International Journal of Pharmaceutical and Clinical Research

**ISSN Print:** 2664-7591
**ISSN Online:** 2664-7605
**Impact Factor:** RJIF 8-16
IJPCR 2025; 7(2): 104-107
www.pharmaceuticaljournal.in
Received: 06-06-2025
Accepted: 08-07-2025

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# Validation of the Nassar intraoperative grading scale for assessment of laparoscopic cholecystectomy difficulty: A retrospective cohort study

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**DOI:** https://www.doi.org/10.33545/26647591.2025.v7.i2b.141

**Abstract**
**Background:** Laparoscopic cholecystectomy (LC) is common, but operative difficulty varies widely. The Nassar intraoperative grading system aims to standardize and predict surgical outcomes.
**Objective:** To assess the degree of difficulty in LC using the Nassar intraoperative scoring system and validate its prediction of conversion and complication rates.
**Methods:** A retrospective cohort of 105 patients undergoing LC (Jan 2023-July 2024) at BGS GIMS Hospital, Bangalore, was analyzed. Intraoperative grading, patient characteristics, conversion rates, and outcomes were recorded and correlated.
**Results:** Mean age was 57.6±16.4 years; 58.1% male. The most frequent indication was cholecystitis (44.8%). Emergency LC was performed in 2.9%. Severe and extreme difficulty was seen in 21.0% and 30.5%, respectively. Overall conversion to open surgery was 8.6%. Conversion rate rose substantially with higher Nassar grade ($p$<0.001).
**Conclusions:** The Nassar intraoperative grading scale is a reliable predictor of operative difficulty and conversion risk in LC. Its standard use can guide intraoperative planning, training, and risk-adjusted analysis of outcomes.

**Keywords:** Laparoscopic cholecystectomy, Nassar grading scale, operative difficulty, conversion rate, validation

## Introduction
Laparoscopic cholecystectomy (LC) is the most frequent surgical intervention for the biliary tract, performed for gallstones and inflammation. While often routine, LC can present significant challenges, particularly with severe cholecystitis or complex anatomy. Few reproducible intraoperative difficulty scores exist; none is universally accepted or adopted in clinical practice. The Nassar grading system, described in 1995, allows for objective intraoperative stratification and risk communication.

**Aim:** To assess the degree of difficulty in LC using the Nassar intraoperative scoring system and validate that score with peri-operative outcomes, including conversion and complication rates.

## Materials and Methods
A retrospective cohort study was conducted (Jan 2023-July 2024) in the General Surgery department at BGS GIMS Hospital, Bangalore.

**Inclusion:** All adult patients undergoing LC with complete intraoperative records and consent.
N=105.

**Intraoperative Assessment:** During LC, surgeons recorded gallbladder (GB) appearance, adhesions, Calot's triangle dissection, and complications. The Nassar grading criteria (see below) were applied, and the highest score in any one domain was used for each patient.

### Nassar Intraoperative Grading Scale

| Grade | Gallbladder | Cystic Pedicle | Adhesions |
|---|---|---|---|
| 1 | Floppy, non-adherent | Thin and clear | Simple up to the neck/Hartmann's pouch |
| 2 | Mucocele, packed with stones | Fat-laden | Simple up to the body |
| 3 | Deep fossa, acute cholecystitis, contracted, fibrosis, Hartmann's adherent to CBD, impaction | Abnormal anatomy or cystic duct short, dilated or obscured | Dense up to fundus; involving hepatic flexure or duodenum |
| 4 | Completely obscured, empyema, gangrene, mass | Impossible to clarify | Dense, fibrosis, wrapping the gallbladder, duodenum or hepatic flexure; difficult to separate |

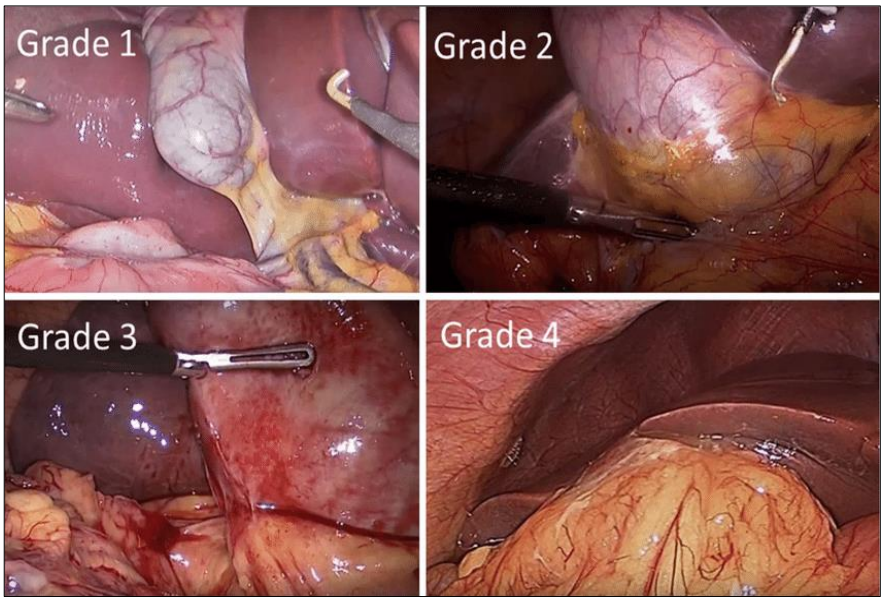


**Fig 1:** Distribution of Nassar intraoperative grading criteria for gallbladder, cystic pedicle, and adhesions.

The grading system is designed to be used as an overall summary of the operative conditions found, and the worst factor found in the individual aspect of either the 'Gallbladder', 'Cystic Pedicle' or 'Adhesions' should be used to define the final overall grade.

### Intraoperative grading system for difficult laparoscopic cholecystectomy

**Gallbladder Appearance**

- No adhesions-0
- Adhesions-1
- Adhesions < 50% and completely buried GB-2
- GB completely buried in adhesions-3

**Distension/Contraction**

- Distended/contracted GB-1
- Unable to grasp acutely with forceps-1
- Stone ≥ 1 cm in Hartmann's pouch-1

**Access**

- BMI >30-1
- Adhesions from previous surgery limiting access-1

**Sepsis/Complications**

- Bile/pus outside GB-1
- Time to cystic artery/duct >90 min-1

**Degree of Difficulty**

- **Mild:** < 2
- **Moderate:** 2-4
- **Severe:** 5-7
- **Extreme:** 8-10

## Results

**Table 1:** Patient and surgical characteristics

| Variables | Degree of difficulty (%) | | P-Value |
|---|---|---|---|
| | Difficult (N=54) | Easy (N=51) | |
| Gender | | | |
| Male (N=61) | 23(42.6) | 38(74.5) | 0.0009 |
| Female (N=44) | 31(57.4) | 13 (25.5) | |
| **Age Group** | | | |
| < 40 years (N=25) | 9 (16.7) | 16 (31.4) | 0.0771 |
| 40 years or more (N=80) | 45 (83.3) | 35 (68.6) | |
| **Type of Intervention** | | | |
| Emergency (N=3) | 3 (5.6) | 0 (0.0) | 0.0042 |
| Elective (N=19) | 4 (7.4) | 15 (29.4) | |
| Delayed (N=83) | 47 (87.0) | 36 (70.6) | |
| **Primary diagnosis** | | | |
| Choledocholithiasis (N=12) | 5 (9.3) | 7 (13.8) | <0.0001 |
| Gall Bladder perforation (N=3) | 1 (1.8) | 1 (1.8) | |
| Cholecystitis (N=47) | 38 (70.4) | 9 (17.6) | |
| Biliary colic (N=43) | 10 (18.5) | 33 (64.7) | |
| **ASA classification** | | | |
| I (N=36) | 14 (25.9) | 22 (43.2) | 0.0073 |
| II (N=46) | 21 (38.9) | 25 (49.0) | |
| III (N=22) | 18 (33.3) | 4 (7.8) | |
| IV or more (N=1) | 1 (1.9) | 0 (0.0) | |
| **Preoperative ERCP** | | | |
| Yes (N=21) | 11 (20.4) | 10 (19.6) | 0.9224 |
| No (N=84) | 43 (79.6) | 41 (80.4) | |
| **Gallbladder wall thickness** | | | |
| 3 mm or more (N=54) | 41 (75.9) | 13 (25.5) | <0.0001 |
| < 3 mm (N=51) | 13 (24.1) | 38 (74.5) | |
| **Common bile duct diameter** | | | |
| > 6 mm (N=23) | 16 (29.6) | 7 (13.7) | 0.0485 |
| 6 mm or less (N=82) | 38 (70.4) | 44 (86.3) | |

### Patient Demographics

- **Mean Age:** 57.6±16.4 years
- **Male:** 61 (58.1%)
- **Female:** 44 (41.9%)
- **Primary diagnosis:** Cholecystitis (44.8%), Pancreatitis (2.9%), others
- **Emergency LC:** 3 (2.9%)

**Difficulty and Conversion**

- **Difficulty Level:**
  - **Severe:** 22 (21.0%)
  - **Extreme:** 32 (30.5%)
- **Conversion Rate:** 9 (8.6%) overall

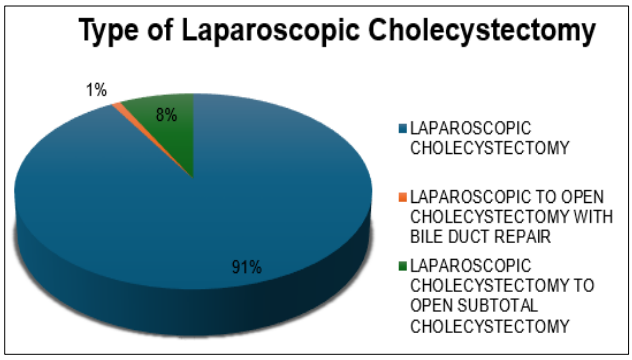


**Fig 2:** Correlation between Nassar grade and conversion rate in laparoscopic cholecystectomy.

**Table 2:** Conversion to open by Nassar grade

| Variable | Value |
|---|---|
| Age (mean ± SD, years) | 57.6±16.4 |
| Gender-Male | 61 (58.1%) |
| Gender-Female | 44 (41.9%) |
| Emergency surgery | 3 (2.9%) |
| Cholecystitis | 47 (44.8%) |
| Conversion to open | 9 (8.6%) |
| Mild difficulty (< 2) | 13 (12.4%) |
| Moderate difficulty (2-4) | 38 (36.2%) |
| Severe difficulty (5-7) | 22 (21.0%) |
| Extreme difficulty (8-10) | 32 (30.5%) |

**Table 3:** Factors associated with operative difficulty

| Nassar Grade | Cases | Converted | Conversion Rate (%) |
|---|---|---|---|
| Mild (< 2) | 13 | 0 | 0.0 |
| Moderate (2-4) | 38 | 0 | 0.0 |
| Severe (5-7) | 22 | 1 | 4.5 |
| Extreme (8-10) | 32 | 8 | 25.0 |

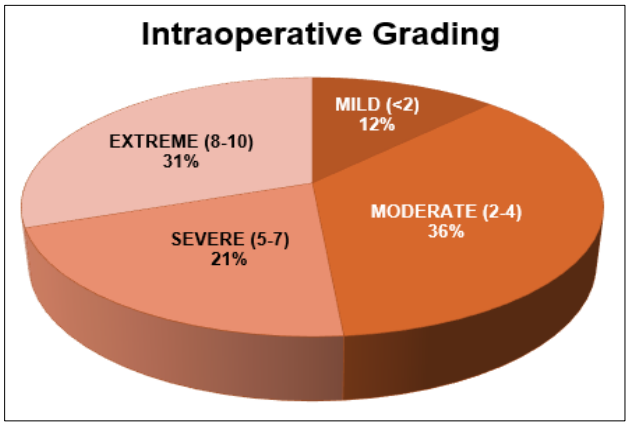


**Fig 3:** Patient and surgical factors significantly associated with higher operative difficulty.

**Table 4:** Association between Nassar operative difficulty grades and intraoperative variables.

| Variable | Difficult (N=54) | Easy (N=51) | P-Value |
|---|---|---|---|
| Male (%) | 23 (42.6) | 38 (74.5) | 0.0009 |
| Female (%) | 31 (57.4) | 13 (25.5) | |
| Age ≥ 40 (%) | 45 (83.3) | 35 (68.6) | 0.0771 |
| Emergency LC (%) | 3 (5.6) | 0 (0.0) | 0.0042 |
| Cholecystitis (%) | 38 (70.4) | 9 (17.6) | <0.0001 |
| ASA III+ (%) | 19 (35.2) | 4 (7.8) | 0.0073 |
| GB wall ≥ 3 mm (%) | 41 (75.9) | 13 (25.5) | <0.0001 |
| CBD > 6 mm (%) | 16 (29.6) | 7 (13.7) | 0.0485 |

Statistical significance reported using chi-square or Fisher's exact test, as appropriate ($p$<0.05 considered significant).

## Discussion

This study validates the Nassar intraoperative grading scale in stratifying LC difficulty and predicting risk of conversion. Rising Nassar grades correlated strongly with conversion likelihood (0% in mild/moderate vs. 25% in extreme, $p$<0.001). Female gender, emergency surgery, cholecystitis, high ASA grade, thickened GB wall, and increased CBD diameter were all significantly associated with greater operative difficulty.

Routine adoption of Nassar scoring can guide intraoperative decisions, risk communication, and training curricula. Limitations include single-center data, moderate sample size, and lack of interobserver grading validation.

## Conclusion

The Nassar intraoperative grading scale is effective for objectively grading LC difficulty and predicting conversion. Widespread use would enhance operative reporting, patient counselling, and evidence-based training in general surgery.

## Acknowledgements

We thank the Department of General Surgery and BGS GIMS Hospital for support.

## Ethics

Approved by the institutional review board. Written informed consent obtained from all patients or their representatives, ASICON.pptx

## Funding

None.

## Conflicts of Interest

None

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