



CORRELATION OF ULTRASONOGRAPHIC FINDINGS IN PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE STUDY

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Abstract

Background: Laparoscopic cholecystectomy is the gold standard treatment for symptomatic cholelithiasis. However, difficult laparoscopic cholecystectomy remains a challenge and may increase operative morbidity. Preoperative prediction of difficult cases using ultrasonography can aid in surgical planning and patient counseling.

Aim: To evaluate the correlation between preoperative ultrasonographic findings and intraoperative difficulty during laparoscopic cholecystectomy.

Materials and Methods: A prospective observational study was conducted in the Department of General Surgery, Sapthagiri Institute of Medical Sciences, Bengaluru, from January 2023 to August 2024. Forty patients with symptomatic cholelithiasis undergoing elective laparoscopic cholecystectomy were included. Ultrasonographic parameters assessed included gallbladder wall thickness, contracted gallbladder, and impacted stone at the gallbladder neck. Difficult laparoscopic cholecystectomy was defined as operative time greater than 90 minutes, presence of dense adhesions, or difficulty in Calot's triangle dissection. Data were analyzed using descriptive statistics and Chi-square/Fisher's exact tests.

Results: Among 40 patients, 34 (85%) were females and 6 (15%) were males. Ten patients (25%) underwent difficult laparoscopic cholecystectomy. Gallbladder wall thickness ≥ 4 mm was observed in 7 patients, of whom 6 (85.7%) had difficult surgery ($\chi^2 = 16.68$, $p < 0.001$). Contracted gallbladder was present in 4 patients and all experienced difficult surgery ($\chi^2 = 13.33$, $p < 0.001$). Impacted gallstone at the neck was present in 3 patients and all were associated with difficult surgery ($\chi^2 = 9.73$, $p = 0.002$). Ultrasonography demonstrated a sensitivity of 80% and a positive predictive value of 90.9%.

Conclusion: Gallbladder wall thickness ≥ 4 mm, contracted gallbladder, and impacted gallstone at the neck are significant ultrasonographic predictors of difficult laparoscopic cholecystectomy. Ultrasonography serves as a valuable preoperative tool for anticipating operative challenges.

Keywords: Laparoscopic cholecystectomy, Ultrasonography, Difficult cholecystectomy, Gallbladder wall thickness, Cholelithiasis.

Introduction

Gallstone disease is one of the most common surgical conditions encountered worldwide. Laparoscopic cholecystectomy has become the preferred treatment modality because of reduced postoperative pain, shorter hospital stay, earlier return to normal activity, and improved cosmetic outcomes. Despite advancements in laparoscopic techniques, certain cases remain technically demanding due to dense adhesions, distorted anatomy, chronic inflammation, fibrosis, or impacted gallstones. Difficult laparoscopic cholecystectomy may lead to prolonged operative time, increased risk of bile duct injury, bleeding, and conversion to open surgery. Ultrasonography is the primary imaging modality used in evaluating gallbladder disease and may provide valuable information regarding the likelihood of operative difficulty. Several sonographic parameters including gallbladder wall thickness, contracted gallbladder, and impacted stones have been reported as predictors of difficult surgery. The present study was undertaken to evaluate the correlation between preoperative ultrasonographic findings and intraoperative difficulty during laparoscopic cholecystectomy.

Aims And Objectives

Primary Objective To determine the correlation between preoperative ultrasonographic findings and difficult laparoscopic cholecystectomy.

Secondary Objectives

To assess the predictive value of gallbladder wall thickness.

To evaluate the significance of contracted gallbladder.

To assess the role of impacted gallstone at the gallbladder neck.

To determine the sensitivity and positive predictive value of ultrasonography.

Materials And Methods

Study Design

Prospective observational study.

Study Setting

Department of General Surgery, Sapthagiri Institute of Medical Sciences, Bengaluru.

Study Duration

January 2023 to August 2024.

Sample Size

40 patients.

Inclusion Criteria

Patients aged 18–65 years.

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- Symptomatic cholelithiasis confirmed on ultrasonography.
- Patients undergoing elective laparoscopic cholecystectomy.

Exclusion Criteria

- Acute cholecystitis.
- Gallbladder malignancy.
- Previous upper abdominal surgery.
- Patients unfit for general anesthesia.

1. Methodology

All patients underwent detailed clinical examination and preoperative ultrasonography. The following parameters were recorded:

- Gallbladder wall thickness.
- Contracted gallbladder in fasting state.
- Impacted stone at gallbladder neck.

Definition of Difficult Laparoscopic Cholecystectomy

A laparoscopic cholecystectomy was considered difficult if one or more of the following criteria were present:

1. Operative time greater than 90 minutes.
2. Presence of dense adhesions.
3. Difficulty in Calot's triangle dissection.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Chi-square test and Fisher's Exact Test were applied where appropriate. A p-value <0.05 was considered statistically significant.

Results

Table 1. Baseline Characteristics of Study Population (n = 40i)

Variable	Number (%)
Total patients	40 (100)
Male	6 (15)
Female	34 (85)
Easy laparoscopic cholecystectomy	30 (75)
Difficult laparoscopic cholecystectomy	10 (25)
Conversion to open surgery	0

Table 2. Association Between Gallbladder Wall Thickness and Operative Difficulty

Wall Thickness	Easy LC	Difficult LC	Total
<4 mm	29	4	33
≥4 mm	1	6	7
Total	30	10	40

$$\chi^2 = 16.68, p < 0.001$$

Table 3. Association Between Contracted Gallbladder and Operative Difficulty

Contracted Gallbladder	Easy LC	Difficult LC	Total
Present	0	4	4
Absent	30	6	36
Total	30	10	40

$\chi^2 = 13.33, p < 0.001$

Table 4. Association Between Impacted Stone at Neck and Operative Difficulty

Impacted Stone at Neck	Easy LC	Difficult LC	Total
Present	0	3	3
Absent	30	7	37
Total	30	10	40

$\chi^2 = 9.73, p = 0.002$

Table 5. Diagnostic Performance of Ultrasonography

Parameter	Value (%)
Sensitivity	80.0
Positive Predictive Value	90.9
Conversion Rate	0

5. Discussion

The present prospective study evaluated the role of ultrasonographic findings in predicting difficult laparoscopic cholecystectomy. Among the 40 patients studied, 25% experienced difficult surgery. Female predominance (85%) was observed, which is consistent with the known epidemiology of gallstone disease.

Gallbladder wall thickness greater than 4 mm was strongly associated with operative difficulty. Among seven patients with thickened gallbladder walls, six experienced difficult surgery. Chronic inflammation and fibrosis associated with gallbladder wall thickening contribute to difficult dissection and distorted anatomy.

Contracted gallbladder was identified in four patients, all of whom underwent difficult laparoscopic cholecystectomy. A contracted gallbladder reflects chronic inflammatory changes and fibrosis, making grasping and dissection technically challenging.

Impacted gallstones at the gallbladder neck were present in three patients and all were associated with difficult surgery. Such stones can distort Calot's triangle anatomy and increase operative complexity. Statistical analysis revealed significant associations between all three ultrasonographic parameters and operative difficulty. Gallbladder wall thickness ≥ 4 mm ($p < 0.001$), contracted gallbladder ($p < 0.001$), and impacted stone at the neck ($p = 0.002$) were significant predictors of difficult laparoscopic cholecystectomy.

Ultrasonography demonstrated a sensitivity of 80% and a positive predictive value of 90.9%, indicating good predictive accuracy. No patient required conversion to open surgery, likely reflecting improved laparoscopic expertise and careful case selection.

6. Limitations

- Small sample size.
- Single-center study.
- Limited ultrasonographic variables evaluated.
- Absence of multivariate analysis.

7. Conclusion

Preoperative ultrasonography is a useful and cost-effective modality for predicting difficult laparoscopic cholecystectomy. Gallbladder wall thickness ≥ 4 mm, contracted gallbladder, and impacted gallstone at the neck were significant predictors of operative difficulty. Recognition of these factors before surgery can assist in operative planning, patient counseling, and optimization of surgical outcomes.

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