age and male gender with difficult laparoscopic cholecystectomy and conversion, which resonates with findings from studies above. However, our results did not establish a strong statistical link between BMI and conversion rates, diverging from the conclusions of other research. This discrepancy suggests that BMI alone may not be a sufficient predictor and that other obesity-related parameters, such as visceral fat distribution and the presence of metabolic syndrome, seem to be more relevant.

Based on our findings, we suggest that preoperative risk assessment using the G10 scoring system should heavily weigh the age of the patients and gender, as these factors turned out to be the most consistent predictors of surgical difficulty in our research.

CONCLUSION

Our research revealed that difficult laparoscopies occurred in 14 (11.1%) cases, while a switch to open surgery was necessary in 8 (6.3%) cases. Older age and being male were key factors influencing these outcomes. Implementing the G10 scoring approach, which focuses more on patient demographics and health conditions, could enhance its usefulness for planning surgeries and forecasting outcomes.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (09-ERB/023)

Consent for publication

Approved

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Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

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