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Research Article

Preoperative Predictors of Difficult Laparoscopic Cholecystectomy in Patients with Symptomatic Gallstone Disease: A Prospective Observational Study

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Abstract: ***Introduction:*** Laparoscopic cholecystectomy is widely used for the treatment of symptomatic gallstone disease. However, some procedures become technically difficult because of inflammation, fibrosis, adhesions, gallbladder wall thickening, impacted stones, or altered anatomy. Identification of preoperative predictors of a difficult laparoscopic cholecystectomy may help in operative planning, patient counseling, and allocation of experienced surgical personnel. **Objective:** To identify clinical, laboratory, and ultrasonographic factors associated with difficult laparoscopic cholecystectomy. **Materials and Methods:** This prospective observational study included sample of 150 patients undergoing elective or early laparoscopic cholecystectomy for symptomatic gallstone disease. Preoperative variables including age, sex, body mass index, previous attacks of acute cholecystitis, previous upper abdominal surgery, leukocyte count, gallbladder wall thickness, pericholecystic fluid, impacted stone at the neck, and contracted gallbladder were recorded. Operative difficulty was assessed using predefined intraoperative criteria. Associations between preoperative factors and difficult surgery were analyzed, with $p<0.05$ considered statistically significant. **Results:** Of 150 patients, 104 (69.3%) underwent uncomplicated laparoscopic cholecystectomy, while 46 (30.7%) had a difficult procedure. Difficult surgery was significantly associated with a history of repeated attacks of cholecystitis, gallbladder wall thickness ≥4 mm, impacted stone at the gallbladder neck, pericholecystic fluid, and previous upper abdominal surgery. Mean operative duration was 48.6 ± 12.4 minutes in the uncomplicated group compared with 82.3 ± 21.6 minutes in the difficult group ($p<0.001$). Conversion to open surgery was required in 6 patients (4.0%). **Conclusion**: Certain readily identifiable preoperative clinical and ultrasonographic factors can help predict difficult laparoscopic cholecystectomy. Gallbladder wall thickening, recurrent inflammatory attacks, impacted stones, and previous upper abdominal surgery were important predictors in the illustrative dataset. Preoperative risk assessment may improve surgical preparedness and patient counseling.

Keywords: Laparoscopic cholecystectomy, gallstone disease, difficult cholecystectomy, gallbladder wall thickness, conversion, risk factors.

INTRODUCTION

Gallstone disease is one of the most frequently encountered conditions in general surgical practice. Laparoscopic cholecystectomy has become the standard surgical approach for symptomatic gallstone disease because it generally permits smaller incisions, shorter recovery, and reduced postoperative morbidity compared with conventional open surgery.

Despite advances in laparoscopic techniques, some cholecystectomies remain technically challenging. Severe inflammation, dense adhesions around Calot's triangle, fibrotic gallbladder, impacted stones, obesity, and previous abdominal surgery may increase operative difficulty.

A difficult laparoscopic cholecystectomy may be associated with prolonged operative time, bleeding, gallbladder perforation, inability to achieve the critical view of safety, subtotal cholecystectomy, or conversion to an open procedure. International guidance emphasizes safe anatomical identification and the use of appropriate bail-out strategies when the critical view of safety cannot be achieved.

Preoperative identification of high-risk cases can therefore help surgeons plan the procedure, counsel patients regarding possible conversion, and ensure the availability of appropriate surgical expertise.

The present study was undertaken to evaluate clinical, laboratory, and ultrasonographic predictors of difficult laparoscopic cholecystectomy.

Aim and Objectives

The primary aim was to identify preoperative factors associated with difficult laparoscopic cholecystectomy. The specific objectives were to assess the relationship between operative difficulty and patient age, sex, body mass index, previous episodes of cholecystitis, history of upper abdominal surgery, leukocytosis, gallbladder wall thickness, pericholecystic fluid, contracted gallbladder, and impacted gallstone.

MATERIALS AND METHODS

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RESULTS

A total of **150 patients** undergoing laparoscopic cholecystectomy were included in the illustrative analysis.
Of these:

- **104 patients (69.3%)** had an uncomplicated/easy laparoscopic cholecystectomy.
- **46 patients (30.7%)** had a difficult laparoscopic cholecystectomy.

Table 1. Demographic Characteristics

Parameter	Easy LC (n=104)	Difficult LC (n=46)	p-value
Mean age, years	39.2 ± 11.4	47.8 ± 12.7	<0.001
Male	28 (26.9%)	19 (41.3%)	0.079
Female	76 (73.1%)	27 (58.7%)	
BMI ≥27.5 kg/m²	21 (20.2%)	17 (37.0%)	0.028

Patients with difficult cholecystectomy were older on average and more frequently had a higher BMI.

Table 2. Clinical Predictors of Difficult Laparoscopic Cholecystectomy

Clinical Factor	Easy LC n (%)	Difficult LC n (%)	p-value
Previous attacks of cholecystitis	26 (25.0%)	28 (60.9%)	<0.001
Previous hospitalization for biliary symptoms	18 (17.3%)	21 (45.7%)	<0.001
Previous upper abdominal surgery	5 (4.8%)	8 (17.4%)	0.017
BMI ≥27.5 kg/m²	21 (20.2%)	17 (37.0%)	0.028
Leukocytosis	15 (14.4%)	16 (34.8%)	0.004

Table 3. Ultrasonographic Predictors

Ultrasonographic Finding	Easy LC n (%)	Difficult LC n (%)	p-value
Gallbladder wall ≥4 mm	14 (13.5%)	24 (52.2%)	<0.001
Impacted neck stone	9 (8.7%)	17 (37.0%)	<0.001
Pericholecystic fluid	6 (5.8%)	10 (21.7%)	0.004
Contracted gallbladder	11 (10.6%)	13 (28.3%)	0.006
Multiple gallstones	58 (55.8%)	29 (63.0%)	0.405

Gallbladder wall thickness ≥4 mm showed a strong association with technically difficult surgery in the illustrative dataset.

Table 4. Operative Outcomes

Parameter	Easy LC	Difficult LC	p-value
Mean operative time	48.6 ± 12.4 min	82.3 ± 21.6 min	<0.001
Gallbladder perforation	5 (4.8%)	9 (19.6%)	0.005
Significant intraoperative bleeding	2 (1.9%)	6 (13.0%)	0.010
Subtotal cholecystectomy	0	4 (8.7%)	—
Conversion to open surgery	0	6 (13.0%)	—
Mean hospital stay	1.8 ± 0.7 days	3.2 ± 1.4 days	<0.001

Overall conversion to open surgery occurred in **6 of 150 patients (4.0%)**.

DISCUSSION

Laparoscopic cholecystectomy is an established surgical treatment for symptomatic gallbladder disease. However, operative difficulty varies significantly between patients.

In the present illustrative study, approximately one-third of patients were classified as having a difficult laparoscopic cholecystectomy. Increasing age, recurrent episodes of cholecystitis, previous upper abdominal surgery, leukocytosis, thickened gallbladder wall, impacted gallstone, and pericholecystic fluid were associated with greater operative difficulty.

One of the strongest predictors was gallbladder wall thickness. Chronic or recurrent inflammation may produce fibrosis and thickening of the gallbladder wall, making grasping and dissection more difficult. Inflammation around Calot's triangle can also obscure the normal anatomical planes.

An impacted stone at the gallbladder neck was another important predictor. An impacted stone may cause gallbladder distension and inflammatory changes around the cystic duct, thereby increasing the difficulty of achieving safe anatomical identification.

Previous attacks of acute cholecystitis were significantly more common in patients with difficult surgery. Recurrent inflammation can produce dense adhesions between the gallbladder, omentum, duodenum, and surrounding structures.

Patients with difficult procedures had longer operative times and prolonged hospitalization. Intraoperative gallbladder perforation and bleeding were also more frequent in this group.

Conversion to open surgery occurred in six patients. Conversion should not be considered a technical failure. It is a safety measure when anatomy cannot be confidently identified or when laparoscopic continuation could increase the risk of bile duct or vascular injury.

The Tokyo Guidelines emphasize appropriate patient selection and safe operative strategies for acute cholecystitis. They also recognize that technically difficult cases may require bail-out procedures, including conversion or alternative approaches, when the critical view of safety cannot be obtained.

The ability to anticipate surgical difficulty can therefore be clinically useful. A simple assessment combining patient history and preoperative ultrasonography may help identify patients who would benefit from surgery by an experienced laparoscopic surgeon.

CONCLUSION

Preoperative clinical and ultrasonographic assessment can help predict difficult laparoscopic cholecystectomy. In the illustrative dataset, recurrent attacks of cholecystitis, gallbladder wall thickness ≥4 mm, impacted neck stone, pericholecystic fluid, previous upper abdominal surgery, and elevated BMI were associated with increased operative difficulty.

Recognition of these factors before surgery may help improve operative planning, patient counseling, allocation of experienced surgical personnel, and timely use of appropriate bail-out techniques.

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Conflict of Interest

The author declares no conflict of interest.

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