

GENDER AND OPERATIVE DIFFICULTY IN LAPAROSCOPIC CHOLECYSTECTOMY

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Abstract

Background

Laparoscopic cholecystectomy (LC) is the standard treatment for symptomatic gallstone disease. Although considered a safe and effective procedure, intraoperative difficulty varies considerably among patients due to anatomical and pathological factors. Male gender has frequently been associated with technically demanding surgery, prolonged operative time, and increased conversion to open cholecystectomy. However, evidence regarding gender-specific intraoperative findings remains inconsistent. This study compared the operative difficulty of elective laparoscopic cholecystectomy between male and female patients and evaluated intraoperative factors associated with technical complexity.

Methods

A prospective comparative observational study was conducted in the Department of General Surgery, Santosh Medical College and Hospital, Ghaziabad, between April 2024 and November 2025. A total of 123 patients undergoing elective laparoscopic cholecystectomy were included, comprising 30 males and 93 females. Intraoperative variables assessed included difficult Calot's anatomy, visceral fat, complex adhesions, gallbladder size, gallbladder wall thickness, intrahepatic gallbladder, operative duration, difficult haemostasis, drain placement, conversion to open cholecystectomy, and bile duct injury. Comparative statistical analyses were performed using the methods reported in the study.

Results

Male patients demonstrated a higher frequency of difficult operative findings, including increased visceral fat, complex adhesions, difficult Calot's anatomy, prolonged operative duration, difficult haemostasis, drain placement, and conversion to open cholecystectomy. Intrahepatic gallbladder was significantly more common in males (50% vs. 10%; $p = 0.003$), whereas large gallbladder was significantly more common in females (60% vs. 20%; $p = 0.005$). Complex adhesions and conversion to open surgery showed clinically important trends but did not achieve statistical significance. No bile duct injuries were observed in either group.

Conclusions

Male patients undergoing elective laparoscopic cholecystectomy exhibited greater intraoperative technical difficulty than female patients, particularly due to increased intrahepatic gallbladder, visceral fat, and complex adhesions. Recognition of these factors may facilitate preoperative risk stratification, operative planning, and appropriate allocation of surgical expertise. Larger multicentre studies with balanced sample sizes are warranted to validate these findings.

Keywords

- Laparoscopic cholecystectomy
- Gallstone disease
- Male gender
- Intrahepatic gallbladder
- Operative difficulty
- Conversion to open cholecystectomy

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INTRODUCTION

Gallstone disease is one of the most common gastrointestinal disorders worldwide and represents a significant cause of surgical morbidity. It affects approximately 10–20% of the adult population, with prevalence varying according to age, sex, ethnicity, dietary habits, obesity, and metabolic risk factors. Although many individuals with gallstones remain asymptomatic, symptomatic cholelithiasis frequently manifests as biliary colic, acute cholecystitis, choledocholithiasis, gallstone pancreatitis, and other biliary complications that necessitate surgical intervention. Laparoscopic cholecystectomy (LC), first introduced in the late 1980s, has become the gold standard treatment for symptomatic gallstone disease because of its advantages over open cholecystectomy, including reduced postoperative pain, shorter hospital stay, faster recovery, improved cosmetic outcomes, and lower postoperative morbidity.

Despite being considered a routine procedure, laparoscopic cholecystectomy can present considerable intraoperative challenges. Technical difficulty varies according to patient-related, disease-related, and anatomical factors. Severe inflammation, dense pericholecystic adhesions, obesity, increased visceral fat, distorted Calot's triangle anatomy, thickened gallbladder wall, contracted gallbladder, intrahepatic gallbladder, previous upper abdominal surgery, and acute inflammatory pathology may obscure critical anatomical landmarks and increase the risk of operative complications. Such difficulties may prolong operative time, increase blood loss, necessitate drain placement, and occasionally require conversion to open cholecystectomy to ensure patient safety.

Among the various predictors of difficult laparoscopic cholecystectomy, male gender has consistently been identified as an important clinical factor. Several studies have reported higher rates of difficult dissection, dense adhesions, prolonged operative duration, and conversion to open surgery in male patients. These observations have been attributed to delayed healthcare-seeking behaviour, recurrent episodes of subclinical inflammation, increased visceral adiposity, and more advanced

fibrotic changes at the time of surgery. However, the exact mechanisms responsible for increased operative difficulty in males remain incompletely understood, and published evidence has shown variability across different populations.

In contrast, female patients have a higher overall incidence of gallstone disease because of hormonal influences, including the effects of oestrogen on cholesterol metabolism and bile composition. While women undergo laparoscopic cholecystectomy more frequently than men, the relationship between female sex and intraoperative technical difficulty is less clearly established. Whether anatomical and pathological differences between the sexes influence operative complexity continues to be an area of clinical interest.

Identification of factors associated with difficult laparoscopic cholecystectomy is important for several reasons. Accurate preoperative risk assessment enables appropriate patient counselling, better operating room scheduling, allocation of experienced surgical teams, anticipation of potential complications, and timely decision-making regarding bailout procedures or conversion to open surgery when necessary. Furthermore, understanding gender-specific intraoperative characteristics may contribute to improved surgical planning and patient safety.

The present prospective comparative study was conducted in the Department of General Surgery, Santosh Medical College and Hospital, Ghaziabad, to evaluate differences in operative difficulty between male and female patients undergoing elective laparoscopic cholecystectomy. The study compared key intraoperative variables including difficult Calot's triangle anatomy, visceral fat, complex adhesions, gallbladder size, gallbladder wall thickness, intrahepatic gallbladder, haemostasis, operative duration, drain placement, conversion to open cholecystectomy, and bile duct injury. By identifying gender-specific patterns associated with operative complexity, this study aims to provide evidence that may improve preoperative risk stratification, optimize surgical planning, and enhance perioperative outcomes in patients undergoing laparoscopic cholecystectomy.

Study Aim

To compare the intraoperative difficulty of elective laparoscopic cholecystectomy between male and female patients.

Objectives

Primary objective

- To compare intraoperative difficulty parameters between male and female patients undergoing elective laparoscopic cholecystectomy.

Secondary objectives

- To compare the incidence of difficult Calot's triangle anatomy, increased visceral fat, complex adhesions, gallbladder wall thickness, large gallbladder, intrahepatic gallbladder, difficult haemostasis, operative duration, drain placement, conversion to open cholecystectomy, and bile duct injury between the two groups.
- To identify gender-related factors associated with increased operative difficulty.
- To assess the clinical implications of gender-specific intraoperative findings for surgical planning and patient management.

MATERIALS AND METHODS

Study Design

This prospective comparative observational study was conducted to evaluate gender-related differences in intraoperative difficulty during elective laparoscopic cholecystectomy. The study compared intraoperative anatomical and operative variables between male and female patients undergoing surgery for symptomatic gallstone disease.

Study Setting

The study was conducted in the Department of General Surgery, Santosh Medical College and Hospital, Santosh Deemed to be University, Ghaziabad, Uttar Pradesh, India, a tertiary care teaching hospital providing elective and emergency hepatobiliary surgical services.

Study Duration

Patients were enrolled consecutively between **April 2024 and November 2025**.

Study Population

A total of **123 consecutive patients** diagnosed with symptomatic cholelithiasis and scheduled for elective laparoscopic cholecystectomy were included in the study.

The study population comprised:

- Male patients: **30 (24.4%)**
- Female patients: **93 (75.6%)**

The demographic and operative characteristics of both groups were compared.

Inclusion Criteria

Patients fulfilling all of the following criteria were included:

- Age ≥ 18 years.
- Symptomatic cholelithiasis confirmed by ultrasonography.
- Elective laparoscopic cholecystectomy planned.
- Fitness for general anaesthesia.
- Written informed consent for participation.

Exclusion Criteria

Patients with the following conditions were excluded:

- Suspected or confirmed gallbladder malignancy.
- Common bile duct stones requiring additional biliary procedures.
- Previous major upper abdominal surgery likely to alter biliary anatomy.
- Patients undergoing emergency surgery for gallbladder perforation or generalized peritonitis.
- Patients unwilling to participate in the study.

Preoperative Assessment

All patients underwent a standardised preoperative evaluation, including detailed clinical history, physical examination, laboratory investigations, abdominal ultrasonography, and anaesthetic assessment. Demographic variables, comorbidities, and imaging findings were documented before surgery.

- Identification of gender-associated intraoperative anatomical variations.

Surgical Technique

All procedures were performed under general anaesthesia using the standard four-port laparoscopic cholecystectomy technique. Pneumoperitoneum was established using the surgeon's preferred method, followed by placement of four laparoscopic ports. The gallbladder was retracted to expose Calot's triangle, and careful dissection was performed to obtain the Critical View of Safety before clipping and dividing the cystic duct and cystic artery. The gallbladder was then separated from the liver bed using electrocautery and retrieved through the epigastric port. A subhepatic drain was inserted at the discretion of the operating surgeon when indicated by intraoperative findings.

Intraoperative Variables

The following intraoperative variables were prospectively recorded:

- Difficult Calot's triangle anatomy.
- Increased visceral fat.
- Complex pericholecystic adhesions.
- Large gallbladder.
- Thickened gallbladder wall.
- Intrahepatic gallbladder.
- Difficult haemostasis.
- Prolonged operative duration.
- Requirement for drain placement.
- Conversion to open cholecystectomy.
- Bile duct injury.

The definitions of these variables were standardized before commencement of the study to minimize observer variability.

Outcome Measures

Primary Outcome

To compare the frequency of intraoperative technical difficulty between male and female patients undergoing elective laparoscopic cholecystectomy.

Secondary Outcomes

- Incidence of conversion to open cholecystectomy.
- Frequency of difficult haemostasis.
- Requirement for drain placement.
- Occurrence of bile duct injury.

Statistical Analysis

Data were entered into a computerized database and summarized using descriptive statistics. Continuous variables should be presented as mean $\pm$ standard deviation or median (interquartile range), depending on data distribution, while categorical variables should be expressed as frequencies and percentages.

Comparisons between male and female patients were performed using the **Chi-square test** or **Fisher's exact test** for categorical variables, with a two-sided **p-value <0.05** considered statistically significant. The statistical analyses reported in this manuscript reflect the summary data available from the study. Because patient-level data were not available for reanalysis, no multivariable logistic regression or adjusted odds ratios are reported.

Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and institutional ethical standards. Approval was obtained from the Institutional Ethics Committee of Santosh Medical College and Hospital before commencement of the study. Written informed consent was obtained from all participants prior to enrolment, and patient confidentiality was maintained throughout the study.

RESULTS

Patient Characteristics

A total of **123 patients** undergoing elective laparoscopic cholecystectomy were included in the study. The cohort comprised **30 males (24.4%)** and **93 females (75.6%)**. All enrolled patients underwent laparoscopic cholecystectomy and were included in the final analysis.

Table 1. Study Population

Characteristic	Male (n=30)	Female (n=93)	Total (n=123)
Number of patients	30	93	123
Percentage (%)	24.4	75.6	100

Percentages are calculated within each sex.

Comparison of Intraoperative Findings

Male patients demonstrated a higher frequency of technically challenging intraoperative findings than female patients. Increased visceral fat, difficult Calot's triangle anatomy, complex adhesions, thickened gallbladder wall, prolonged operative duration, difficult haemostasis, drain placement, and conversion to open surgery were more common in males. Conversely, large gallbladder was significantly more frequent among female patients.

Table 2. Comparison of Intraoperative Findings Between Male and Female Patients

Variable	Male n (%)	Female n (%)	p-value	Interpretation
Difficult Calot's anatomy	15 (50.0)	28 (30.1)	0.61	Not significant
Increased visceral fat	21 (70.0)	37 (39.8)	0.41	Not significant
Complex adhesions	18 (60.0)	23 (24.7)	0.06	Borderline significance
Large gallbladder	6 (20.0)	55 (59.1)	0.005	Significant
Thickened gallbladder wall	15 (50.0)	28 (30.1)	0.61	Not significant
Intrahepatic gallbladder	15 (50.0)	9 (9.7)	0.003	Significant
Difficult haemostasis	15 (50.0)	28 (30.1)	0.61	Not significant
Prolonged operative duration	18 (60.0)	28 (30.1)	0.10	Not significant
Drain placement	24 (80.0)	37 (39.8)	0.27	Not significant
Conversion to open surgery	6 (20.0)	3 (3.2)	0.08	Borderline significance
Bile duct injury	0	0	—	None observed

Significant Findings

Two intraoperative variables demonstrated statistically significant differences between the two groups.

A **large gallbladder** was significantly more common in female patients than in male patients (59.1% vs. 20.0%; $p = 0.005$). In contrast, an **intrahepatic gallbladder** was significantly more common in male patients (50.0% vs. 9.7%; $p = 0.003$).

Borderline Significant Findings

Complex adhesions occurred more frequently in male patients (60.0% vs. 24.7%; $p = 0.06$). Similarly, conversion to open cholecystectomy was observed more often in males than females (20.0% vs. 3.2%; $p = 0.08$). Although these differences did not reach statistical significance, they may be clinically relevant and merit further investigation in larger studies.

Operative Safety

No bile duct injuries were recorded in either study group, indicating that safe operative techniques were maintained despite variations in operative difficulty.

Key Results

- Male patients demonstrated a higher prevalence of technically difficult intraoperative findings.
- **Intrahepatic gallbladder** was significantly associated with male patients.
- **Large gallbladder** was significantly associated with female patients.
- Complex adhesions and conversion to open surgery showed clinically important trends but were not statistically significant.
- No bile duct injuries occurred during the study period.

DISCUSSION

- The present prospective comparative study evaluated gender-related differences in intraoperative difficulty during elective laparoscopic cholecystectomy. Although laparoscopic cholecystectomy is considered the standard treatment for symptomatic gallstone disease, technical complexity varies considerably among patients due to anatomical variations, inflammatory changes, and disease severity. In this study, male patients consistently demonstrated a greater frequency of technically challenging intraoperative findings than female patients, supporting previous reports that male sex is associated with increased operative difficulty.
- One of the most important observations was the significantly higher prevalence of **intrahepatic gallbladder** among male patients (50.0% vs. 9.7%; $p = 0.003$). An intrahepatic gallbladder alters the normal anatomical relationship between the gallbladder and liver, making dissection technically demanding and reducing the visibility of Calot's triangle. Difficult identification of the cystic duct and artery may increase operative time and the likelihood of conversion to open surgery. Previous studies have similarly described intrahepatic gallbladder as an important anatomical factor contributing to operative complexity and increased surgical risk.
- Conversely, a **large gallbladder** was significantly more common among female patients (59.1% vs. 20.0%; $p = 0.005$). Although enlargement of the gallbladder may complicate retraction and exposure, our findings suggest that gallbladder size alone does not necessarily predict operative difficulty. Female patients exhibited lower rates of dense adhesions, conversion to open surgery, and intrahepatic gallbladder despite the higher prevalence of enlarged gallbladders. This observation may reflect the influence of hormonal and metabolic factors on gallstone disease in women rather than increased surgical complexity.
- Male patients also showed higher frequencies of increased visceral fat, difficult Calot's triangle anatomy, complex adhesions, prolonged operative duration, difficult haemostasis, drain placement, and conversion to open cholecystectomy. Although these differences were not statistically significant, they consistently favoured greater operative difficulty in men. The higher prevalence of visceral

adiposity and chronic inflammatory changes may obscure important anatomical landmarks, increase operative time, and complicate safe dissection. Similar observations have been reported in previous studies, where delayed presentation and recurrent inflammation among male patients resulted in more technically demanding procedures.

- Complex adhesions (60.0% vs. 24.7%; $p = 0.06$) and conversion to open surgery (20.0% vs. 3.2%; $p = 0.08$) approached statistical significance. Although these findings should not be interpreted as statistically significant, the magnitude of the observed differences suggests potential clinical relevance. Conversion to open surgery should be regarded as a safety strategy rather than a surgical failure, particularly when anatomical clarification cannot be achieved safely during laparoscopic dissection. Larger studies with balanced recruitment of male and female patients are required to determine whether these trends represent true gender-related differences.
- Importantly, **no bile duct injuries** occurred in either study group. This finding indicates that careful adherence to safe surgical principles, including meticulous dissection and achievement of the Critical View of Safety before division of the cystic structures, can minimize major biliary complications even in technically challenging cases. The absence of bile duct injury reflects appropriate intraoperative judgment and emphasizes that patient safety should remain the primary determinant of operative decision-making.

Clinical Implications

- The findings of this study have practical implications for preoperative planning. Male patients, particularly those with imaging findings suggestive of an intrahepatic gallbladder, significant visceral adiposity, or chronic inflammatory changes, may benefit from surgery performed by experienced hepatobiliary surgeons or under senior supervision. Early recognition of these risk factors can improve operative planning, optimize theatre scheduling, facilitate appropriate patient counselling, and encourage timely conversion to open surgery when safe laparoscopic progress cannot be maintained.

Strengths

- This study has several strengths. It was conducted prospectively using a standardized operative protocol in a tertiary care teaching hospital. Multiple intraoperative variables relevant to operative difficulty were systematically evaluated, allowing direct comparison between male and female patients. The study also highlights the importance of intrahepatic gallbladder as a clinically relevant anatomical variation associated with increased operative complexity.

Limitations

- The study has several limitations. First, it was performed at a single institution, which may limit the generalizability of the findings. Second, the male cohort was substantially smaller than the female cohort, reducing statistical power and increasing the possibility of type II error for several comparisons. Third, multivariable analysis could not be performed because patient-level data were unavailable. Finally, operative difficulty was assessed using selected intraoperative variables rather than a validated composite grading system, limiting comparison with some published studies.

Future Directions

- Future multicentre studies involving larger and more balanced patient populations are required to validate these findings. Prospective validation of standardized intraoperative difficulty grading systems, together with multivariable analyses incorporating patient-, disease-, and surgeon-related variables, may further improve prediction of difficult laparoscopic cholecystectomy and guide individualized surgical planning.

CONCLUSION

The present prospective comparative study demonstrated that male patients undergoing elective laparoscopic cholecystectomy experienced a greater frequency of technically challenging intraoperative findings than female patients. Among the evaluated variables, **intrahepatic gallbladder** was significantly more prevalent in males, whereas **large gallbladder** was significantly more common in females. Although increased visceral fat, difficult

Calot's anatomy, complex adhesions, prolonged operative duration, drain placement, and conversion to open cholecystectomy occurred more frequently in male patients, these differences did not reach statistical significance within the present sample.

These findings suggest that male gender may be associated with increased operative complexity, primarily because of anatomical and inflammatory factors rather than gender alone. Careful preoperative assessment, meticulous surgical technique, and early recognition of challenging intraoperative anatomy are essential to optimize patient safety. Larger multicentre studies with balanced gender representation and multivariable statistical analysis are required to confirm these observations and improve preoperative prediction of difficult laparoscopic cholecystectomy.

DECLARATIONS

Ethics Approval and Consent to Participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and approved by the Institutional Ethics Committee of Santosh Medical College and Hospital, Santosh Deemed to be University, Ghaziabad, India.

- IEC Approval Number: SU/R/2024/1350(26)
- Date of Approval: 15.05.2024

Written informed consent was obtained from all participants before enrolment.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request, subject to institutional policies and ethical approval.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions (CRediT Taxonomy)

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- Conceptualization
- Study design
- Data collection
- Surgical assistance
- Data interpretation
- Manuscript preparation
- Literature review

Dr. Shalabh Gupta

- Study supervision
- Conceptual supervision
- Manuscript revision
- Final approval of the manuscript

Dr. Hari Mohan

- Methodology
- Manuscript review and editing
- Clinical guidance

All authors read and approved the final manuscript.

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Abbreviations

Abbreviation	Full Form
LC	Laparoscopic Cholecystectomy
GB	Gallbladder
CBD	Common Bile Duct
CVS	Critical View of Safety
IEC	Institutional Ethics Committee

What this Study Adds

1. This prospective study demonstrates that **intrahepatic gallbladder** is significantly more frequent in male patients undergoing elective laparoscopic cholecystectomy and is associated with greater operative difficulty.
2. Male patients showed higher frequencies of several technically challenging intraoperative findings, supporting the need for careful preoperative assessment and surgical planning.
3. The findings emphasise that anatomical variations and chronic inflammatory changes, rather than sex alone, contribute to operative complexity.

BIBLIOGRAPHY

1. Strasberg SM, Brunt LM. The critical view of safety: why it is important in laparoscopic cholecystectomy. *J Am Coll Surg*. 2010;211(1):132-138. doi:10.1016/j.jamcollsurg.2010.02.053.
2. Wakabayashi G, Iwashita Y, Hibi T, Takada T, Strasberg SM, Asbun HJ, et al. Tokyo Guidelines 2018: surgical management of acute cholecystitis. *J Hepatobiliary Pancreat Sci*. 2018;25(1):89-96. doi:10.1002/jhbp.517.
3. Nassar AHM, Hodson J, Ng HJ, Vohra RS, Catton JA, Royston CMS. Predicting the difficult laparoscopic cholecystectomy: development and validation of a pre-operative risk score. *Surg Endosc*. 2020;34(10):4548-4555. doi:10.1007/s00464-019-07266-5.
4. Gupta N, Ranjan G, Arora MP, Goswami B, Chaudhary P, Kapur A, et al. Validation of a scoring system to predict difficult laparoscopic cholecystectomy. *Int J Surg*. 2013;11(9):1002-1006. doi:10.1016/j.ijssu.2013.09.011.
5. Griniatsos J. Factors predisposing to conversion from laparoscopic to open cholecystectomy. *Ann Laparosc Endosc Surg*. 2018;3:12.

6. Genc V, Sulaimanov M, Cipe G, Basceken SI, Erverdi N, Gurel M, et al. What necessitates the conversion to open cholecystectomy? A retrospective analysis of 5164 consecutive laparoscopic operations. *Clinics (Sao Paulo)*. 2011;66(3):417-420. doi:10.1590/S1807-59322011000300009.
7. Yokoe M, Hata J, Takada T, Strasberg SM, Asbun HJ, Wakabayashi G, et al. Tokyo Guidelines 2018: diagnostic criteria and severity grading of acute cholecystitis. *J Hepatobiliary Pancreat Sci*. 2018;25(1):41-54. doi:10.1002/jhbp.515.
8. Pisano M, Allievi N, Gurusamy K, Borzellino G, Cimbanassi S, Boerna D, et al. 2020 World Society of Emergency Surgery updated guidelines for the diagnosis and treatment of acute calculous cholecystitis. *World J Emerg Surg*. 2020;15:61. doi:10.1186/s13017-020-00336-x.
9. Brunt LM, Deziel DJ, Telem DA, Strasberg SM, Aggarwal R, Asbun HJ, et al. Safe cholecystectomy multi-society practice guideline and state of the art consensus conference on prevention of bile duct injury during cholecystectomy. *Ann Surg*. 2020;272(1):3-23. doi:10.1097/SLA.0000000000003791.
10. Ansaloni L, Pisano M, Coccolini F, Peitzmann AB, Fingerhut A, Catena F, et al. 2020 World Society of Emergency Surgery guidelines for the detection and management of bile duct injury during cholecystectomy. *World J Emerg Surg*. 2021;16:30. doi:10.1186/s13017-021-00369-w.