

Clinical Implication of Intraoperative Gallbladder Scoring Predicting the Need for Conversion from Laparoscopic Cholecystectomy to Open Cholecystectomy

Adil Hameed, Muhammad Asad, Rehan Ahmed Khan, Muhammad Ismail Seerat, Sufyan Rauf, Naveed Ahmed

ABSTRACT:

Objective: To determine the association between intraoperative Nassar Difficulty Grade and conversion from laparoscopic to open cholecystectomy in adults undergoing laparoscopic cholecystectomy for benign gallbladder disease.

Study Design & Setting: Prospective observational cohort study conducted in the Department of General Surgery, Pakistan Railways Hospital, Rawalpindi, from 9 February 2026 to 8 May 2026.

Methodology: Ninety-eight consecutive adults undergoing laparoscopic cholecystectomy for benign gallbladder disease were enrolled. Demographic, clinical, ultrasonographic, intraoperative and conversion data were recorded prospectively. Intraoperative difficulty was graded using the Nassar Difficulty Grading Scale. Grades I-II were categorized as low difficulty and Grades III-IV as high difficulty. Conversion proportions were compared using two-sided Fisher exact testing because of sparse cells, and a crude odds ratio (OR) with 95% confidence interval (CI) was calculated for high versus low Nassar grade. A p-value <0.05 was considered statistically significant.

Results: The mean age was 43.8 ± 13.2 years; 67/98 (68.4%) participants were female. Overall, 10/98 (10.2%) procedures were converted to open cholecystectomy. Conversion occurred in Grade I 1/34 (2.9%), Grade II 1/29 (3.4%), Grade III 3/21 (14.3%), and Grade IV 5/14 (35.7%). High difficulty (Grades III-IV) was associated with greater crude odds of conversion than low difficulty (Grades I-II): 8/35 (22.9%) versus 2/63 (3.2%); crude OR 9.04 (95% CI 1.80-45.41), Fisher exact $p=0.004$.

Conclusion: Higher intraoperative Nassar Difficulty Grade was associated with conversion to open cholecystectomy in this single-center observational cohort. The scale may support structured intraoperative assessment and communication, but the findings are unadjusted and should not be interpreted as evidence that Nassar grade independently predicts conversion.

Keywords: Laparoscopic cholecystectomy, open cholecystectomy, Nassar score, conversion, gallbladder scoring

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Adil Hameed

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email: adilhameed217@gmail.com

Muhammad Asad

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email: tifortup@gmail.com

Rehan Ahmed Khan

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email:

Muhammad Ismail Seerat

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email: doctor_seerat@yahoo.com

Sufyan Rauf

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email: khansufyan93@gmail.com

Naveed Ahmed

Post Graduate Resident, Department of General Surgery
Pakistan Railway Hospital, Rawalpindi
Email: naveedahmedsheen@hotmail.com

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INTRODUCTION:

Laparoscopic cholecystectomy (LC) is the standard surgical treatment for most symptomatic benign gallbladder disease because it is associated with less postoperative pain, shorter hospital stay, faster recovery, and improved cosmesis compared with open cholecystectomy.^{1,2} Nevertheless, some procedures are technically difficult because of acute or chronic inflammation, dense adhesions, a contracted or fibrotic gallbladder, empyema, gangrene, impacted stones, bleeding, obesity, previous abdominal surgery, or distorted anatomy in the hepatocystic triangle. In such circumstances, conversion to open surgery is a safety strategy rather than a surgical failure. Reported conversion rates vary across institutions and patient populations because of differences in case mix, timing of surgery, severity of inflammation, surgeon experience, operative technique, and availability of bailout procedures.³ Difficult anatomy, severe inflammation, dense adhesions, and bleeding are among the most frequently reported reasons for conversion. Because conversion can be associated with both patient-related and operative factors, systematic assessment of operative difficulty may improve documentation and intraoperative

decision-making. Several preoperative scoring systems use variables such as age, sex, body mass index, previous hospitalization or abdominal surgery, palpable gallbladder, gallbladder wall thickness, pericholecystic fluid, impacted stones, and inflammatory markers to estimate operative difficulty.⁴⁻⁶ However, preoperative scores cannot fully capture the actual severity of adhesions, cystic pedicle anatomy, tissue friability, or exposure encountered during surgery. The Nassar Difficulty Grading Scale provides an intraoperative assessment based on gallbladder appearance, adhesions, cystic pedicle anatomy, and difficulty of access or dissection.⁷⁻¹⁰ Intraoperative grading therefore offers real-time information on technical complexity and may assist the surgical team in deciding whether continued laparoscopic dissection is appropriate or whether a bailout strategy or conversion should be considered. Such grading should support, rather than replace, established principles of safe cholecystectomy and surgeon judgment. Evidence from Pakistan also supports the value of structured assessment in difficult LC. Ahmed et al. evaluated an intraoperative scoring system at Shalamar Hospital, Lahore, and found that increasing operative difficulty was associated with conversion to open surgery.⁷ Malik, in a large Pakistani series, emphasized timely conversion when dissection becomes hazardous as an important safety decision.⁸ These local data highlight the relevance of objective documentation of operative difficulty in Pakistani surgical practice.

The rationale for the present study was that local prospective data linking a standardized intraoperative difficulty grade with conversion are limited, while conversion decisions are clinically important for patient safety, operative planning, communication, and training. The professional significance lies in providing a reproducible description of operative difficulty that can improve case documentation, facilitate communication between surgeons, and support audit and quality-improvement activities. The objective was to determine the association between intraoperative Nassar Difficulty Grade and conversion from laparoscopic to open cholecystectomy in adults undergoing LC for benign gallbladder disease.

METHODOLOGY:

This prospective observational cohort study was conducted in the Department of General Surgery, Pakistan Railways Hospital, Rawalpindi, over three months from 9 February 2026 to 8 May 2026, after approval by the Institutional Review Committee (Ref. No. Riphah/IRB/26/1014, dated 9 February 2026). Adults scheduled for LC for benign symptomatic gallbladder disease were assessed for eligibility. The study was observational and did not mandate an intervention beyond routine surgical care. Eligible participants were adults aged 18 years or older undergoing LC for benign gallbladder disease, including biliary colic, acute or chronic cholecystitis, or gallbladder polyps requiring surgery. Elective and emergency cases were eligible. Exclusion criteria were

suspected or confirmed gallbladder carcinoma, choledocholithiasis, obstructive jaundice or a dilated common bile duct requiring ERCP or another intervention, planned open cholecystectomy, absolute contraindication to laparoscopy such as uncontrolled coagulopathy or inability to tolerate general anesthesia, and refusal or withdrawal of consent. Sample size was calculated for comparison of two proportions, assuming a 5% conversion proportion in a low-difficulty group and 25% in a high-difficulty group, with two-sided alpha 0.05 and 80% power. The resulting requirement was approximately 49 participants per comparison group, giving a total target sample of 98. Non-probability consecutive sampling was used until the target sample was reached.

After written informed consent, data were recorded on a structured proforma. Baseline variables included age, sex, weight, height, body mass index, presenting symptoms, previous acute cholecystitis, previous abdominal surgery, diabetes mellitus, hypertension, cardiac disease, respiratory disease, and relevant ultrasonographic findings. Ultrasound variables included gallbladder wall thickness, pericholecystic fluid, impacted stone in Hartmann's pouch, and common bile duct dilatation. All 98 enrolled participants had documented Nassar grade and final conversion status and were included in the analysis; no participant was omitted from the primary analysis. LC was performed according to routine institutional practice. The study did not prospectively record a minimum surgeon case-volume threshold, years of laparoscopic experience, or a formal credentialing category; therefore, surgeon experience could not be analyzed quantitatively. Safe identification of cystic structures and avoidance of hazardous dissection were the operative priorities. Conversion to open surgery was considered when anatomy could not be defined safely, bleeding could not be controlled laparoscopically, or another intraoperative safety concern required open access. The study did not mandate or systematically record a standardized algorithm for fundus-first dissection or subtotal cholecystectomy, and these bailout procedures were therefore not analyzed as study outcomes. These limitations are acknowledged when interpreting conversion decisions. During surgery, gallbladder appearance, adhesions, cystic pedicle anatomy, and difficulty of access/exposure were assessed using the Nassar Difficulty Grading Scale, and each case was assigned Grade I, II, III, or IV. For the prespecified grouped comparison, Grades I-II were classified as low difficulty and Grades III-IV as high difficulty. Conversion was defined as abandonment of the laparoscopic approach after laparoscopic access had been established, followed by completion through an open abdominal incision.

Reasons for conversion were recorded as dense adhesions, unclear cystic pedicle anatomy, uncontrolled bleeding, severe inflammation/empyema/gangrene, or other documented surgical safety concerns. Intraoperative events recorded

included bile spillage, stone spillage, bleeding, drain placement, common bile duct injury, and bowel injury.

Data were analyzed using SPSS version 21. Continuous variables were summarized as mean $\pm$ standard deviation and categorical variables as frequency and percentage. The primary comparison was conversion in high Nassar difficulty (Grades III-IV) versus low difficulty (Grades I-II). Because expected counts were small, two-sided Fisher exact testing was used for the primary grouped comparison and for each 2 $\times$ 2 comparison in the selected-factor analysis. Crude odds ratios with 95% confidence intervals were calculated from the reported 2 $\times$ 2 counts. The grade-specific conversion proportions were presented descriptively. All analyses were unadjusted; therefore, associations were not interpreted as independent predictive effects. A two-sided p-value <0.05 was considered statistically significant.

RESULTS:

A total of 98 participants underwent LC and all were included in the primary analysis. Mean age was 43.8 $\pm$ 13.2 years (range 18-72 years); 31 (31.6%) were male and 67 (68.4%) were female. Mean BMI was 27.6 $\pm$ 4.1 kg/m². The distribution of baseline clinical and ultrasonographic characteristics is shown in Table 1. Diabetes mellitus was present in 18 participants (18.4%), hypertension in 22 (22.4%), cardiac disease in 6 (6.1%), respiratory disease in 8 (8.2%), and previous abdominal surgery in 15 (15.3%). The indications for surgery were biliary colic in 45 (45.9%), chronic cholecystitis in 28 (28.6%), acute cholecystitis in 20 (20.4%), and gallbladder polyp in 5 (5.1%). Preoperative ultrasonography showed gallbladder wall thickness >4 mm in 32 participants (32.7%), pericholecystic fluid in 14 (14.3%), and an impacted stone in Hartmann's pouch in 18 (18.4%). Common bile duct dilatation was not present in the analyzed cohort because cases requiring additional biliary intervention were excluded. Nassar Grade I was recorded in 34 participants (34.7%), Grade II in 29 (29.6%), Grade III in 21 (21.4%), and Grade IV in 14 (14.3%). Overall, 10/98 procedures (10.2%) were converted to open cholecystectomy.

Conversion increased across Nassar grades: Grade I 1/34 (2.9%), Grade II 1/29 (3.4%), Grade III 3/21 (14.3%), and Grade IV 5/14 (35.7%). When grouped, conversion occurred in 2/63 (3.2%) low-difficulty cases (Grades I-II) and 8/35 (22.9%) high-difficulty cases (Grades III-IV). High difficulty was associated with greater crude odds of conversion (OR 9.04, 95% CI 1.80-45.41; two-sided Fisher exact p=0.004) (Table 2). Among the 10 converted cases, the documented reasons were dense adhesions obscuring Calot's triangle in 4 (40%), unclear cystic pedicle anatomy in 3 (30%), uncontrolled bleeding in 2 (20%), and severe inflammation/empyema/gangrenous gallbladder in 1 (10%). Recorded intraoperative events included bile spillage in 16/98 (16.3%), stone spillage in 9/98 (9.2%), bleeding in 7/98 (7.1%), and

drain placement in 12/98 (12.2%); no common bile duct or bowel injury was recorded (Table 3). Selected-factor analyses were exploratory and unadjusted. Using two-sided Fisher exact testing for all 2 $\times$ 2 comparisons, gallbladder wall thickness >4 mm (p=0.013), impacted stone in Hartmann's pouch (p=0.017), and Nassar Grade III-IV (p=0.004) were associated with conversion. Age >60 years, BMI =30 kg/m², diabetes mellitus, and previous abdominal surgery were not statistically significant in these exact tests (Table 4).

DISCUSSION:

The current research article assessed the clinical value of intraoperative scoring of the gallbladder to predict conversion to laparoscopic cholecystectomy. The total conversion rate of the patients in this study was 10.2 because 10 among the 98 patients needed to be converted to open surgery. This result is in keeping with those obtained in earlier literature, where the conversion rates were usually dependent on the disease severity, patient features, and the surgical experience of the surgeon and the anatomical complexity during the operation. Warcha³owski et al. stated that age, emergency treatment, acute cholecystitis, adhesions, chronic inflammation and inflammatory infiltration were found to be significant predictors leading to conversion in laparoscopic continuation, which is normally necessary.¹¹ Equally, Sapmaz and Karaca found out that acute cholecystitis was a notable factor that raised the risk of conversion in laparoscopic cholecystectomy.¹² The rate of conversion in the current study is thus seems to be clinically reasonable and comparable where the opposing difficulty in anatomy of the gallbladder and inflammatory modifications were significant issues which led to conversion in the studies. In the current analysis, the sample was composed of mostly female patients with female making up 68.4 percent of the sample and male 31.6 percent. This female preponderance has been in line with the already established epidemiological trend of the gallstone disease characterized by commonness in women. Nevertheless, even though female patients prevail, prior researches have indicated that male gender has tendencies to be characterized by increased surgical complexity and increased risk of conversion. Warchawa-lowski et al. support this assumption as they determined that demographic and inflammatory factors had a significant impact on conversion risk.¹¹ The lack of a robust contrast in the gender-based results in the current results might have been caused by a lower number of male patients and narrow sample. Age was an important factor in this study. The conversion rate among patients above 60 years was 25.0, statistically significant. Age can contribute to operative complexity since older patients are more susceptible to recurrent occurrences of cholecystitis, chronic inflammation, thick adhesions, fibrotic changes of the gallbladder, and comorbidities. Di Buono et al. indicated that predictive factors leading to difficult laparoscopic cholecystectomy affect both clinical and radiological features, which tend to amplify predictive factors

Table 1: Baseline Demographic, Clinical, Ultrasonographic, and Intraoperative Characteristics

Variable	Category / Finding	Frequency / Mean	Percentage / SD
Total patients	—	98	100%
Mean age	—	43.8 years	±13.2
Age range	—	18-72 years	—
Sex	Male	31	31.6%
Sex	Female	67	68.4%
Mean BMI	—	27.6 kg/m ²	±4.1
Age group	18–30 years	18	18.4%
Age group	31–45 years	39	39.8%
Age group	46–60 years	29	29.6%
Age group	>60 years	12	12.2%
BMI category	Normal weight	36	36.7%
BMI category	Overweight	38	38.8%
BMI category	Obese	24	24.5%
Comorbid conditions	Diabetes mellitus	18	18.4%
Comorbid conditions	Hypertension	22	22.4%
Comorbid conditions	Cardiac disease	6	6.1%
Comorbid conditions	Respiratory disease	8	8.2%
Comorbid conditions	Previous abdominal surgery	15	15.3%
Indication for surgery	Biliary colic	45	45.9%
Indication for surgery	Chronic cholecystitis	28	28.6%
Indication for surgery	Acute cholecystitis	20	20.4%
Indication for surgery	Gallbladder polyp	5	5.1%
Preoperative ultrasound findings	Gallbladder wall thickness >4 mm	32	32.7%
Preoperative ultrasound findings	Pericholecystic fluid	14	14.3%
Preoperative ultrasound findings	Impacted stone in Hartmann's pouch	18	18.4%
Preoperative ultrasound findings	CBD dilatation	0	0%
Nassar difficulty grade	Grade I	34	34.7%
Nassar difficulty grade	Grade II	29	29.6%
Nassar difficulty grade	Grade III	21	21.4%
Nassar difficulty grade	Grade IV	14	14.3%

Table 2: Conversion According to Low- and High-Difficulty Nassar Groups

Difficulty group / Nassar grade	Total n	Converted n (%)	Not converted n (%)	Crude OR (95% CI)	Fisher exact p-value
Low difficulty (Grades I-II)	63	2 (3.2%)	61 (96.8%)	Reference	—
High difficulty (Grades III-IV)	35	8 (22.9%)	27 (77.1%)	9.04 (1.80-45.41)	0.004
Total	98	10 (10.2%)	88 (89.8%)	—	—

with age change.¹³ Another justification of objective preoperative assessment to predict the risk of patients who are more susceptible to acute cholecystitis was clinico-radiological assessment that was developed by Jang et al.¹⁴ Hence, the strong correlation between age (above 60) and conversion is not a new finding in the current study. Another factor was the body mass index. The conversion rate in patients with BMI 20.8, in a current study, was 30 kg/m² and obesity was found to have a significant correlation with the rate of conversion. Obesity complicates laparoscopic

cholecystectomy because it involves constraining the port access and exposure, and complicates the task of the liver retraction as well as the fat retention in the Calot triangle. These factors may prolong dissection and make identification of the cystic duct and artery more challenging. Other predictors of challenging laparoscopic cholecystectomy were also discovered in Di Buono et al. which focused on the necessity to be aware of patient factors before surgery.¹³ The presence of obesity alone might not necessarily necessitate any conversion, though its presence coupled

Table 3: Reasons for Conversion and Recorded Intraoperative Events

Category	Finding	Frequency	Percentage
Reason for conversion	Dense adhesions obscuring Calot's triangle	4	40.0% of converted cases
Reason for conversion	Unclear cystic pedicle anatomy	3	30.0% of converted cases
Reason for conversion	Uncontrolled bleeding	2	20.0% of converted cases
Reason for conversion	Severe inflammation/empyema/gangrenous gallbladder	1	10.0% of converted cases
Reason for conversion	Total converted	10	100.0%
Intraoperative event	Bile spillage	16	16.3%
Intraoperative event	Stone spillage	9	9.2%
Intraoperative event	Bleeding	7	7.1%
Intraoperative event	Drain placement	12	12.2%
Intraoperative event	Common bile duct injury	0	0%
Intraoperative event	Bowel injury	0	0%

Table 4: Exploratory Unadjusted Associations of Selected Factors with Conversion to Open Cholecystectomy

Variable	Factor present n	Converted n (%)	Not converted n (%)	Crude OR (95% CI)	Fisher exact p-value	Interpretation
Age >60 years	12	3 (25.0%)	9 (75.0%)	3.76 (0.82-17.17)	0.103	Not significant
BMI =30 kg/m ²	24	5 (20.8%)	19 (79.2%)	3.63 (0.95-13.86)	0.062	Not significant
Diabetes mellitus	18	4 (22.2%)	14 (77.8%)	3.52 (0.88-14.12)	0.083	Not significant
Previous abdominal surgery	15	3 (20.0%)	12 (80.0%)	2.71 (0.62-11.96)	0.179	Not significant
Gallbladder wall thickness >4 mm	32	7 (21.9%)	25 (78.1%)	5.88 (1.41-24.56)	0.013	Significant
Impacted stone in Hartmann's pouch	18	5 (27.8%)	13 (72.2%)	5.77 (1.46-22.76)	0.017	Significant
Nassar Grade III-IV	35	8 (22.9%)	27 (77.1%)	9.04 (1.80-45.41)	0.004	Significant

Note: All p-values in Table IV are two-sided Fisher exact tests because one or more expected cell counts were <5. Odds ratios are crude and unadjusted

with inflammation, thickened gallbladder wall, adhesions, or impacted stone can be a significant factor highlighting technical difficulty.

A diabetes mellitus state was observed in 18.4% of patients and a conversion rate of 22.2 in diabetic patients. More serious inflammation, delayed manifestation, depressed immune response, and progressive probable cholecystitis are often the factors that are linked to diabetes. In diabetic patients, the pathogenesis of inflammation of the gallbladder can occur without the initial symptoms, and subsequent operating results are more problematic. This finding is corroborated by past literature that demonstrates that systemic comorbidities are a contributing factor to challenging laparoscopic cholecystectomy and conversion risk. Warchaw optionsk et al. showed the usefulness of predictive assessments models to risk-stratify patients preoperative¹¹, and Di Buono et al. also asserted that clinical and preoperative variables need to be used to predict the difficulty during operative procedures.¹³ A large correlation found between the conversion and diabetes in this study can therefore be clinically plausible. A conversion rate of 20.0 was linked to a previous abdominal surgery that was identified in 15.3% of patients. Previous surgery can predispose intra-abdominal adhesions, troublesome trocar insertion, lack of visualization,

and dissection. Bowel injury might be more likely or a result of adhesions, which may lead to non-visibility of the gallbladder, especially when the upper abdomen was surgically done. Sapmaz and Karaca found that conversion might be needed in cases where difficult conditions during the laparoscopic procedure limit safe advancement.¹² This facilitates the current observation that a history of abdominal surgery was also a risk factor to open conversion.

Conversion was also related to preoperative ultrasound results. Wall thickness of + 32.7% of patients had a + 4 mm gallbladder wall, and it was found to be associated with a conversion rate of 21.9. An inflamed gallbladder wall becomes thick and is often a sign of acute and/or chronic inflammation, edema, fibrosis or recurrent instances of cholecystitis. These variations may complicate the understanding of the gallbladder, and may obscure the triangle of Calot. Jang et al. in particular emphasized the usefulness of clinico-radiological parameters in the prediction of conversion in acute cholecystitis.¹⁴ On the same note, when Rangel-Olvera et al. compared preoperative risk and intraoperative complexity they assessed them on the Parkland grading scale and discovered that intraoperative severity was related to conversion to open surgery.¹⁵ Depending on the current observation, ultrasound evidence of gallbladder

wall thickening is a good red flag towards a challenging operation. A significant correlation between Nassar difficulty grade and conversion was found as the main conclusion of this study. Patients were distributed as Grade I 34.7%, Grade II 29.6%, Grade III 21.4%, and Grade IV 14.3%. In Grade III and Grade IV, conversion rates had risen steadily to 14.3 and 35.7 per cent respectively compared to 2.9 and 3.4 in Grade I and Grade II. The gradual progression is an indicator that conversion was strongly linked with the grades of intraoperative difficulty. According to Baral et al., intraoperative grading scales have the potential to estimate the operative difficulty in laparoscopic cholecystectomy and make decisions.¹⁶ Shrestha et al. were able to validate the Parkland grading scale and discovered higher grade and higher intraoperative difficulties, bile spillage, placement of the drain, assistance, and conversion.¹⁷ Even though the Nassar scale was applied in the current study instead of Parkland grading, the idea is not that different since the higher the intraoperative grades, the more extreme inflammatory processes, adhesions, and distorted anatomy, the more likely conversion.

In the case where patients were categorized into low- and high-difficulty patients, only Grade I and II patients (3.2 percent of all patients) were converted to Grade IX patients (22.9 percent of all patients). This variation was statistically significant and underlies the practicality of intraoperative scoring. The Nassar grade was thus not only a characteristic tool, but also a predictive one of operative outcome. The Surgical Cholecystectomy Score was created and proved and evaluated by Kruthika et al. to make the grading of the difficulty of laparoscopic cholecystectomy standardized and in line with the need of using objective intraoperative grading tools.¹⁸ Objective grading can enhance documentation in the operating room, enable comparisons across cases, and enable communication of the severity of operative findings between surgeons. Bile spillage, stone spillage, bleeding, and drain placements constituted intraoperative complications in this study with percentages of 16.3, 9.2, 7.1 and 12.2 respectively. Common bile duct injury, or bowel injury was nonexistent. The significant finding of the absence of major ductal or bowel damage can also indicate that timely conversion may have been employed as a prophylactic measure in challenging situations. Subtotal cholecystectomy is another bailout alternative that has been discussed extensively in case the critical view of safety can not be attained. In a systematic review, Toro et al. came to the conclusion that laparoscopic subtotal cholecystectomy may serve as a safe method to complete the complicated acute cholecystitis cases.¹⁹ Similar results were found by Chavez-Villa et al who found that subtotal cholecystectomy following unsuccessful critical view of safety is an effective and safe bailout modality.²⁰ The difficulty of the gallbladder and the risky dissection might also be controlled via the subtotal cholecystectomy, as LeCompte et al. also noted.²¹ These

investigations contribute to a larger idea that in the face of unsafe anatomy, bailout techniques, such as conversion or subtotal cholecystectomy, should be employed by surgeons.

This is particularly important as the absence of bile duct damage in this study is one of the most dreaded effects of laparoscopic cholecystectomy. The findings indicate that the intraoperative scoring can be used to diagnose high-risk cases sooner to prevent unsafe dissection. Deng et al. presented an algorithmic laparoscopic cholecystectomy including subtotal cholecystectomy as a bailout strategy of problematic gallbladders.²² Haldeniya et al. similarly shared their experience of laparoscopic subtotal cholecystectomy in challenging cases of gallbladder and justified the value of laparoscopic surgery as an option in select cases of patients.²³ Though the current research was centered on conversion, and not on subtotal cholecystectomy, the same concept is involved: challenging anatomy must implement a safer method of operation.

The current research also emphasizes the significance of jointly using preoperative and intraoperative evaluation. Some form of intraoperative scoring is however direct real-time confirmation of the severity of operations. The authors Ie et al. investigated laparoscopic subtotal cholecystectomy following percutaneous transhepatic gallbladder drainage in moderate to severe acute cholecystitis, and conclude that hard-to-treat inflammatory cases demand care in operative planning.²⁴ Di Martino et al. also addressed the concept of laparoscopic cholecystectomy used in treating acute cholecystitis and the importance of timing and severity of operations.²⁵ In the current study, the high intraoperative Nassar grade was the strongest predictor, indicating that the real time assessment of the operations is possibly more decisive than the preoperative variables taken individually. Limitations: This was a single-center observational study with a modest sample and only 10 conversion events, producing imprecise effect estimates and limiting multivariable analysis. Consecutive non-probability sampling may introduce selection bias. Surgeon case volume, minimum credentialing threshold, years of laparoscopic experience, and individual conversion thresholds were not prospectively recorded. Use of the critical view of safety and bailout techniques such as subtotal cholecystectomy or fundus-first dissection was not captured as standardized study variables. Therefore, surgeon- and technique-related confounding cannot be excluded. The reported associations are crude and should not be interpreted as independent predictors or causal effects. Larger multicenter studies with standardized operative protocols and adjusted analyses are required.

CONCLUSION:

Higher Nassar Difficulty Grade was associated with conversion from laparoscopic to open cholecystectomy in this prospective single-center cohort. Grade-specific conversion increased from 2.9% in Grade I and 3.4% in

Grade II to 14.3% in Grade III and 35.7% in Grade IV; high difficulty (Grades III-IV) had a crude OR of 9.04 (95% CI 1.80-45.41) compared with Grades I-II. These findings support the Nassar scale as a useful tool for structured intraoperative assessment and communication, but they do not establish independent predictive accuracy or a causal effect on patient safety.

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Authors Contribution:

Adil Hameed: Conception and Design, acquisition of data, analysis and interpretation of data, drafting and critical revision, final approval of the version to be published.

Muhammad Asad: Conception and Design, acquisition of data, analysis and interpretation of data, drafting and critical revision, final approval of the version to be published.

Reham Ahmed Khan: Conception and Design, acquisition of data, analysis and interpretation of data, drafting and critical revision, final approval of the version to be published.

Muhammad Ismail Seerat: Conception and Design, acquisition of data, drafting and critical revision, final approval of the version to be published

Sufyan Rauf & Naveed Ahmed: Conception and Design, acquisition of data, drafting and critical revision, final approval of the version to be published

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